Online ISSN: 2249-4596
Print ISSN: 0975-5861

Global Journal of Researches in Engineering : J
General Engineering

DISCOVERING THOUGHTS AND INVENTING FUTURE

HIGHLIGHTS

Shielding Processing Technique

Natural Flows Reconstitution

Stabilized Expansive Soils

Water Resources Management

Atlantis on Launch Pad, NASA

Volume 12 | Issue 3 | Version 1.0 ENG

Global Journal of Researches in Engineering: J
General Engineering

Global Journal of Researches in Engineering: J
General Engineering

Volume 12 Issue 3 (Ver. 1.0)

Open Association of Research Society

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals Inc., Headquarters Corporate Office, Cambridge Office Center, II Canal Park, Floor No. 5th, ***Cambridge (Massachusetts)***, Pin: MA 02141 United States

USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Open Association of Research Society, Marsh Road, Rainham, Essex, London RM13 8EU
United Kingdom.

Packaging & Continental Dispatching

Global Journals, India

Find a correspondence nodal officer near you

To find nodal officer of your country, please email us at *local@globaljournals.org*

eContacts

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investers@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

Pricing (Including by Air Parcel Charges):

For Authors:

22 USD (B/W) & 50 USD (Color)

Yearly Subscription (Personal & Institutional):

200 USD (B/W) & 250 USD (Color)

Editorial Board Members (HON.)

Contents of the Volume

i. Copyright Notice
ii. Editorial Board Members
iii. Chief Author and Dean
iv. Table of Contents
v. From the Chief Editor's Desk
vi. Research and Review Papers

1. Shielding Processing Technique through the Calculations and Measurement of the Time Averaged Cross-Section of Multiphase Domain. *1-10*
2. Do Agile Worth: A Survey of Three Agile Methods. *11-16*
3. Conceptual Model Development of Lime Versus Cement Stabilized Expansive Soils. *17-26*
4. Generation of 3-D City Model for Urban Utility Information System Using Digital Photogrammetry & GIS Technology. *27-30*
5. Sisvaznat: Natural Flows Reconstitution System as a Support for Water Resources Management. *31-38*

vii. Auxiliary Memberships
viii. Process of Submission of Research Paper
ix. Preferred Author Guidelines
x. Index

Global Journal of Researches in Engineering
General Engineering
Volume 12 Issue 3 Version 1.0 Year 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Shielding Processing Technique through the Calculations and Measurement of the Time Averaged Cross-Section of Multiphase Domain

By Karwi. Abbas Ali Mahmmoed, Abdullah. Eman Mohammed
Ministry of higher education, Iraq

Abstract - The dual source computed tomography (DSCT) setup has been developing in the central and has potential for use as anon-invasive tool for determining the time averaged cross section of multiphase domain. The two sources used in (DSCT) setup are located inside source collimator device (SCD) to collimate the beam to give it a fan shape. The count rate of un-attenuated photons will be measured by two sets of detectors. Radiation shielding is based on the principle of attenuation, which is the ability to reduce a wave's or ray's effect by blocking or bouncing particles through a barrier material. Charged particles may be attenuated by losing energy to reactions with electrons in the barrier, while gamma radiation is attenuated through scattering, or pair production. Calculated results showed a substantial convergence with the real measurement values of dose rates especially in the common points.

Keywords : *Shielding, Arrays, Scanning, Dose rate, Time averaged.*

GJRE-J Classification : *FOR Code: 290305*

SHIELDINGPROCESSINGTECHNIQUETHROUGHTHECALCULATIONSANDMEASUREMENTOFTHETIMEAVERAGEDCROSS-SECTIONOFMULTIPHASEDOMAIN

Strictly as per the compliance and regulations of:

Shielding Processing Technique through the Calculations and Measurement of the Time Averaged Cross-Section of Multiphase Domain

Karwi. Abbas Ali Mahhmoed [α], Abdullah. Eman Mohammed [σ]

Abstract - The dual source computed tomography (DSCT) setup has been developing in the central and has potential for use as anon-invasive tool for determining the time averaged cross section of multiphase domain. The two sources used in (DSCT) setup are located inside source collimator device (SCD) to collimate the beam to give it a fan shape. The count rate of un-attenuated photons will be measured by two sets of detectors. Radiation shielding is based on the principle of attenuation, which is the ability to reduce a wave's or ray's effect by blocking or bouncing particles through a barrier material. Charged particles may be attenuated by losing energy to reactions with electrons in the barrier, while gamma radiation is attenuated through scattering, or pair production. . Calculated results showed a substantial convergence with the real measurement values of dose rates especially in the common points.

Keywords : Shielding, Arrays, Scanning, Dose rate, Time averaged.

I. Introduction

Radiation can be a serious concern in gamma-ray systems, containing radiation and preventing it from causing physical harm to employees or their surroundings is an important part of operating equipment that emits potentially hazardous rays. Preserving both human safety and structural material that may be compromised from radiation exposure are vital concerns, as well as shielding sensitive materials. The process of regulating the effects and degree of penetration of radioactive rays varies according to the type of radiation involved. Indirectly ionizing radiation, like gamma ray is categorized, which involves charged particles. Different materials are better suited for certain types of radiation than others, as determined by the interaction between specific particles and the elemental properties of the shielding material. The DSCT unit is a research machine designed to quantitatively determine the time averaged of multiphase flow systems.

It has been designed to use two sealed point gamma ray sources [1, 2, 3, and 4]. Currently, it is equipped with Co60 (~50 mCi) and Cs137 (~300 mCi). Each source is housed in a Source Collimator Device which is made of lead (for Cs137) and tungsten (for Co60). A fan beam arrangement of source-detectors is used for measuring the transmission of the gamma ray photons across the multiphase experimental setup [5, 6, 7, and 8]. The fan beam consists of a longitudinal section of a cone. Each point gamma ray source is placed at the vertex of a cone. Its detector array is placed along the bottom section of its cone and the multiphase experiential setup is placed in the middle. The sources are positioned at the geometrical center of their SCDs to provide maximum shielding. The setup is designed so that the multiphase experimental setup placed at the center is simultaneously exposed to gamma photons from both sources. A detector array is located at the side opposite to each source in the respective fan beams. These arrays are capable of counting the un attenuated photons or even the scattered photons of the gamma ray that pass through the multiphase experimental setup. Typically a window of energy is set and the counts that fall in this window are recorded. Before a DSCT experiment is be performed, it is first ensured that the multiphase experimental setup is operating at the desired conditions. The SCDs are opened, to turn on the source. The DSCT experiment called a scan is then started and typically runs for about 8 hours. At the end, the SCDs are closed to 'turn off' the sources. During the scan, for a given source position, the detectors array is made to move in an angular manner. For each motion, the computer and data acquisition system collect the gamma ray counts data. The detector plate is moved 21 times; hence, the 15 detectors are oriented at 21 angular positions each with respect to the source. This way, for a given position of the source, 315 angular positions are covered along the arc of the fan beam.

II. Materials And Methoeds

a) Gamma ray sources and the Collimator Devices (SCDs)

Figures (1-12) are for equipments used in Fulton Lab. The Source Collimator Devices (SCDs) were designed by Dr. Charles Alexander at Oak Ridge National Laboratory (ORNL) as a part of the DOE-anaerobic digester grant and manufactured by the

Author α : Head of department of Mechanical Technology, Foundation of Technical Institute, Babylon (96403), Iraq, Assist Prof, Post Doctorate- USA. E-mail : here@abbas30032oo2@yahoo.com
Author σ : Assis Dean for Scientific research, Foundation of Technical Institute, Babylon(96403), Iraq, Assist Prof, Post Doctorate- USA. E-mail : eman_abdullah2001@yahoo.com

Global Journal of Researches in Engineering (J) Volume XII Issue III Version I Year 2012
1

Machine Shop facility at ORNL [9, 10, 11, 12, and 13]. Lead was used for the Cs^{137} SCD, and tungsten was used for the Co^{60} SCD [3]. The gamma ray beam emerges from the collimator window, which is always shut with a window wedge when the source is not in use. The wedge is secured by a wedge pin [14, 15, 16, and 17] as shown in Figure 1.

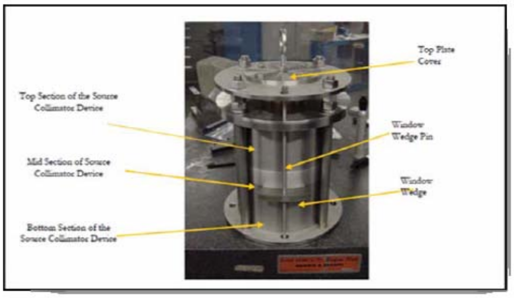


Fig. 1 : Front view of the Source Collimator Device provided by the manufacturer (Oak Ridge National Laboratory).

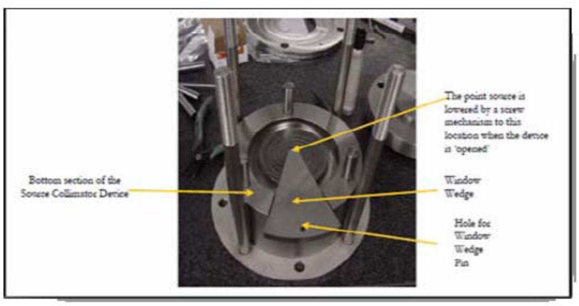


Fig. 2 : Front view of the bottom section of the Source Collimator Device when it is dismantled. The window wedge and location of the point source when the device is opened

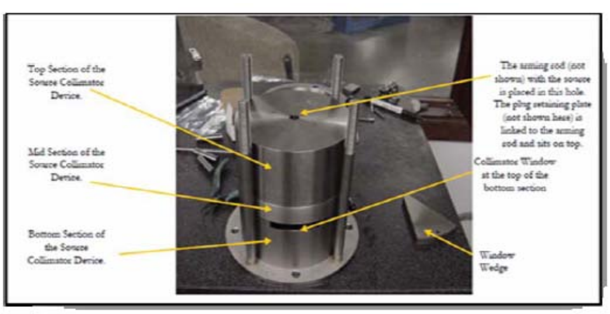


Fig. 3 : Front view of the Source Collimator Device with the top, mid, and bottom sections assembled

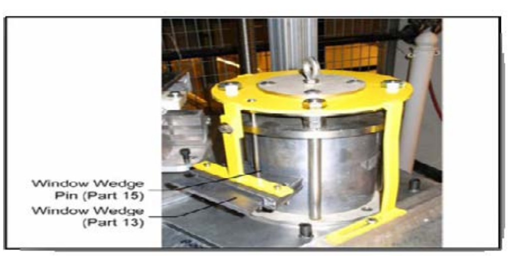


Fig. 4 : Side view of the Source Collimator Device

The point source is located inside the lower half of an arming rod. In use, the arming rod is at the axial center of the SCD. Figure 2 shows the disassembled SDC. The window wedge is placed so that its apex occupies the axial center of the device, the location the source will be lowered to when the source is to be 'turned on' or 'opened'. Figure 3 shows the SCD partially assembled and labels the window through which the gamma ray beam appears. This window is perfectly aligned with the detector lead collimators when the SCD is mounted on the DSCT setup. The source device has a wedge pin as a security device. To 'open' the source, the wedge pin is first removed. The window wedge is then removed with pliers. The top plate cover is removed by loosening the bolts attached to it. The removal of the top plate cover makes the plug retaining plate accessible. This plug retaining plate is attached to the arming rod that has the source in it. This externally threaded plate is lowered with a custom tool until the source is in the lower section of the SCD and centered in collimator window is in the lower section of the SCD and centered in collimator window.

b) *Gamma ray sources and the Collimator Devices (SCDs)*

The following shielding components are used in the DSCT setup. 1. Source Collimator Device (lead or tungsten) [18 and 19]. The Source Collimator Devices (SCDs) are 6 inches in diameter. The closest distance from the outer surface of the SCD to the source is source is 3 in. for Cs^{137} and 3.5 in. for Co^{60}. Hence, these are the minimum shielding thicknesses of the SCDs Tungsten collimator for the Co^{60} has an additional lead shield of ½ in. thickness. 2-External Beam Collimator (lead): External Beam Collimators have been attached to each of the SCDs with the aid of annex tension from the upper section of the collimator strap, so that they are in line with the collimator window, as shown in Figure 4. These collimators, 2 inches in length at their center, make the gamma ray beam shorter in height as it emerges from the collimator window. 3. Extended Window Wedge: The window wedges supplied by the manufacturer are not used on the SCDs when the external source collimators are attached to them, because they are short and are inaccessible through the extended collimator. Extended Window Wedges made of lead, are used for both the SCDs while they are installed on the DSCT apparatus. 4. Detector Array Lead Shield: The Detector Array Lead Shields are the major shielding component of the DSCT setup as shown in Figure 7. These are curved lead blocks 2.5 inch thick and 3 inch tall that are placed in front of the detectors. They have fifteen 1 inch diameter holes in them to accommodate the Detector Lead Collimators.. Only photons that are incident on the aperture of the collimator pass through unhindered to the detectors. 5. Detector Lead Collimators: The Detector Lead

Global Journal of Researches in Engineering (J) Volume XII Issue III Version I Year 2012

Collimators have an aperture in the center. Two different sizes of apertures are used (small and large). The small aperture collimator is used by default. When a detector is not used in one of the slots in the detector array, a blind collimator (a collimator without an aperture) is inserted for that slot in the detector shield. 6. Extenders attached to Detector Array Lead Shield: Lead extenders shown in Figure 8, are placed at the edges of the detector array lead 7. Lead Beam Stops The Lead Beam Stop for each detector as indicated in Figures 9 and 10 is made of half inch thick lead and has area of 1cm x1 cm.

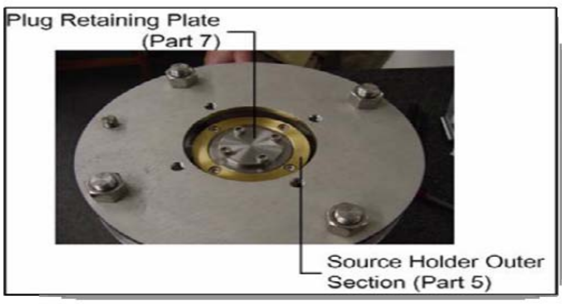


Fig. 5 : View of the SCD showing the Set screw and the Source holder outer section.

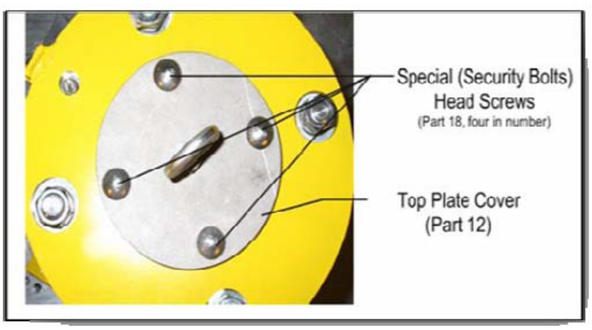


Fig. 6 : View of the SCD showing the security bolts and the top plate cover.

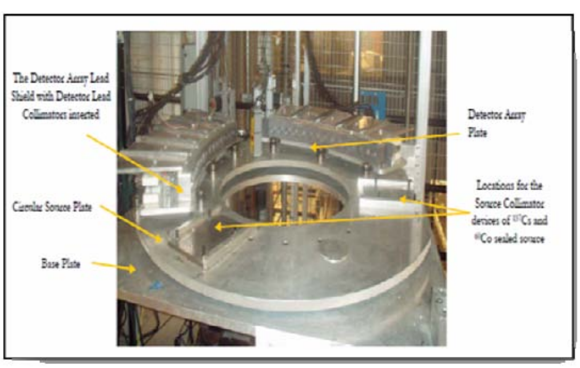


Fig. 7 : Photograph of the DSCT setup without the Source Collimator Devices.

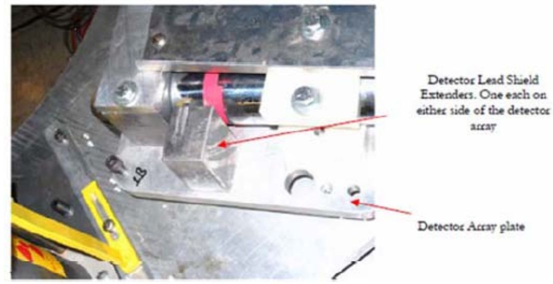


Fig. 8 : Detector Array Lead Shield extenders, made of lead, are secured by bolts to the detector array plate on either side of detector shields. They provide additional shielding at the sides.

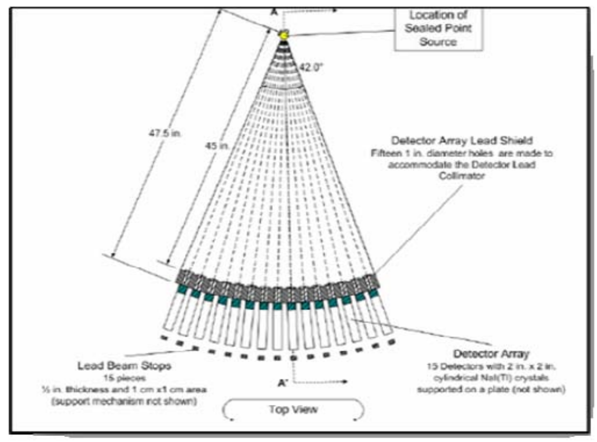


Fig. 9 : Schematic of the fan beam arrangement of the Detector Lead Collimators with the Detector Array Lead Shield.

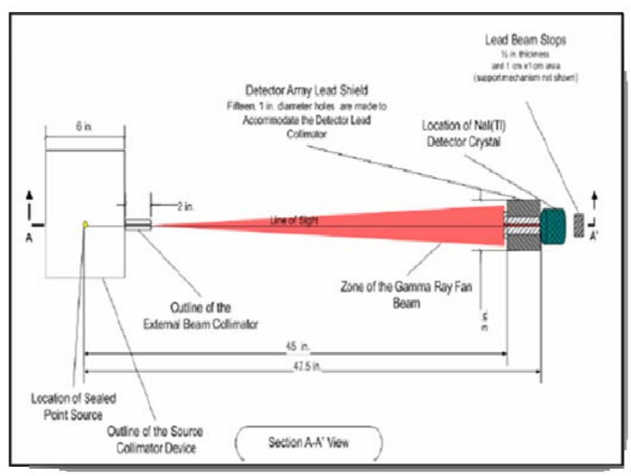


Fig. 10 : Source Collimator Device and detector arrangement. The shaded triangular region in the middle shows a section of the gamma ray fan.

c) Radiation dose rates through operation of (DSCT) setup

The local dose rates in and around the DSCT setup when both SCDs are 'turned on'. The highest possible dose received is at Location I, full body exposure with these dose rates at any location in the structure of the DSCT setup and around it. Since locations V and VI are beyond the aperture of the detector collimators as shown in Figure 11, the area of exposure for dose rates is same as the aperture of the collimator. Occupational dose rates when the SCDs are 'turned on'. The occupational dose has been calculated for a distance of 3 ft from the edges of the DSCT setup. Public dose rates. These doses have been calculated assuming the concrete walls and the doors are absent, and the fan beams are directly oriented towards the wall. The wall thickness and an additional distance of 30 cm (11.81 in.) have been considered to determine the distance for these calculations as shown in Figure 12. The shielding by the NaI crystal in the detector has been accounted. Since attenuation data for parts of the detector excluding the crystal was unavailable, attenuation by the crystal alone has been included. DSCT operation the public dose is calculated to be less than 2 mrem/hr. sight of the source when it is ''turned on''. These dose rates will be received, if one is .Since the dose rates calculated here doesn't account for the shielding from the block walls doors, and the multiphase experimental column in the center of the DSCT setup, the measured values will be less than 1mrem/hr in any one hour . Dosimeters will be placed on the walls on the North, the West and the South sides, and on the mesh on the East side such that they are in line with the DSCT set up. These will record the dose received at the periphery of the room due to the DSCT experiments. These dose records will be a good estimate (after accounting for attenuation by the walls) of the public dose rates. These dosimeters will be returned every quarter to Radiation Safety, and the new ones issued will be placed at the same location. Dose rates related to closed SCDs when the source is 'turned off'. These doses will be received in the region behind the SCD even when the source is 'turned off'

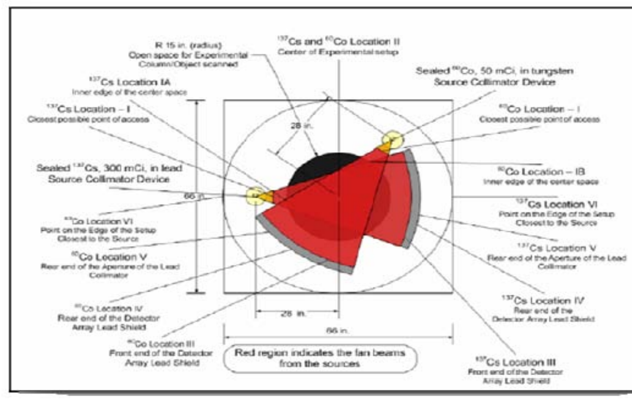
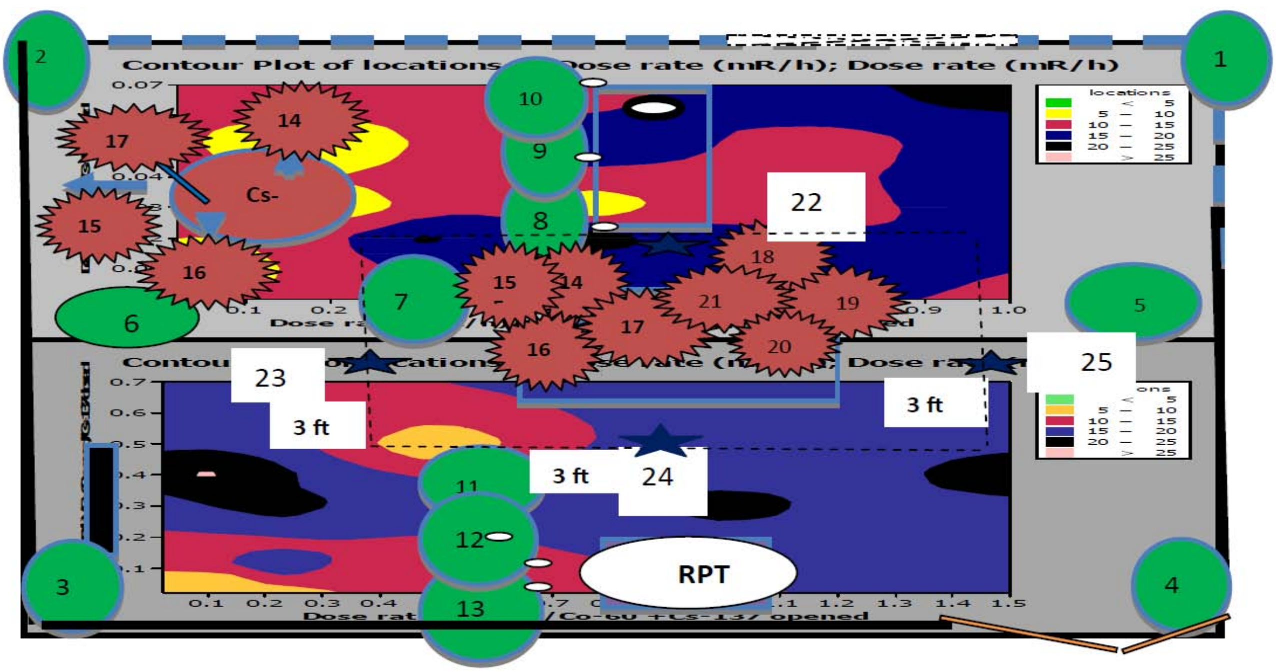


Fig. 11 : Schematic showing a top view of (DSCT) setup



[* Left side / (1ft) from Cs source –point (14) : * Behind / (1ft) from Cs source –point (15) : * Right side/ (1ft) from Cs source –point (16) *Above / (1ft) from Cs source –point (17) * Left side / (1ft) from Co source –point (20) : * Behind / (1ft) from Co source –point (19) : * Right side/ (1ft) from Co source –point (18) *Above / (1ft) from Co source –point (21)]

Fig.11 : Fulton Hall Lab

d) Operational Controls and surveying processes

1. Rope barrier around DSCT setup: The DSCT setup will have a rope barrier around it at a minimum distance of 3 ft from the DSCT, or the 2 mrem/hr perimeter, whichever is greater. This is to demarcate the minimum distance the DSCT User needs to maintain from the DSCT setup when a DSCT experiment is on. Further if the dose due to scatter is high near the DSCT setup.

2. Red Beacon: A red beacon is fitted on top of the DSCT's computer tower. This is connected to a sensor box, placed on the circular source table (Figure 1). When either of the SCDs is opened to 'turn the source on' the sensor detects the radiation and the beacon is turned on. This sensor is set at threshold of 2 mrem/hr.
3. Postings: The following signs will be posted on all doors (North, South and West). a- "Caution-Radioactive Material".b-"Authorized Personal Only".c-"Caution Radiation Area".d-"Warning: Do not enter if the RED BEACON is on.". e- " This gate is to be shut at all times"-(For the Riser gate) On all sides of the DSCT setup's frame. f-" Caution High Radiation Area" - on all sides of the DSCT structure. g-" Critical Shielding Component, not to be removed".
4. Tools for Opening Source Collimator Devices (SCDs): The SCDs require a special key to open the top cover plate and a special screw driver to rotate the source plate and lower it down to the collimator window.

DSCT radiation workers must conduct instrument surveys monthly and after any CT work, and must document these results properly. There must be no more than a 30 day gap between monthly surveys. If the lab contains no radioactive materials (RAM) or sealed sources, but the lab is still on active status as defined by radiation safety, it is still required to perform and document monthly lab surveys. The instrument surveys are used to detect radiation and to identify areas of contamination. Radiation workers must routinely survey the place of work and themselves individually, both during and after their work. The areas to be surveyed are: areas of radioactive material use and storage, components of the DSCT setup, experimental setup and its components, and the equipment used with the DSCT instrument. Radiation survey instruments are available in areas where sealed sources/devices are used. In these laboratories, there are two different types of portable Geiger-Muller (G-M) surveymeters: one is a Bicron Model 50 with cylindrical G-M probe, and the other is a Ludlum Model 3 with a pancake G-M probe. Instrument surveys are valuable in identifying areas where radioactive contamination may be present and surveying the radiation field around the sealed sources/devices. In a typical survey, dose rate measurements are made in the vicinity of the sources /devices and throughout the laboratory. In addition, these portable survey instruments are used for a variety of general tasks:

1. To conduct routine area surveys of the laboratory.
2. To confirm the successful opening and shutting of the collimator containing the sealed source.
3. To survey shipments of sealed sources received.
4. To monitor hands, shoes, clothing, and the work area for contamination before leaving the area.

G-M instruments are widely used for radiation survey work because of their reliability and low cost. The Bicron G-M probe is suitable for measuring exposure rates (mR/hr) in the vicinity of radioactive sources, but is relatively insensitive for detecting low levels of radioactivity associated with contamination. The Ludlum pancake G-M probe is much more sensitive to low levels of radioactive contamination, and the open side of the detector can be used for surface contamination measurements in counts per minute (cpm). The back side of the detector can be used like any G-M probe for exposure rate or dose rate measurements (mR/hr or mrem/hr). Figure 13 shows the Ludlum model3 survey meter with the pancake probe for general-purpose surveying.

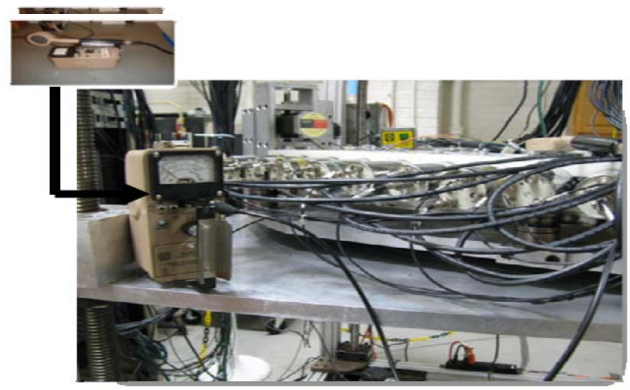


Fig. 13 : The Ludlum Model 3 Survey Meter with Model 44-9 G-M Pancake Probe

Electronic pocket dosimeter is suited for measuring the accumulated dose equivalent to X-ray of 20KeV , also used in medical service and other fields. The obtained data are stored in the battery for along time. There are three serial numbers for this device as shown in Table 1

Serial No	Dose equivalent	Error%	Calibrati on factor
E0740	41μSv	0.0	1
E0741	41μSv	0.0	1
E0742	41μSv	-2.4	1.03

Table 1 : Dosimeter models

Fig.14 : Electronic pocket dosimeter instrument (EPD^{TM})

III. Results And Discussion

Radiation protection can be divided into occupational radiation protection, medical radiation protection, and public radiation protection. There are three factors that control the amount of dose like; a- Time: Reducing the time of an exposure reduces the effective dose proportionally. Reducing radiation doses by reducing the time of exposures might be improving operator training to reduce the time they take to handle a source. b- Distance: Increasing distance reduces dose due to the inverse square law. Distance can be as simple as handling a source with forceps rather than fingers. c- Shielding: Biological shield refers to a mass of absorbing material placed around the radioactive source, to reduce the radiation to a level safe for humans. The effectiveness of a material as a biological shield is related to its cross-section for scattering and absorption, and to a first approximation is proportional to the total mass of material per unit area interposed along the line of sight between the radiation source and the region to be protected. Almost any material can act as a shield from gamma or x-rays if used in sufficient amounts. Experimental work as shown in Table 2 which presents the concentrations of the radiation of sources 235mCi Cs^{137} and 22mCi $C0^{60}$ for twenty five locations using gamma ray tomography. Doses for locations one-thirteen when the two sources closed are between 0.01-0.05 mR/h. The Doses for these points when the Cs^{137} source is opened are between 0.02-0.05 mR/h, but the doses when the Co^{60} source is opened are between 0.02-0.07mR/h. When the two sources are in work, the maximum concentration is at point 6 as shown in Figure 12. Table 3 presents the equivalent dose for locations 1ft far from the two sources at points fourteen-twenty one, the maximum dose rate is at point eigteen when the two sources are in work. Table 4 presents the doses rates for locations twenty two-twenty five for locations far 3ft from the view plate, so the maximum dose rate is at point twenty four and equal to 1.5 mR/h when the two sources are active in work. Figures 15, 16, 17, and 18 shows that the results obtained using the Ludlum Model 3 Survey Meter with Model 44-9 G-M Pancake Probe and electronic pocket dosimeter instrument(EPD™) Figures 19 and 20 shows that the equivalent dose rates in (mR/h) and (rad/h) in 3-D. The calculation dose rates induced by Cs^{137} and Co^{60} sources as shown.The maximum dose rates when 235mCi Cs^{137} source is active in work is 1 mR/h at a distance (1ft) far from view plate for points 14,15,16,17,18,19,20, and 21 as shown in Figure 12, the dose rates for these points are 0.8,0.5,0.5,1,0.4,0.4,0.3 and 0.4 resp. For points ate distance of (3ft) far from view plate, the minimum dose is 1 rad/h, while the maximum dose is 0.5 rad/h. Other locations 1-13 as shown in Figure 12 , the dose rates are between 0.02-0.03 rad/h, these doses are low and not affected on human health. Dose rates recorded by 22mCi Co^{60} source is lower than the rates of Cs^{137} source. When the two sources are in work, all doses are reached the maximum values near the view plate as shown in Figures 18, 19, and 20. So we can say that the doses are at the maximum limits when the two sources are in work around view plate. Gamma ray is the form of electromagnetic radiation that occurs with higher energy levels than those displayed by ultraviolet or visible light. There are several factors that influence the selection and use of radioactive shielding materials, such as attenuation effectiveness, strength, resistance to damage, thermal properties, and cost efficiency can affect radiation protection in numerous ways. So materials with high density are more effective than the low density for reducing the intensity of radiation. Low density materials can compensate for the disparity with increased thickness, which is as significant as density in shielding applications. Lead is particularly well suited for lessening the effect of gamma rays due to its high atomic number. This number refers to the amount of protons within an atom, so a lead atom has a relatively high number of protons along with a corresponding number of electrons. These electrons block many of the gamma ray particles that try to pass through a lead barrier, and the degree of protection can be compounded with thicker shielding barriers.

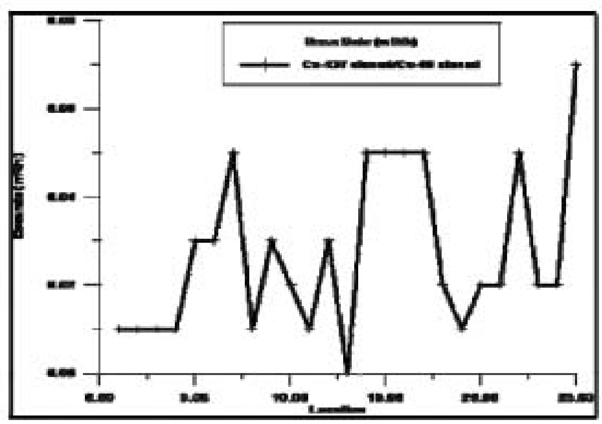


Fig.15 : Measured dose rate (mR/h) for G-2 Fulton Hall room when both sources are closed.

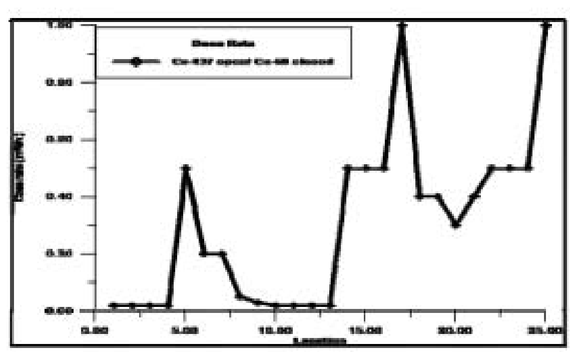


Fig. 15 : Measured dose rate (mR/h) for G-2 Fulton Hall room when both sources are closed

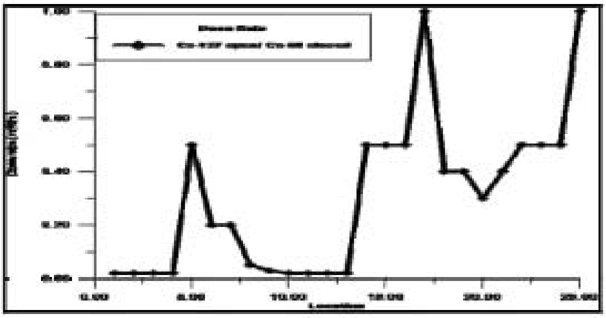


Fig. 16 : Measured dose rate (mR/h) for G-2 Fulton Hall room when Cs-137 open/Co-60 close

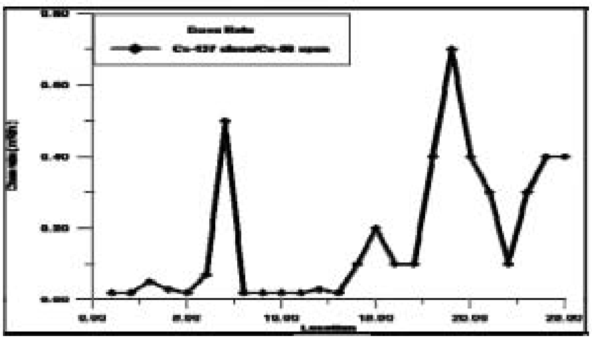


Fig. 17 : Measured dose rate (mR/h) for G-2 Fulton Hall room when Cs-137 close/Co-60 open

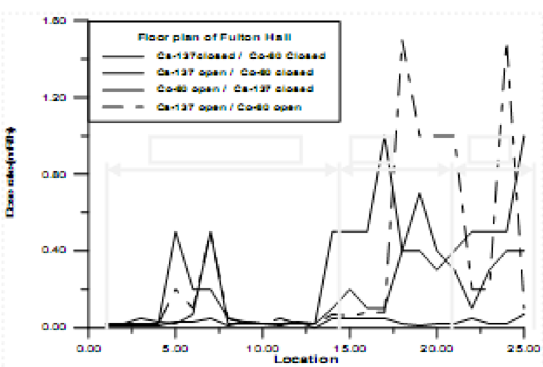


Fig. 18 : Measured dose rate (mR/h) for G-2 Fulton Hall room when Cs-137 close/Co-60 open

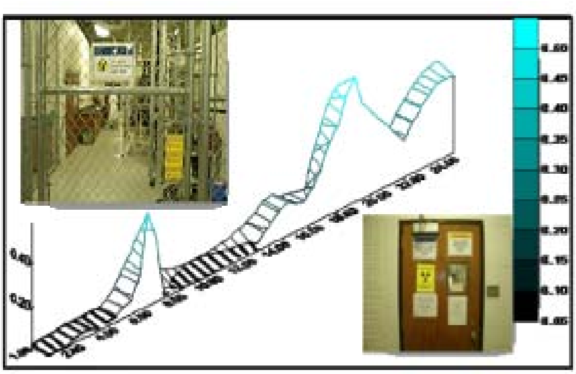


Fig. 19 : Dose rate(mR/h) of G-2 Fulton Hall room locations

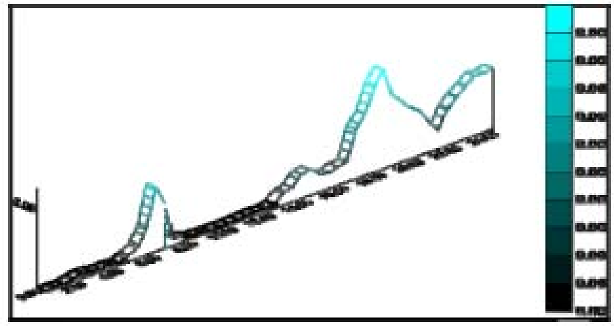


Fig. 20 : Dose rate (rad/h) of G-2 Fulton Hall room locations

Table 2 : Equivalent dose rate for locations (around, 1ft, and 3ft) from 200 mCi Cs-137 & 50 mCi Co-60 sources /Distance from source to floor =41in

Location	Dose rate (mR/h) /Cs-137 closed	Dose rate (mR/h)/ Cs-137 opened /Co-60 closed	Dose rate (mR/h) /Co-60 opened/ Cs-137 closed	Dose rate (mR/h)/ Co-60 + Cs-137 opened
1 (around)	0.01	0.02	0.02	0.02
2 (around)	0.01	0.02	0.02	0.02
3 (around)	0.01	0.02	0.05	0.02
4 (around)	0.01	0.02	0.03	0.02
5 (around)	0.03	0.5	0.02	0.2
6 (around)	0.03	0.2	0.07	0.1
7 (around)	0.05	0.2	0.5	0.5
8 (around)	0.01	0.05	0.02	0.05
9 (around)	0.03	0.03	0.02	0.02
10(around	0.02	0.02	0.02	0.02
11(around	0.01	0.02	0.02	0.05
12(around	0.03	0.02	0.03	0.02
13(around	0.00	0.02	0.02	0.02
14 (1ft)	0.05	0.8	0.1	0.07
15 (1ft)	0.05	0.5	0.2	0.06
16 (1ft)	0.05	0.5	0.1	0.08
17 (1ft)	0.05	1.0	0.1	0.08
18 (1ft)	0.02	0.4	0.4	1.5
19 (1ft)	0.01	0.4	0.7	1
20 (1ft)	0.02	0.3	0.4	1
21 (1ft)	0.02	0.4	0.3	1
22 (3ft)	0.05	0.5	0.1	0.2
23 (3ft)	0.02	0.5	0.3	0.2
24 (3ft)	0.02	0.5	0.4	1.5
25 (3ft)	0.07	1.0	0.4	0.1

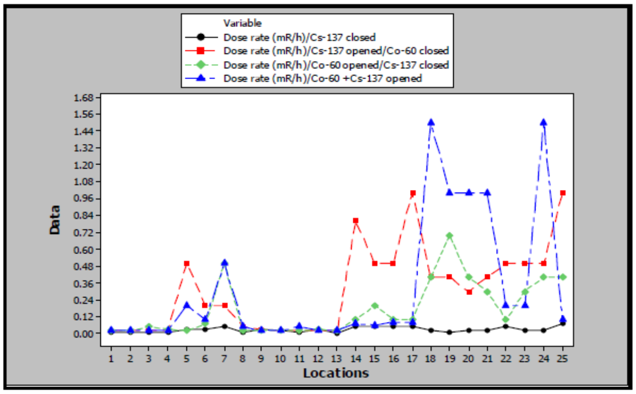


Fig. 21 : Dose rate (rad/h) of locations (1-25)

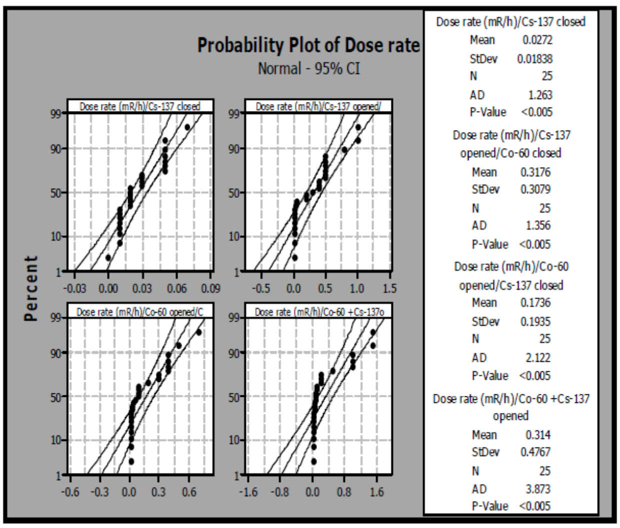


Fig. 22 : Probability plot of dose

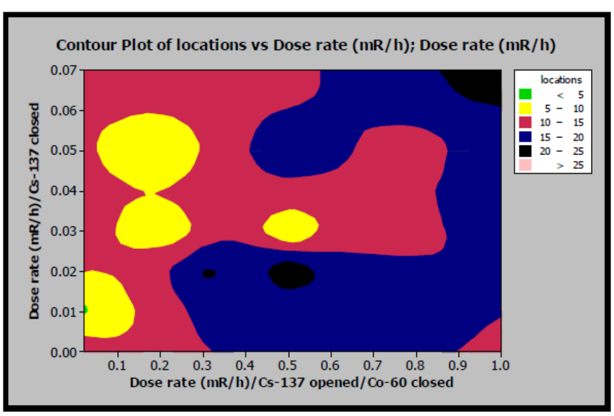


Fig. 23 : Contour plot locations vs dose rate

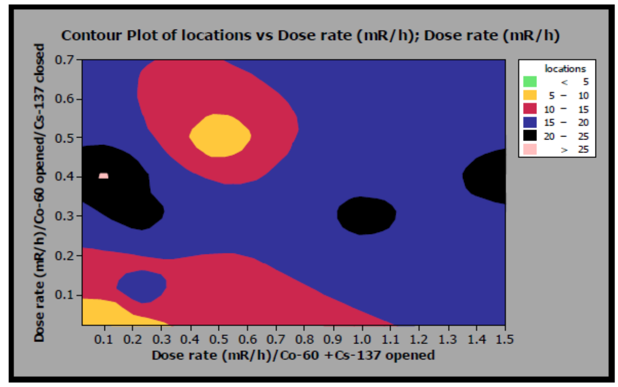


Fig. 24 : Contour plot locations vs dose rate

Table 3 : Input Data/Cs-137

No	Variable	Symbol	value	Unit
1	Cs-137 source activity	C1	235	mCi
2	Distance -1	d1	12.7cm=5in	Cm
3	Distance-2	d2	33.02cm=13in	Cm
4	Distance-3	d3	91.44cm=36in	Cm
5	Distance-4	d4	71.2cm=28in	Cm
6	Distance-5	d5	114.3cm=45in	Cm
7	Distance-6	d6	120.65cm=47.5in	Cm
8	Distance-7	d7	120.65cm=47.5in	Cm
9	Distance-8	d8	189.23cm=74.5in	Cm
10	Distance-9	d9	246.38cm=97in	Cm
11	Distance-10	d10	513cm	Cm
12	Distance-11	d11	520cm	Cm
13	Distance-12	d12	185	Cm
14	Distance-13	d13	303	Cm
15	Distance-14	d14	7.62cm=3in	Cm
16	Distance-15	d15	37.62cm=15.5in	Cm
17	Lead shielding distance-1	TL1	6.35cm=2.5in	Cm
18	Lead shielding distance-2	TL2	1.25cm=0.75in	Cm
19	Lead shielding distance-3	TL3	7.62cm=3in	Cm
20	NaI Shielding distance	TNaI	5.08cm=2in	cm

Table 4 : Output Data/Cs-137

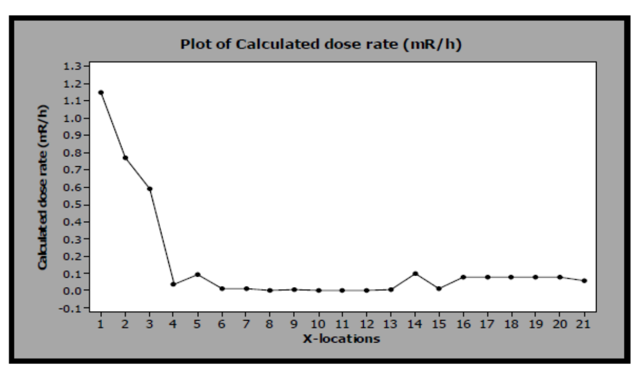


Fig. 25 : Plot of calculated dose rate

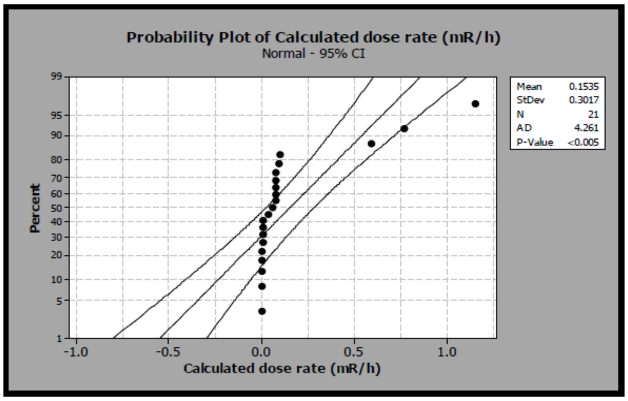


Fig. 26 : Probability plot of calculated dose rate

Radiation can be a serious concern in nuclear power facilities, industrial or medical x-ray systems, radioisotope projects, particle accelerator work, and a number of other circumstances. Containing radiation and preventing it from causing physical harm to employees or their surroundings is an important part of operating equipment that emits potentially hazardous rays. Preserving both human safety and structural material that may be compromised from radiation exposure are vital concerns, as well as shielding sensitive materials. The process of regulating the effects and degree of penetration of radioactive rays varies according to the type of radiation involved. Indirectly ionizing radiation, which includes neutrons, gamma rays, and x-rays, is categorized separately from directly ionizing radiation, which involves charged particles. Different materials are better suited for certain types of radiation than others, as determined by the interaction between specific particles and the elemental properties of the shielding material. Through Figure 22, we see that the standard deviation has the highest value in the case of open the two sources , so we see some points are out the domain of the probability lines, while we see that the standard deviation is less when we open the cesium source and the value becomes half when we open the cobalt source. From Figures 23 and 24 ,we see that the blue area is for the sites 15-20, these areas are widely exposure to gamma rays ,so we advise workers not to work for long periods within this region. The theoretical calculations as shown in Figures 25 and 26 ,we see there is a strong match between theoretical calculations and measurement processes up to 95% when the two sources are open, which confirms the correctness of theoretical calculations which we made.

References Références Referencias

1. Johansen GA. Nuclear tomography methods in industry. Nuclear Physics A 752:696-705, 2005.
2. Johansen GA, Froeystein T, Hjertaker BT, Olsen O. A dual sensor flow imaging tomographic system. Measurement Science & Technology 7(3):297-307, 1996.
3. Kak A, Slaney M. Principles of Computerized Tomographic Imaging. New York: IEEE Press. 83-86 p, 1998.
4. Hu B, Stewart C, Hale CP, Lawrence CJ, Hall ARW, Zwiens H, Hewitt GF, Development of an X-ray computed tomography (CT) system with sparse sources:application to three-phase pipe flow isualization Experiments in Fluids 39(4):667-678, 2005
5. Kumar S. Computed Tomographic Measurements of Void Fraction and Modeling of the Flow in Bubble Columns [Ph.D Thesis]: Florida Atlantic University. 1994.
6. Kumar S, Dudukóvi MP. Computer Assisted Gamma and X-ray Tomography: Applications to Multiphase Flow Systems. In: J. Chaouki FL, M.P.Duduković, editor. Non-Inavsive Monitoring of Multiphase Flows, 1997.
7. Kumar SB, Moslemian D, Dudukovic MP. A [gamma]-ray tomographic scanner for imaging voidage distribution in two-phase flow systems. Flow Measurement and Instrumentation 6(1):61-73, 1995
8. Kumar SB, Moslemian D, Dudukovic MP. Gas-holdup measurements in bubble columns using computed tomography. AIChE Journal 43(6):1414-1425. Carson R. 1984. EM Reconstruction Algorithims for Emission and Transmission Tomography. Journal of Computer Assisted Tomography 8(2):306-316. 1997
9. Ledere MC, Hollander JM, Perlman I. Table of Isotopes. New York: john Wiley & Sons, Inc, 1966
10. Mudde RF, Bruneau PRP, vanderHagen THJJ. Time-Resolved gamma-Densitometry Imaging within Fluidized Beds. Ind. Eng. Chem. Res. 44(16):6181-6187, 2005
11. Nikitidis MS, Tüzün U, Spyrou NM. Determination of Phase Velocities in Multi-Phase Flows Using Dual Photon Gamma-Ray tomography Chemical Engineering Communications 175(1):3 - 24. 1999.
12. Nooralahiyan AY, Hoyle BS. Three-component tomographic flow imaging using artificial neural network reconstruction. Chemical Engineering Science 52(13):2139-2148. 1997
13. O'Sullivan JA, Benac J. Alternating Minimization Algorithms for Transmission Tomography. Medical Imaging, IEEE Transactions on 26(3):283-297. 2007.
14. Schaffer HE. Algorithms 369: Generation of random numbers satisfying the poission distribution Communication of the assocations for computing machinery 13(1). 1970.
15. Ollinger JM. Maximum-likelihood reconstruction of transmission images in emission computed tomography via the EM algorithm. Medical Imaging, IEEE Transactions on 13(1):89-101, 1994.
16. Rapaport MS, Gayer A, Iszak E, Goresnic C, Baran A, Polak E. A dual-mode industrial CT. Nuclear

Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 352(3):652-658. 1995.

17. Rados N, Shaikh A, Al-Dahhan M. Phase Distribution in a High Pressure Slurry Bubble Column via a Single Source Computed Tomography The Canadian Journal of Chemical Engineering 83:104-112. 2005.
18. DixonW.R. Build-up factor for transmission of Co60 gamma-rays through concrete and lead. Physical Review, Letters to the editor :489-499. 1951.
19. 19. Sanchez L.C., McConnel P.E. Estimation of shielding thickness for a prototype department of energy national spent nuclear fuel program transport cask. Sandia Report (SAND 2000-1595). 2000.

Global Journal of Researches in Engineering
General Engineering
Volume 12 Issue 3 Version 1.0 Year 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Do Agile Worth: A Survey of Three Agile Methods

By Bodje N'kauh Nathan-Regis & V. Balaji
Christ University, Bangalore - India

Abstract - Agile methods are Group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams.

Today, the debate continues again about how much agile method worth? Is it really true that the software development in agile way have real advantages? As Craig Larman said as foreword in Patterns of Agile Practice Adoption, The Technical Cluster writes by Amr Elssamadisy": "Many confuse the heart of 'Agile' with practices rather than values; yet the essence of Agile methods is the four values ". The agile Manifesto describes four values, which sustain all the methods agile. This article with the help of a survey conducted in a poll of the "agile practitioners" will demonstrates until where the agile values influences the production software in a study of 3 factors : Team, Usage and Organization.

Keywords : Agile methods, software metrics, Extreme Programming, Scrum Methodologies, Lean Software Development.

GJRE-J Classification : (GJCST) D.2.8

Strictly as per the compliance and regulations of:

Do Agile Worth: A Survey of Three Agile Methods

Bodje N'kauh Nathan-Regis [α] & V. Balaji [σ]

Abstract - Agile methods are Group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams.

Today, the debate continues again about how much agile method worth? Is it really true that the software development in agile way have real advantages? As Craig Larman said as foreword in Patterns of Agile Practice Adoption, The Technical Cluster writes by Amr Elssamadisy": "Many confuse the heart of 'Agile' with practices rather than values; yet the essence of Agile methods is the four values ". The agile Manifesto describes four values, which sustain all the methods agile. This article with the help of a survey conducted in a poll of the "agile practitioners" will demonstrates until where the agile values influences the production software in a study of 3 factors : Team, Usage and Organization.

Keywords : Agile methods, software metrics, Extreme Programming, Scrum Methodologies, Lean Software Development.

I. Introduction

The need for better quality of software has given rise to many software methodologies. During (40) forty years we observe the proliferation of methods in the software development life cycle (Fig 1.1). Some of these methods have been characterized[1] as hard (technically oriented), soft (human-centred), hybrid (the combinaison of hard and soft) and specialized (application oriented).

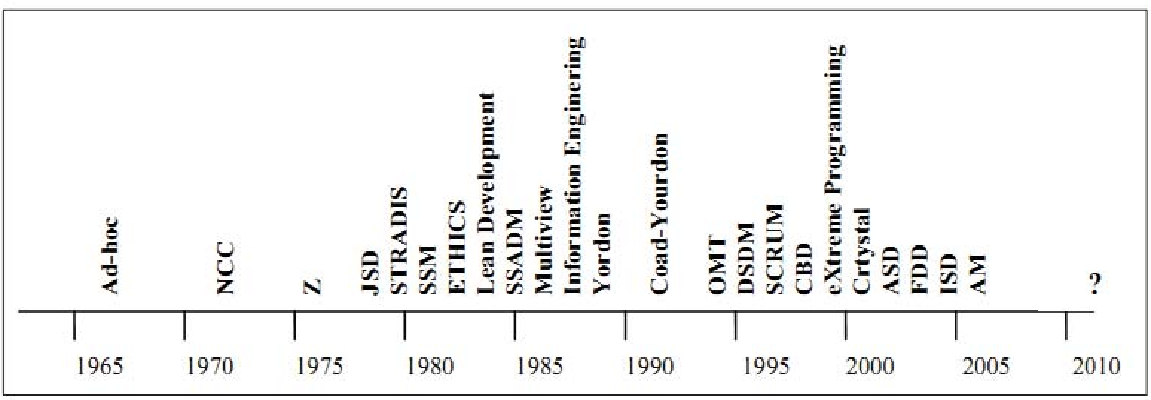


Fig 1.1 Forty years of information systems development methodologies

Iterative software lifecycle appeared around the middle of the decade, which consisted of using a planned sequence of programming enhancements until computer software was complete (Basili & Turner, 1975). Agile methodologies work in shorter iterations and promote a collaborative approach where project teams include members representing business, development and test work closely together throughout the entire lifecycle. Agile methods are an approach for managing the development of software, which is based upon obtaining early customer feedback on a large number of frequent software releases (Beck, 1999).

Nowadays Agile raises still more and more questions. Discussion around "the power of agile methods" is confused with many voices and ideas. In our work we have tried to know more about the impact of using agile methods in software production. The impact was study among four factors in the original research of our master of philosophy thesis untitled: " Evaluation of the most used agile methods with the definition of quality developed by Toyota: (XP, SCRUM, LEAN)".

Author α : Research Scholar, PhD Candidate, Computer Science, Christ University, Bangalore. E-mail : bodje.nathan@yahoo.fr

Author σ : Assoc. Professor, Research Guide, Christ University, Bangalore – India. E-mail : balaji.v@christuniversity.in

Debates are still going on inside agile development area. Practitioners and researcher argue against or in favor of placing practices before values. We have designed a framework which combined the values and principles of agile method as return in Agile manifesto in one hand and in the other and the Toyota Production system. The framework lead us to produce a series of question about the Teams, Organization and Usage factors that was allowed us to determine how the set of agile values and principles influence practices and lead to produce a quality product. The figure below (Fig 1.2) represents the basic idea of the framework build.

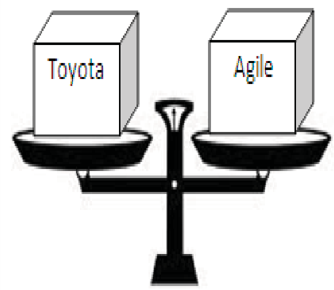
Toyota Principles	Framework Link of Team Factors	Agile Principles
TP09- Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others. *TP10- Develop exceptional people and teams who follow your company's philosophy.* *TP 11- Respect your extended network of partners and suppliers by challenging them and helping them improve.*		AP07- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done AP08- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation AP09- The best architectures, requirements, and designs emerge from self-organizing teams
NB: The survey question relatives to evaluating contribution (add values) of agile is given on the question n°24 to 29		

Fig 1.2 Balance idea of Agile and TPS: Team Factor

The present paper reports our finding about three factors: Team, Organization and Usage.

II. Factor In Study

By analyzing the agile values and principles with the Toyota Production System; we have found four factors in which the study was done. Here we present the three main factors studied: Organization, Team and Usage.

- Organization, means how the decision is taken. How the IT industry using Agile manage their business and also seeing the emergence of Toyota way organization.
- Team, was a factor which is expected to take care of all domain member like developer, tester, quality manager etc. how they interact and improve their work by using agile methodology.
- Usage, is the criteria of practice and techniques. What are the methodologies practices and is their any similar or difference with the practice given under the Toyota way. This criterion includes the perception of success. Usage takes also in compt the tools support by the agile methodology, to review if there are in the same goals of the Toyota way.

a) Factor 1: Organization

The term Self-organizing for defining agile methods introduces a notion to the management. The emergent nature of agile methodologies means that agile software development is in fact a learning experience for each project. In a case of XP (Beck 1999b) said "Any resistance against XP practices and principles on behalf of project members, management or customer may be enough to fail the process". This makes sense that the way we manage the production system will impact the result of the end-product.

The concept behind scrum is drastic simplification of project management. Scrum is especially self organizing team, Since Scrum does not require any specific engineering practices, it can be adopted to manage whatever engineering practices are used in an organization. (Schwaber and Beedle 2002).

Lean organization split into three generic layers how to manage their responsibilities and purposes[3]. The Figure (Fig 2.1) show how the hierarchy of a "lean" adaptable organization looks like.

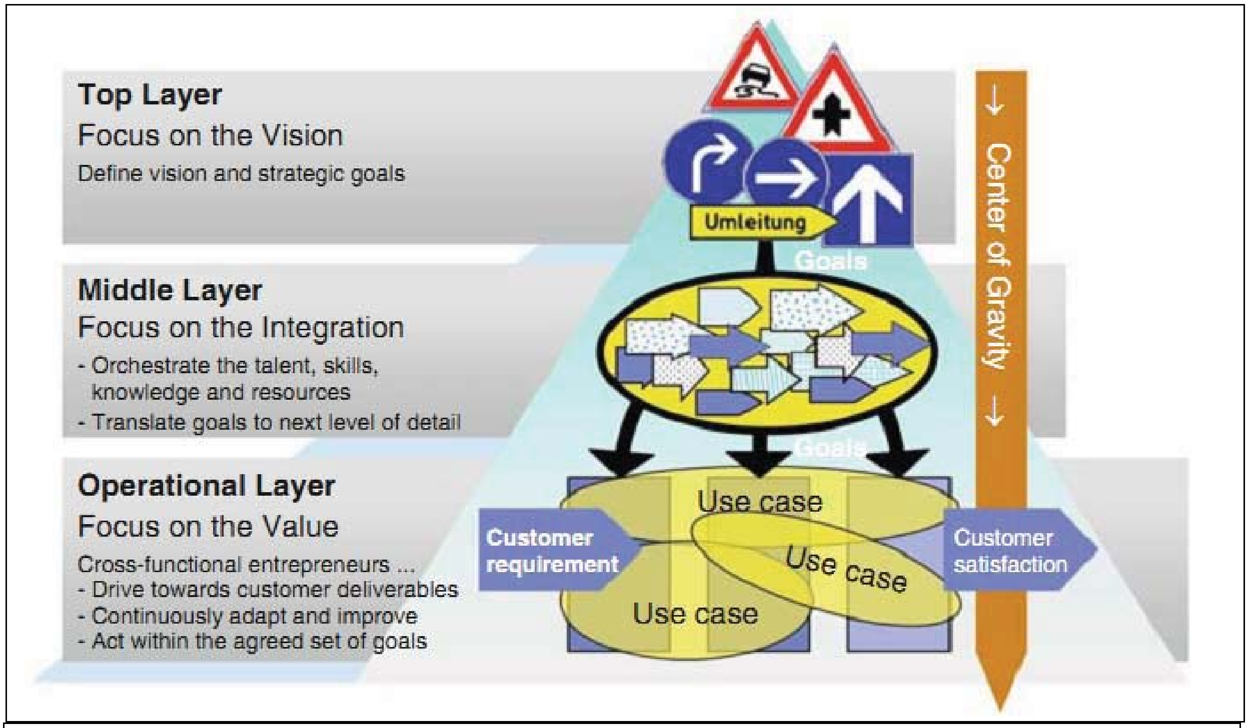


Fig 2.1 LEAN Layers of an organization

b) Factor 2: Team

Scrum is a method suitable for small teams of less than 10 engineers2. Rising and Janof (2000) suggest that "Clearly, [Scrum] is not an approach for large, complex team structures, but we found that even small, isolated teams on a large project could make use of some elements of Scrum. This is true process diversity"

XP is aimed for small and medium sized teams. Beck (1999b) suggests the team size to be limited between three and a maximum of twenty project members.

According to the way some agile practitioners have understood agile methodologies as they used them in real practice; We can say that agile do not require a team with more people because Communication and coordination between project members should be enabled at all times. If more people are available, multiple teams should be formed. The physical localization of the teams is impacting also the end-product development.

c) Factor 3: Usage

MnKandla, 2006 presented an evaluation technique which permit to reveal the similarities among extreme programming, lean development and scrum. The figure of the table below classifies the practices using the superscript 1,2,3,4 and 5.

The same superscript implements the same agile principle.

- "1" represents practices that deal with planning issues such as requirements gathering. The three methods shown here use different terms but the principle is to capture minimal requirements in the simplest available way and start coding.
- "2" represents practices that deal with improvement of quality in terms of meeting the volatile requirements.
- "3" represents practices that facilitate freely working together of developers, effective communication, empowered decision-making, and team dynamics issues.
- "4" represents practices that deal with quick delivery of the product.
- "5" represents practices that deal with agile quality assurance property of ensuring that the product is improved continuously until deployment.

	Practices
XP	The planning process[1], small releases[2], metaphor, test-driven development[2], story prioritization[3], collective ownership[3], pair programming[3], forty-hour work week[3], on-site customer[4], refactoring[5], simple design[5], and continuous integration[5].
LD	Eliminate waste[1], minimize inventory[1], maximize flow[2], pull from demand[2], meet customer requirements[2], ban local optimization[2], empower workers[3], do it right the first time[4], partner with suppliers[4], and create a culture of continuous improvement[5].
Scrum	Capture requirements as a product backlog[1], thirty-day Sprint with no changes during a Sprint[2], Scrum meeting[3], self-organizing teams[3], and Sprint planning meeting[4].

Fig 2.2 Identifying similarities among agile practices

III. Result Of Evaluation

a) Descriptive Analysis

General view of data: The population was constituted of 43% of Team manager and 39% are programmer, with 53% of them with the maturity on agile between 2 to 5 years, the method use in order are SCRUM (31%), XP (23%) LEAN (14%) and OTHER (12%).

Factor 1 = Organization Criteria
Factor 2 = Usage Criteria
Factor 3 = Team Criteria

Summated Scales: The plot below split show the summated scaled for the factors studied.

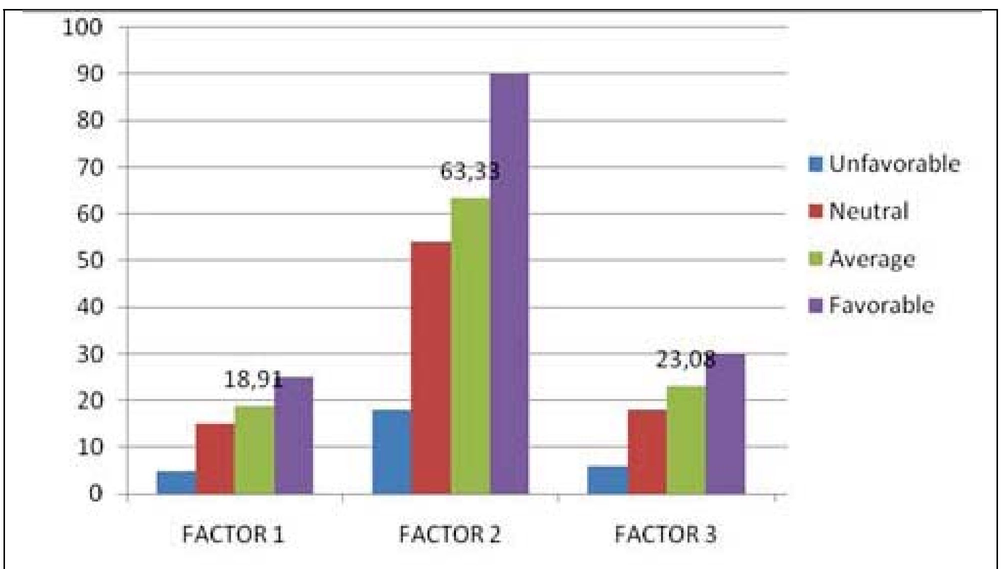


Fig 3.1 Cumulative scales of the survey

The plot show that the average cases of the survey (in purple) are more than the average (Minimum required) for all Factors. We can notice a weak presence of unfavorable cases. We have also notice that more than 50% of the respondent are agree with the questions under the each factor (organization, usage and team). The result shows that the Three (3) factors have really an impact on the quality of production. This can mean that put in different side; agile methods have also greater impact like TPS in producing quality.

b) Statistical Analysis

The statistics may used are non-parametric test. In this research two reliability test (Cronbach's α (alpha) and Pearson-Brown coefficient of reliability) and one test of concordance (Kendall's coefficient of concordance (W)) was use.

The Test show the strong dependencies among all the variable and help to conclude that there are a link between the success of production in agile methods and the Organization, team and Usage factors.

Subburaj R.[4] give this formula for the quality rate (Q) = Number of good parts produced / total produced. We adapt this formula to our case to calculate the quality improvement factor (Qi) = mean observed / Maximum expected

The tables below give the measurement of how much production can be improve in agile depending of the factors.

FACTOR	*MEANS*	*% IMPROVEMENT*
ORGANISATION	3.542857143	71%
USAGE	3.490740741	70%
TEAM	3,623015873	72%

Tab 3.1. % of agile improvement into factors.

The survey conducted was in the form of likert scales from 1 to five. So the negative answer will be less than 3 point. In resume: 'Agile Organization' contributes at 71%, 'Agile Usage' contributes at 70%, 'Agile Team' contribute at 72%.

IV. Conclusions

a) Threat to validity

There are several major threats to the validity of this study. First, the instrument to measure agile methods is new and untested, so its reliability cannot be fully determined in advance. Second, the improvement relative of the software production was not compared with any late production result. Third, the respondents are self-selected, so there may be some bias towards the use of agile methods. Fourth, survey research may or may not be the best research method to analyze the impacts of agile methods, in lieu of quantitative methods, which yield richer experiences. Sixth, the statistical analysis may not be sensitive enough to measure greatly the variations in the data we collect.

b) Summary

This full research has generated a numbers of contributions; the literature reviews, the framework developed and the analysis of the survey result. The Technique developed for this evaluation was specially built to this work and can be modified for further more experimentation of agile methods. Using a survey method, we are providing raw data from the respond by many agile practitioners working in different places and in different project; this non homogeneity of the population survey gives general view of how agile worth. The analysis gives a comfortable representation of the impact of agile to organization, team and usage in the IT industry. This work can be view as a complementary support of same authors paper[5] accepted in the International Journal of Engineering Science and Technology (IJEST).

Acknowledgements

The authors would like to thank everyone, just everyone!

References Références Referencias

1. Avison & Fitzgerald, 2003; Berki et al., Georgiadou & Milankovic-Atkinson,1995.
2. Agile software development methods Review and analysis; Pekka Abrahamsson, Outi Salo & Jussi Ronkainen.
3. Agile Software Development : Best Practices for Large Software Development Projects. Thomas Stober and Uwe Hansmann.
4. Subburaj R., Total Quality Management. Tata McGraw-Hill Education Pvt Ltd, Noida, Uttar Pradesh, India.
5. Bodje N'kauh Nathan-Regis et al. / International Journal of Engineering Science and Technology (IJEST), Vol. 4 No.01 January 2012.

This page is intentionally left blank

Global Journal of Researches in Engineering
General Engineering
Volume 12 Issue 3 Version 1.0 Year 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Conceptual Model Development of Lime Versus Cement Stabilized Expansive Soils

By Charles Lucian
Ardhi University

Abstract - This paper presents conceptual development of fundamental concepts of modelling the elasto-plastic behaviour of expansive soils stabilized soils with lime and cement. The stabilization is accomplished with both lime and cement treatments of expansive soils where lime proves to be the best additive in treatment of plastic soils than cement. The concepts of the yield surfaces of the Tresca, von-Mises, Drucker-Prager, Mohr-Coulomb and Cam-Clay elasto-plasticity models are reviewed. Because the initial consumption of lime (ICL) of 3.5% with the mellowing period of 4 hours was established for the expansive soils, the lime stabilization of 4%, 6%, 8% and 10% of lime by weight of dry soil was added to the soils and cured for 7, 14 and 28 days. Cement contents of 2%, 4% and 6% were used for the cement stabilized specimens. Both treated and untreated soil specimens were tested in the laboratory to determine which model accounts for the complex elastoplastic behaviour of both treated and untreated expansive soils. The treated and untreated specimens were characterized in terms of model performance. Of all the reviewed models, the Modified Egg Cam Clay model was able to decribe reasonably many features of the behavior of both untreated and treated expansive soils. The model is superior because it is characterized with the limited number of constitutive parameters easily determined in the laboratory or even in situ.

Keywords : Constitutive Models; Elastoplasticity; Cohesive soils.

GJRE-J Classification : FOR Code: 090503

CONCEPTUALMODELDEVELOPMENTOFLIMEVERSUSCEMENTSTABILIZEDEXPANSIVESOILS

Conceptual Model Development of Lime Versus Cement Stabilized Expansive Soils

Charles Lucian

Abstract - This paper presents conceptual development of fundamental concepts of modelling the elasto-plastic behaviour of expansive soils stabilized soils with lime and cement. The stabilization is accomplished with both lime and cement treatments of expansive soils where lime proves to be the best additive in treatment of plastic soils than cement. The concepts of the yield surfaces of the Tresca, von-Mises, Drucker-Prager, Mohr-Coulomb and Cam-Clay elasto-plasticity models are reviewed. Because the initial consumption of lime (ICL) of 3.5% with the mellowing period of 4 hours was established for the expansive soils, the lime stabilization of 4%, 6%, 8% and 10% of lime by weight of dry soil was added to the soils and cured for 7, 14 and 28 days. Cement contents of 2%, 4% and 6% were used for the cement stabilized specimens. Both treated and untreated soil specimens were tested in the laboratory to determine which model accounts for the complex elastoplastic behaviour of both treated and untreated expansive soils. The treated and untreated specimens were characterized in terms of model performance. Of all the reviewed models, the Modified Egg Cam Clay model was able to decribe reasonably many features of the behavior of both untreated and treated expansive soils. The model is superior because it is characterized with the limited number of constitutive parameters easily determined in the laboratory or even in situ.

Keywords : Constitutive Models; Elastoplasticity; Cohesive soils.

I. Introduction

Like untreated soil, lime and lime - cement stabilized soil is not entirely pure isotropic, elastic and homogenous material but rather a material with elasto-plastic behaviour. To stimulate the complex behaviour of both natural and treated soils, constitutive models assuming linear elastic perfectly plastic brittle weakening behaviour are assessed. Elasto-plasticity constitutive models of soil have received the attention of many writers like Gens et al. (2008), Bazant & Prager, (1985), Beer & Watson (1992), Kolar & Nemec (1989), Merouani, (2004), Vermeer & Neher, (1999) and Chen et al. (1994). The stress strain response in these models assumes that the material a linear elastic behaviour prior to yielding and perfectly plastic behaviour after yielding. In these cases, the peak and residual strength values can be different depending on the type of soil. This study pays attention to plasticity models such as Tresca, von Mises, Drucker-Prager, Drucker-Prager Cap, Mohr-Coulomb, Rankine Model, Modified Cam Clay, Lade and Egg Cam-clay models. The purpose of the study therefore is to test the performance of the said soil models in the simulation of drained triaxial tests on both untreated and lime and cement treated expansive soils.

II. Model Development Theories

Lime and lime-cement treatment or stabilization has been conventionally used in engineering to enhance the properties of expansive soils. The Lime and lime cement stabilized soils exhibit yielding behaviour when loaded. The material behaviour of soil cannot be described as a linear isotropic elastic material but a combination of elastic, plastic and viscous flow behaviors (often referred to as creep). Therefore, the two major aspects of soil behaviour, namely elastic and plastic (elasto-plastic) are under consideration in this study. The great difference between plasticity and nonlinear elasticity is that elastic deformation is fully recoverable (reversible) on unloading whereas plastic deformation is non-recoverable (permanent). The relationship between stress and strain can be presented in two forms that are strain hardening and strain softening. Normally consolidated soils and loosely parked soils are strain hardening because they tend to compress and reach a critical state when sheared. Densely packed soils and overconsolidated soils are strain softening because they tend to expand (dilate) requiring large work to overcome the interlocking as they reach critical state at large strains. In densely packed soil the hardening appears just before the peak stress and the softening just after. On the other hand, the loosely parked soil posses strain hardening only.

Any material under a multi-axis state of stress will yield when the maximum shear stresses exceed the yield shear strengths of the material. The plasticity theory for granular materials that include a yield surface is best described by Tresca Model (Yu, 2006). Figure 1 shows Tresca model in 3-D space of principal stresses system for Yield criterion. The model is often idealized for cohesionless (*c*=0) frictionless ($\phi = 0$) soils. The maximum shear strength is as shown in equation 1:

$$\tau_{\max} = k = \frac{\sigma_1 - \sigma_3}{2} \qquad (1)$$

Author : Ardhi University (ARU), Tanzania, P.O. Box 35176, Dar es Salaam, Tanzania.
E-mail : charleslucian@gmail.com, lucian@aru.ac.tz

Where:

$\sigma_1 > \sigma_2 > \sigma_3$ and k is material constant representing a yield stress in a pure shear test .
For failure to occur the equation above is rearranged to yield the following expression:

$$f = \sigma_1 - \sigma_3 - 2\tau_{\max} = 0 \quad (2)$$

For uniaxial tension:

$\sigma_1 = \sigma_0$ and $\sigma_2 = \sigma_3 = 0$, thus equation 1 reduces to

$$\tau_0 = \frac{\sigma_0}{2} \quad (3)$$

The failure criteria for isotropic material is expressed by $f(\sigma_1, \sigma_2, \sigma_3) = \sigma_C$ Substituting equation 2 into equation 3 we obtain the following expression:

$$\tau_{\max} = \frac{\sigma_1 - \sigma_3}{2} = \tau_0 = \frac{\sigma_0}{2}\text{, thus, } \sigma_1 - \sigma_3 = \sigma_0 \quad (4)$$

Equation 4 above is termed as the equation of the maximum-shear-stress criterion

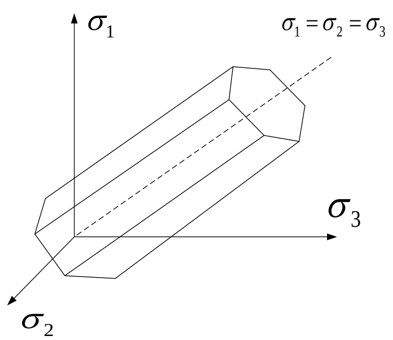


Figure 1 : Tresca Yield Criterion (Maximum-Shear-Stress Failure Theory)

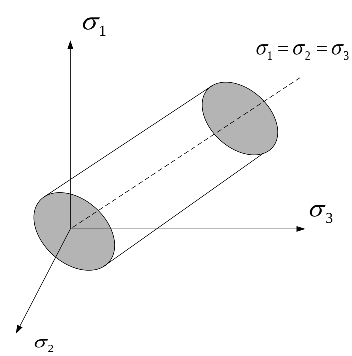


Figure 2 : von Mises Yield Surface in Principal Stress Space(Distortion Energy Theory)

On the other hanad, Von Mises postulated (1913) that a material will yield when the distortional energy at the point in question reaches a critical value (Yu, 2002). Figure 2 shows a typical sketch of an isotropic elastic-perfectly plastic von Mises model. The model is based on distortional energy necessary to initiate yielding. Von Mises criterion incorporates the contribution of the intermediate stress to the yield state. It highlights that yield occurs when the second invariant of the deviatoric stress reaches a certain value. The exact solution for the von Mises yield criterion is given by the following expression:

$$f = J_2 - k^2 = 0 \quad (5)$$

where:

$$J_2 = \frac{1}{6}\left[(\sigma_1 - \sigma_3)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_1 - \sigma_2)^2\right] = k^2 \quad (6)$$

For yielding in uniaxial tension:

$$\sigma_1 = \sigma_0 ; \sigma_2 = \sigma_3 = 0 \quad (7)$$

Substituting equation 7 into equation 6, the following expression is obtained:

$$\sigma_0^2 + \sigma_0^2 = 6k^2 \quad (8)$$

Substituting (8) in yield criteria (5) the following usual form of von Mises yield criterion is obtained:

$$\frac{1}{\sqrt{2}}\left[(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2\right]^{1/2} = \sigma_0 \quad (9)$$

Another failure criterion is according to Drucker-Prager Model which bases on the fact that the strain rates increase with the increase in yield strength (Drucker and Prager, 1952). The model is used to modulate materials that exhibit pressure-dependent yield such as soil and rocks. The model has an advantage that it handles the gross inelastic coupling between deviatoric and volumetric behaviours of soils. Figure 3 shows Drucker model without a cap that was later modified to the cap model (Figure 4). The Drucker-Prager Cap Model failure criterion for cohesive soils (Chen, 1994)] is as follows:

$$f = \sqrt{J_2} - \alpha I_1 - k = 0 \quad (10)$$

where:

α and k = material constants related to the friction ad cohesion of soil respectively determined from the Mohr-Coulomb stress invariant

J_2 = second stress deviator invariant

I_1 = first stress invariant

I_1 & J_2 are given in equations 21 and 26

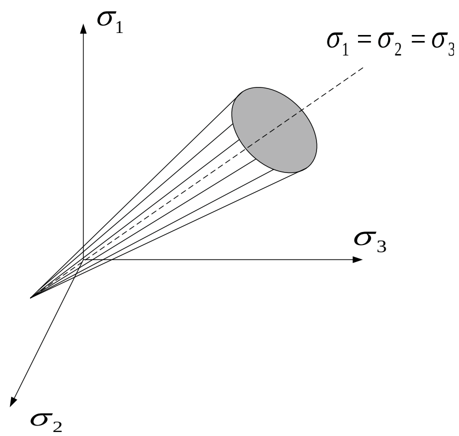


Figure 3 : Drucker-Prager Yield Criterion: (Without a Cap)

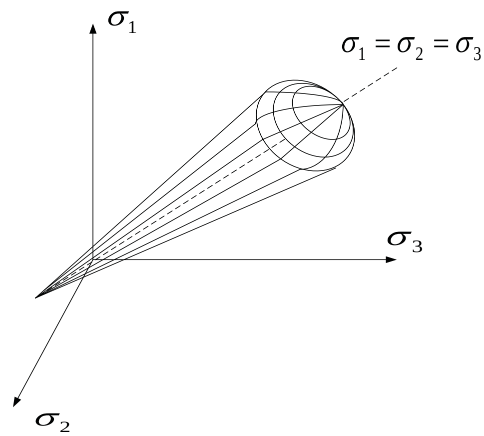


Figure 4 : Capped Drucker-Prager Model

To capture soil behaviour in general, Mohr-Coulomb introduced an elastic perfectly-plastic model to serve as a first-order model (Ti et al., 2009). Failure criterion in the Mohr-Coulomb bases on the assumption that the maximum shear stress as well as principal stresses is the only measure of failure. Figure 5 represents the Mohr-Coulomb yield surface in deviatoric plane while Figure 6 represents it in 2-D system. The failure of the Mohr-Coulomb is the best straight-line envelope touching the Mohr's circle (Figure 6). Mathematically the equation for the best straight-line envelope is as follows:

$$\tau = c - \sigma \tan\phi \tag{11}$$

where:

τ is the shear stress, σ is the normal stress (negative in compression), c is the cohesion of the material, and ϕ is the material angle of friction.

In terms of principle stresses, the Mohr-Coulomb failure criterion is as follows:

$$f = \tau_f + \sigma_m \sin\phi - c\cos\phi = 0 \tag{12}$$

Where $\tau_f = \dfrac{\sigma_1 - \sigma_3}{2}$ and $\sigma_m = \dfrac{\sigma_1 + \sigma_3}{2}$

Thus $\sigma_1 - \sigma_3 + (\sigma_1 + \sigma_3)\sin\phi - 2c\cos\phi = 0 \quad (13)$

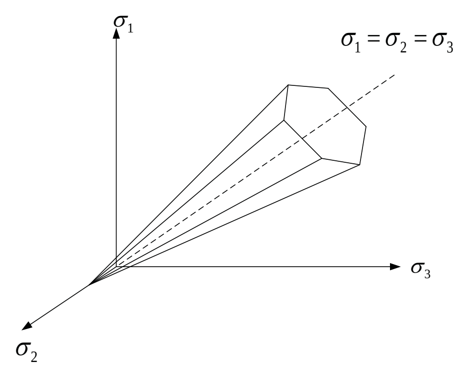


Figure 5 : Mohr Coulomb Yield Surface in the principal stress

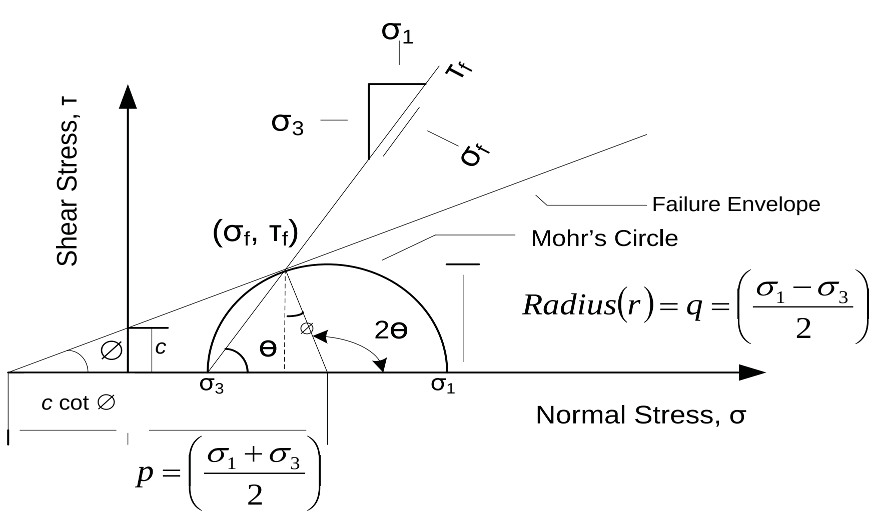


Figure 6 : Mohr-Coulomb failure criterion

The Mohr-Coulomb failure criterion states that materials fail when the shear strength on the failure plane reaches some unique function of the normal stress on that plane so that

$$\tau_f = c + \sigma_f \tan\phi \qquad (14)$$

where:

τ_f = failure shear strength on the failure plane, σ_f = total normal stress on the failure plane, c = cohesion intercept for the failure plane ϕ = friction angle for the failure plane $\theta = \frac{\phi}{2} + 45^\circ$

Another important theory is the Rankine Modela which is the maximum normal strength hypothesis based on similar supposition to that of Coulomb. It states that failure occurs whenever one of the maximum three principle stresses equals the strength. It finds its use in ductile materials. The yield surface associated with this criterion is given by:

$$Max(\sigma_1, \sigma_2, \sigma_3) = f_t' \qquad (15)$$

where f_t' is the tensile strength at failure.

Furthermore, Roscoe and Burland (1968) originally described the Modified Cam Clay Model (MCCM) to distinguish it from the earlier model called Cam clay (Roscoe and Schofield, 1963 and Ortiz, Pandolfi, 2004 & Carter and Liu, 2005). The modified Cam clay model employs the concept of yield criteria defined by the ellipsoid as is shown in Figure 7. It is an elasto-plastic model having no-linear elasticity characteristics prior to yielding. The model takes into account the aspect of plastic volume change in compression. The model captures the commonly observed properties such as an increasing stiffness as a material undergoes compression, hardening/softening and compaction/dilatancy behaviour, and eventually reaching a state in which the strength and volume become constant. The model is described in terms of effective stresses p and q which are very important to the area of soil response in conventional triaxial test. For simplification, the failure model is simply presented in 2-D system (Figure 8). The cam clay yield rule (flow rule) reads as:

$$f_{yield} = f_{yield}(p, q, p_0) = q^2 - M^2[p(p_0 - p)] = 0 \qquad (16)$$

Failure Criterion is as follows:

$$f_{fail} = f_{fail}(p, q) = q - M(p) = 0 \qquad (17)$$

Where $p = \frac{(\sigma_{11} + \sigma_{22} + \sigma_{33})}{3}$

$$q = \left[\frac{1}{2}(\sigma_{11} - \sigma_{22})^2 + (\sigma_{22} - \sigma_{33})^2 + (\sigma_{33} - \sigma_{11})^2 + 3(\sigma_{12}^2 + \sigma_{23}^2 + \sigma_{31}^2)\right]^{1/2}$$

$M = \frac{6\sin\phi}{3 - \sin\phi}$ for external cone (Triaxial Compression)

$= \frac{6\sin\phi}{3 + \sin\phi}$ for internal cone (Triaxial Extension)

$$\frac{\partial p_0}{p_0} = \frac{(1+e)\partial\varepsilon_v^p}{\lambda - \kappa}$$

p = general volumetric effective stress (mean effective stress), q = general deviator stress (effective), p_0 = hardening parameter (preconsolidated stress) for the modified Cam Clay Model, $\partial\varepsilon_v^p$ = plastic volumetric strain rate, λ = compressibility index for virgin loading The compressibility indices λ and κ relate to the slopes of the virgin loading-unloading curves in one-dimensional or hydrostatic consolidation tests

Thus:

$\lambda = \frac{C_c}{1+e_0}\frac{1}{\ln 10}$ and $\kappa = \frac{C_s}{1+e_0}\frac{1}{\ln 10}$ where

$C_i = -\frac{\partial e}{\partial(\log_{10} p)}$; e = void ratio with the evolution equation: $\partial e = -\partial\varepsilon_v(1+e)$

or simply $\lambda = \frac{C_c}{2.303}$ and $\kappa = \frac{C_s}{2.303}$

$C_i = C_c$ and C_s for virgin compression index and swelling index respectively.

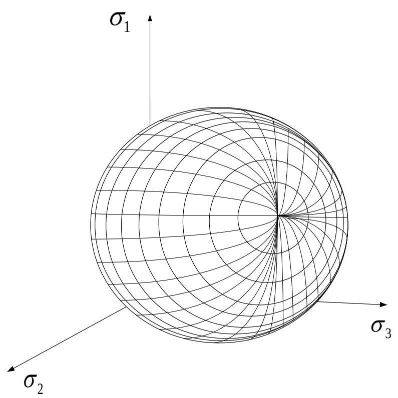


Figure 7 : Cam Clay Failure Criterion in the Deviatoric Plane

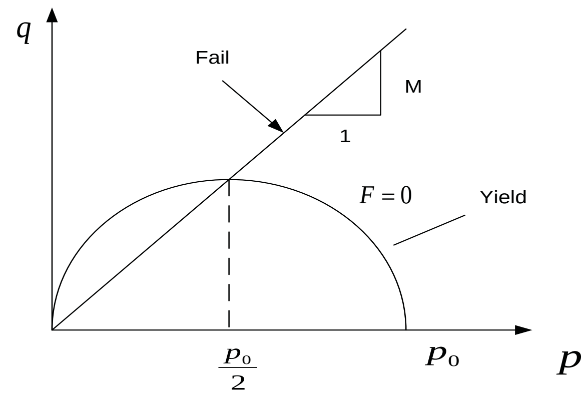


Figure 8 : Cam Clay Yield Surface

For Cam Clay Cap Model (Figure 9) the yield function is affected by a as follows:

$$f_{yield} = f_{yield}(p, q, p_0) = q^2 - M^2[(p+a)(p_0 - p)] = 0 \tag{18}$$

And the failure criterion is as follows:

$$f_{fail} = f_{fail}(p, q) = q - M(p+a) = 0 \tag{19}$$

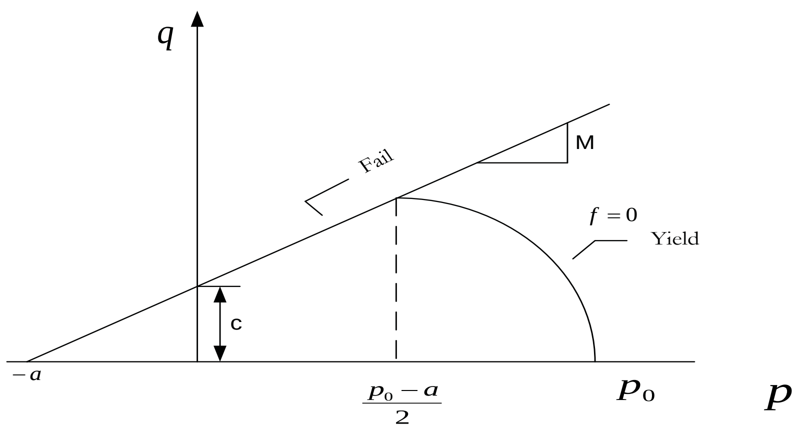


Figure 9 : Cam Clay Cap Model

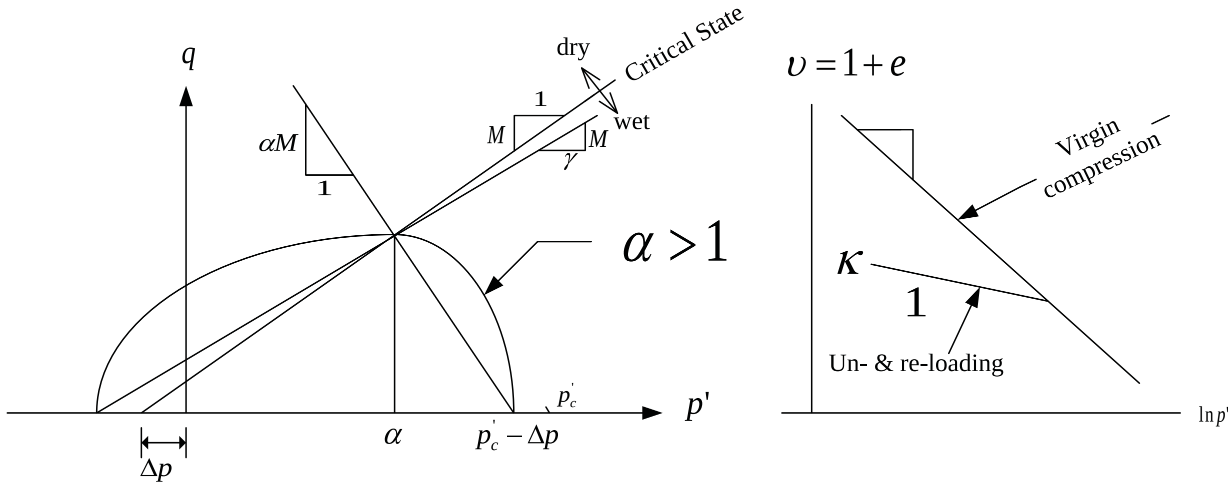
Similarly, Lade proposed a general three dimensional failure criteria for granular soils as well as normally consolidated clays in 1977 (Chen et al., 1994). The model resembles that of Cam Clay Cap Model with failure criteria proportional to the first and third stress invariant of the stress tensor. The model stimulates the behaviour of cohesionless materials like sand under both low and high confinement stresses. The model predicts the general failure surface for cohesionless soils more accurately. The failure expression has the following form:

$$f(I_1, I_3) = \left[\frac{I_1^3}{I_3} - 27\right]\left[\frac{I_1}{P_a}\right]^m - \eta = 0 \tag{20}$$

where,

I_1 is the first invariant of the stress tensor (deviator) (equation 21), I_3 is the third invariant of the stress tensor (equation 23), P_a = the atmospheric pressure in the same units as the stresses, m and η are material parameters determined by plotting $(I_1^3 / I_3 - 27)$ against (P_a / I_1) on a log-log scale and fitting the best straight line. η is obtained by reading the intercept of this best line with $(P_a / I_1) = 1$ while m is found by working out the slope of that line.

As the modification of Modified Cam-clay model, the Egg Cam-clay model (Figure 10) was proposed (Yu, 2002, Wood, 2004 and Suebsuk et al., 2010). This model is able to capture two key features namely nonlinear elasticity model and plasticity model. The nonlinear elasticity model demonstrates an increasing bulk elastic stiffness as the material undergoes compression. The plasticity model is defined by an elliptically shaped yield surface with an elliptically shaped cap that indicates the expansion or shrinkage of materials.



(a) Standard Yield Contours

(b) Soil Response in Compression

Figure 10 : Egg Cam Clay Models

Relationship between Stress Invariants, Deviatoric Stress and Deviatoric Stress Invariants

The Stress Invariants (I_1, I_2 & I_3), Deviatoric Stress (S_1, S_2 & S_3) and Deviatoric Stress Invariants (J_1, J_2 & J_3) are inevitable for some soil models. These are easily determined in Continuum Mechanics and to save on space only final expressions are included here:

i. *Stress Invariants (I_1, I_2 & I_3)*

$$I_1 = \sigma_{11} + \sigma_{22} + \sigma_{33} = \sigma_1 + \sigma_2 + \sigma_3 = 3\sigma_m \tag{21}$$

$$I_2 = -\sigma_{11}\sigma_{22} - \sigma_{11}\sigma_{33} - \sigma_{22}\sigma_{33} + \sigma_{12}^2 + \sigma_{13}^2 + \sigma_{23}^2 = -\sigma_1\sigma_2 - \sigma_2\sigma_3 - \sigma_3\sigma_1 \tag{22}$$

$$I_3 = \det(\sigma) = \sigma_{11}\left(\sigma_{22}\sigma_{33} - \sigma_{23}^2\right) - \sigma_{12}\left(\sigma_{12}\sigma_{33} - \sigma_{13}\sigma_{23}\right) + \sigma_{13}\left(\sigma_{12}\sigma_{23} - \sigma_{13}\sigma_{22}\right) \tag{23}$$

$$= \sigma_1\sigma_2\sigma_3$$

ii. *Deviatoric Principal Stress (S_1, S_2 & S_3)*

$$S_1 = \sigma_1 - \sigma_m \qquad S_2 = \sigma_2 - \sigma_m \qquad S_3 = \sigma_3 - \sigma_m \tag{24}$$

Where $\sigma_m = (\sigma_{11} + \sigma_{22} + \sigma_{33})/3 = (\sigma_1 + \sigma_2 + \sigma_3)/3 = I_1/3$

iii. *Deviatoric Stress Invariants (J_1, J_2 & J_3)*

These take the form of Stress Invariants (I_1, I_2 & I_3) as follows:

$$J_1 = S_{11} + S_{22} + S_{33} = O \tag{25}$$

$$J_2 = -S_{11}S_{22} - S_{11}S_{33} - S_{22}S_{33} + S_{12}^2 + S_{13}^2 + S_{23}^2 = -S_1S_2 - S_1S_3 - S_2S_3$$

$$= (1/6)\left[(\sigma_1 - \sigma_2)^2 + (\sigma_1 - \sigma_3)^2 + (\sigma_2 - \sigma_3)^2\right]$$

$$= -\sigma_1\sigma_2 - \sigma_1\sigma_3 - \sigma_2\sigma_3 + (1/3)(\sigma_1 + \sigma_2 + \sigma_3)^2 = I_2 + I_1^2/3 \tag{26}$$

$$J_3 = \det(S) = S_{11}\left(S_{22}S_{33} - S_{23}^2\right) - S_{12}\left(S_{12}S_{33} - S_{13}S_{23}\right) + S_{13}\left(S_{12}S_{23} - S_{13}S_{22}\right)$$

$$= S_1 * S_2 * S_3 \tag{27}$$

III. Materials Employed

a) Soil

The soil used in this study was obtained from a 3.5 m deep open pit dug in Kibaha, Tanzania where expansive soil is abundant. The soil in the area is classified as as a highly expansive clay of high plasticity (Lucian, 2008 & 2009). The maximum dry density (MDD) and optimum moisture content (OMC) for the soil in consideration are in the region of 1910kg/m^3 and 11.7% respectively. Some of the determined engineering properties of the natural soil are summarized in the following Table:

Table 1 : Geomechanical parameters of Kibaha expansive soil

Bulk density	Dry density	Density of solids	Swell potential	Swell pressure	Compaction (Heavy Proctor)		UCS	Triaxial test (CU)	
ρ	ρ_d	ρ_s	S	P_s	MDD	OMC	q_f	Φ	c
kg/m^3	kg/m^3	kg/m^3	%	kPa	kg/m^3	%	kN/m^2	°	kN/m^2
2120	1910	2650	19.2	560	1944	11.7	106	14	17

b) Stabilizers

The stabilizer materials used in this study were Lime and Cement. The cement used was the Ordinary Portland Cement, Twiga brand from Tanzania Portland Cement at Wazo Hill, Tegeta, Dar es Salaam. The powder hydrated lime was also obtained locally in Tanzania. The required quantity of hydrated lime was sieved through No. 40 sieve before mixing.

c) Specimen Preparation

Air-dried soil samples for mixing were pulverized and sieved through No. 40 sieve and oven dried at 50°C for 24 hours. The soil was then mixed with the various amounts of the stabilizers and the required amount of water. Specimens were then prepared by compaction in specimen moulds. Hydrated lime and Ordinary Portland Cement were used to stabilize the samples. The initial consumption of lime (ICL) of the soil had been determined to be 3.5% and mellowing period to be 4 hours. Thus, 4%, 6%, 8% and 10% of lime by weight of dry soil was added to the soil and cured for 7, 14 and 28 days, after which laboratory experiments were conducted. Untreated soil and lime-treated samples were subjected to CU triaxial compression tests four hours after preparation (mellowing).

IV. Experimental Results And Observations

The results for CU triaxial compression tests are presented in Table 1 and Figure 11. Furthermore, Figures 13 – 15 show effective stress Mohr circle and failure envelope obtained from triaxial test for non-treated, 4%, 6% and 8% lime treated expansive soils respectively. The best fit tangent failure lines were drawn tangent to the Mohr circles to show the failure envelope. For cement treated soils the Mohr-Coulomb failure turned out to be a curve, therefore it was not possible to report particular strength parameters. The results indicate that lime-treatment greatly improves the strength of the soil, both in terms of the internal angle of friction (from 14° to 33°) and cohesion (from 17 kPa to 300 kPa) in four hours mellowing period. Further, the samples treated with 6% lime show better strength properties than the other tested mix proportions. It is likely that higher lime content (e.g. 8% lime) creates excess lime in the mixture that makes the sample less cohesive and weaker than the lower (6%) lime-treated samples. The semi-barrelling form of failure for the 8% lime-stabilized sample supports this argument, when compared with the 6% lime-treated sample which shows a clear shear form of failure (closely similar to that of granular soils; ref. Figure 11). Although perhaps adequate as a first approximation, the Mohr-Coulomb criterion is the elastoplastic model of general scope with fixed yield surface, thus does not accurately model the actual failure conditions of real soils. Therefore, a model whose yield surface is not fixed but expands due to plastic straining to account for the plastic deformation of expansive soils is called for. When the plastic deformation occurs, the yield surface changes in size, shape and degree of inclination. To capture that complex behaviors of expansive soils as well as predict the true triaxial test results, the modified Cam Clay Model (MCCM) is introduced (Figure 12). It can be seen that the modified Cam Clay Model gives avery good comprehensive comparison between experimental stress paths for 6% lime treated specimens and model simulation results.

Table 1 : Triaxial strength parameters

	Untr. Soil	4% Lime	6% Lime	8% Lime
Φ´ [°]	14	31	32	33
c [kN/m^2]	17	152	300	187

Figure 11 : Triaxial compression (CU) samples after test

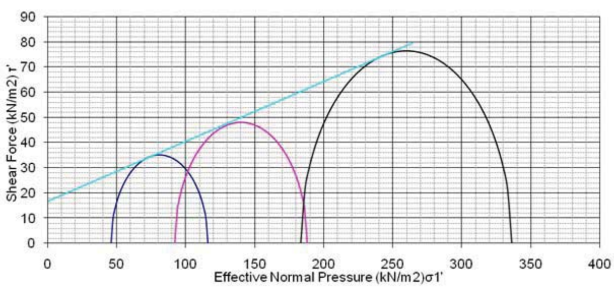


Figure 12 : Mohr-Coulomb failure envelope for non treated expansive soils

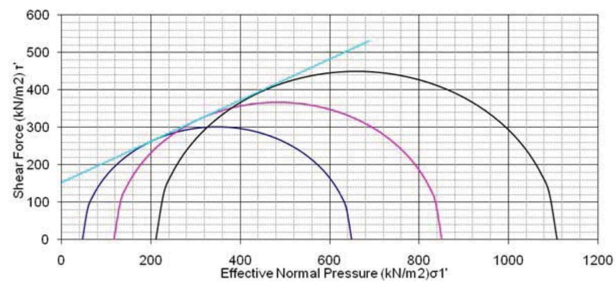


Figure 13 : Mohr-Coulomb failure envelope for 4% lime treated expansive soils

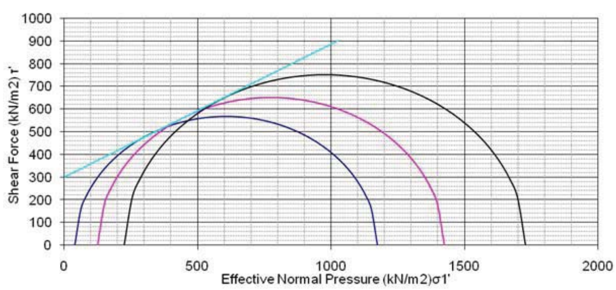


Figure 14 : Mohr-Coulomb failure envelope for 6% lime treated expansive soils

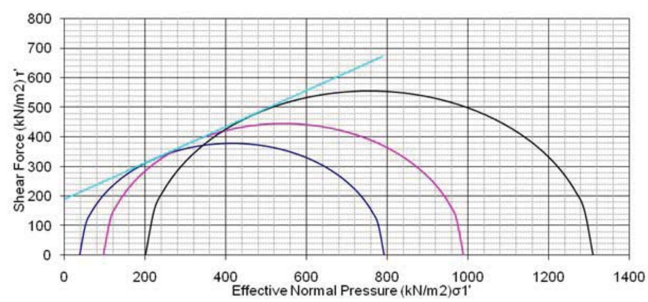


Figure 15 : Mohr-Coulomb failure envelope for 8% lime treated expansive soils

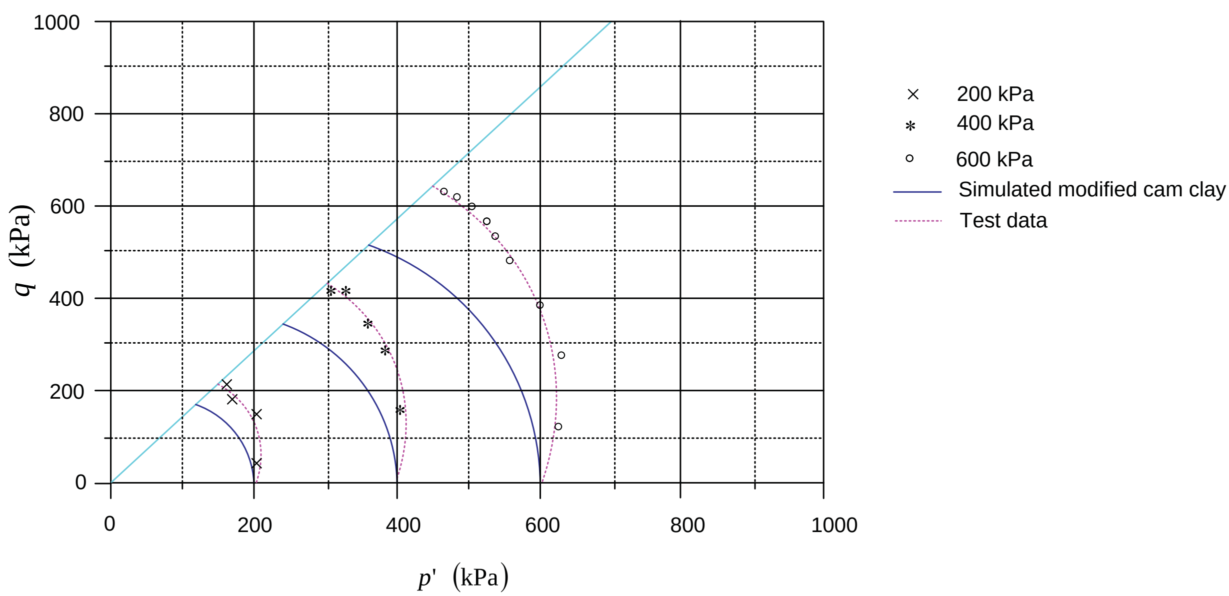


Figure 16 : Comparison between simulated modified cam clay model and test data for 6% lime treated expansive soil

V. Concluding Remarks

Practical application of models in finding solution of real-world problems attracts little theoretical or practical attention from Geotechnical Engineers. Therefore, proper application of these models requires thorough understanding of applications, basic features and limitations of various models. Efforts in this paper have been directed to several soil models to describe the behaviour of lime vs. cement stabilized expansive soils in Kibaha, Tanzania. It is obvious from the models that for the case of Theories of Shear Strength and Deformation, the Mohr-Coulomb failure criterion pays no attention to strain which accompany soil failure at peak strength. On the other hand the Von-Mises criterion is typically applicable for elastic plastic material. However, it enjoys superior level of acceptance for friction behaviour of idealized undrained frictional cohesive material like sand. Rankine model is the best fit for brittle materials. Mohr-Coulomb and Drucker-Prager elasto (visco)-plastic models are typically for soils and other frictional materials. However, the Mohr-coulomb model neglects the effect of the intermediate stress, σ_2 but the Drucker-Prager takes it into account. The Drucker-Prager, however, overestimates the strength of soil. The Tresca Model is ideal for cohesionless soils only.

The Lade Model is limited to failure criteria for granular soils as well as normally consolidated clays. The modified Cam clay model takes into account elasto-plastic behaviour of soil leaving alone none-linear elasticity characteristics prior to yielding. The Egg Cam-clay model addresses precisely the nonlinear elasticity and plasticity of the soil. Of the failure criteria for clay soils in subcritical region, the Modified Egg Cam Clay is the most appropriate one for the description of expansive soil behavior with reasonable accuracy. The model is superior because it is characterized with the limited number of constitutive parameters easily determined in the laboratory or even in situ. Indeed, engineers can make use of this model which provides a reasonable fit to data obtained from laboratory tests.

References Références Referencias

1. Bazant, Z. P., and Prager, W., (1985). *Mechanics of Geomaterials : Rocks, Concretes, Soils*, John Wiley & Sons, Chichester, New York (Proc., IUTAM Symposium held at Northwestern University, Sept, 1983).
2. Beer, G. and Watson, J. O., (1992). *Introduction to Finite and Boundary Element Methods for Engineers,* John Wiley & Sons, Chichester, New York .
3. Carter, J. P. and Liu, M. D. (2005). Review of the Structure Cam Clay Model. Soil Constitutive Models: Evaluation, Selection and Calibration. *ASCE Geotechnical Special Publication*, Vol. 128, pp. 99-132
4. Chen, W.F. (1995) *The Civil Engineering Handbook*. Purdue University, Indiana, CRC Press Inc.
5. Chen, W. F., McCarron, W. O. and Yamaguchi, E. (1994). *Constitutive Equations for Engineering Materials, Vol. 2: Plasticity and Modelling, Elserier Science Publishers B.V.,* Amsterdam.
6. Drucker, D. C. and Prager, W. (1952). Soil Mechanics and Plastic Analysis or Limit Design, Quarterly of Applied Mathematics, Vol. 10, No. 2, pp. 157 - 165
7. Gens, A., Sánchez, M. and Sheng, D. (2008). On Constitutive Modelling of Unsaturated Soils, *Acta Geotechnica,* Vol. 1, N0. 3, pp. 137-147.
8. Kolar, V. and Nemec, I (1989). *Modelling of Soil-Structure Interaction (Developments in Geotechnical Engineering, 58),* Elservier Science Publishing Company, Inc. New York.
9. Lucian, C., (2008). Development of models to predict swell potential based on soil index properties, *Journal of Building and Land Management*, vol. 14, No. 2, pp. 59-66.
10. Lucian, C. (2009). Spatial Variability of Expansive Soil Properties at Different Scale within Kibaha, Tanzania, *The Global Journal of Agricultural Sciences*, vol. 8, No.1, pp. 95-100
11. Merouani, Z. (2004) *Anchors in Soils- Preliminary Studies, Licentiate Thesis,* KTH, Stockholm, Sweden.
12. Ortiz, M and Pandolfi, A. (2004). A variational Cam-clay Theory of Plasticity, *Journal of Computer Methods in Applied Mechanics and Engineering,* Vol. 193, 2645-2666.
13. Roscoe K. H. and Burland J. B. (1968). “On the Generalized Stress-Strain Behaviour of ‘Wet’ Clay.” *Engineering Plasticity,* Heyman J & Leckie FA (ed.) Cambridge University Press, pp. 535-609.
14. Roscoe, K. H., Schofield, A. N. (1963). “Mechanical Behaviour of an Idealized ‘Wet’ Clay”. 2nd ECSMFE, Wiesbaden, vol. 1, pp. 47-54.
15. Suebsuk, J., Horpibulsuk, S. and Liu, M. D. (2010). Modified Structured Cam Clay Model: Theory and Verification. *Proceedings of the International Symposium and Exhibition on Geotechnical and Geosynthetics Engineering: Challenges and Opportunities in Climate Change*, Bangkok, Thailand, pp. 419-434
16. Ti, K. S., Huat, B. B. K., Noorzaei, J., M. S. Jaafar and Sew, G. S. (2009). A review of Basic Soil Constitutive Models for Geotechnical Application, *Electronic Journal of Geotechnical* Engineering, Vol. 14, pp.
17. Yu, M. -H (2002). Advance in Strength Theory of Materials Under Complex Stress State in the 20th Century, *Applied Mechanics Reviews*, Vol. 55, No. 3 pp. 169–218.
18. Yu, M.-H. 2006). *Generalized Plasticity*. Springer, Berlin

19. Vermeer, P. A. & Neher, H. P. (1999). *A Soft Soil Model that Accounts for Creep*, Institute of Geotechnical engineering, university of Stuttgart, German. Balkema Publishers, Rotterdam, www.uni-stuttgart.de/igs/content/publications/39.pdf, access -ed 22nd November, 2010
20. Wood, D. M. (2004). *Geotechnical Modelling*. Taylor & Francis.

Global Journal of Researches in Engineering
General Engineering
Volume 12 Issue 3 Version 1.0 Year 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Generation of 3-D City Model for Urban Utility Information System Using Digital Photogrammetry & GIS Technology

By Sagar Mali, Sachin Panhalkar, C. Pawar & Sandipan Das
Shivaji University, Kolhapur, India

Abstract - In the urban environment due to the rapid rate of urbanization and industrialization, it needs proper planning, management and requires up-to date digital spatial information for multifaceted applications with higher accuracy. Digital photogrammetry provides maps and databases to support decision-making and futuristic planning as well as to access the utility services in urban areas for civilians well being. The objective of the study is to access the various urban utilities for civilian's wellbeing and develop a 3D model of the area for planning and monitoring of Dahisar urban area of Mumbai City. Cadastral map (G F/15) and utility information from National Informatics Centre (NIC) has been used to assess household information with each building details. Aerial stereo pairs are used to generate 3D model after data processing and orthorectification by applying LPS software. Attribute data has been attached to each building as a separate layer by using ArcGIS software. Land use / land cover classification has been carried out to identify various utility services sectors like school, hospital, banks, public toilets, commercial area, bus stops etc. The utilities like school and bank are better towards western and south-western part.

Keywords : Digital Photogrammetry, Orthorectification, Utility Information System.

GJRE-J Classification : FOR Code: 160511

GENERATIONOF3-DCITYMODELFORURBANUTILITYINFORMATIONSYSTEMUSINGDIGITALPHOTOGRAMMETRYGISTECHNOLOGY

Strictly as per the compliance and regulations of:

Generation of 3-D City Model for Urban Utility Information System Using Digital Photogrammetry & GIS Technology

Sagar Mali [α], Sachin Panhalkar [α], C. Pawar [α] & Sandipan Das [σ]

Abstract - In the urban environment due to the rapid rate of urbanization and industrialization, it needs proper planning, management and requires up-to date digital spatial information for multifaceted applications with higher accuracy. Digital photogrammetry provides maps and databases to support decision-making and futuristic planning as well as to access the utility services in urban areas for civilians well being. The objective of the study is to access the various urban utilities for civilian's wellbeing and develop a 3D model of the area for planning and monitoring of Dahisar urban area of Mumbai City. Cadastral map (G F/15) and utility information from National Informatics Centre (NIC) has been used to assess household information with each building details. Aerial stereo pairs are used to generate 3D model after data processing and orthorectification by applying LPS software. Attribute data has been attached to each building as a separate layer by using ArcGIS software. Land use / land cover classification has been carried out to identify various utility services sectors like school, hospital, banks, public toilets, commercial area, bus stops etc. The utilities like school and bank are better towards western and south-western part. In Dahisar region, residential area dominates with respect to other type of land use. Hospital services are poor in Dahisar region and there is urgent need to establish some new hospitals in the area. Vertical growth of the city shows that 41% buildings in Dahisar region are above 30 meter height. 3D city model of the area gives the precise information of the area which can be used for urban planning and development.

Keywords : Digital Photogrammetry, Orthorectification, Utility Information System.

I. Introduction

Urbanization is a problem which has assumed gigantic dimensions in some of the technically and industrially advanced countries of the world. It means the concentration of population in the economically developed and industrialized centres and other big cities. This leads to much congestion and many social and economic problems. It is now a universally recognized fact that the progress of man depends upon social planning, upon a perfect harmony between man and his total environment. For organised way of urban planning, up to date information about build up areas and urban infrastructure is prerequisite. Digital photogrammetry and GIS techniques can facilitate the planner in decision making to make the urban environment much more suitable for living.

With the rapid development of GIS techniques, 3D GIS have emerged as a reality. Creation of 3D city model using conventional stereo images of aerial photos or satellite images is cumbersome and is a less cost-effective technique for many applications (Jalli and D, 2007). Planners, urban designers, landscape architects, and other planning professionals use computerized visualization techniques to encourage participation of the public for better urban planning. Many of the techniques they employ can be incorporated into a GIS (Meenar and Ambrus, 2006). The use of 3D functions is particularly powerful for the creation of DEMs and 3D visualization models which are used in a very wide range of application for urban planning (Naidoo and Mohamed, 2007). Remote sensing studies in conjunction with urban GIS modelling have the potential to provide the information needed for urban planning and management. Urban utility information system incorporates different data components like spatial, attribute models etc.

3D city models with urban utility information system can be used to support management policies and future planning of urban resources.

II. Objective

For the present study, following objectives have been formulated.

- To create the 3d city model for urban planning and development.
- To assess the utility infrastructure of Dahisar region of Mumbai city by developing utility information system (UIS).

III. Study Area

Mumbai city is the 'Economical Capital' of India. The study area is a part of Dahisar region which is located towards northern side of Mumbai. The study area covers 376011.16 sq. m area and located between 19° 15' North to 19° 15' 20" North Latitude and 72° 51' 40" East to 72° 52' East Longitude. Average height of study area from MSL is only 10 meter.

Author α : Department of Geography, Shivaji University, Kolhapur-411004, INDIA.
Author σ : Symbiosis Institute of Geoinformatics, Pune, INDIA.

Global Journal of Researches in Engineering (J) Volume XII Issue III Version I Year 2012

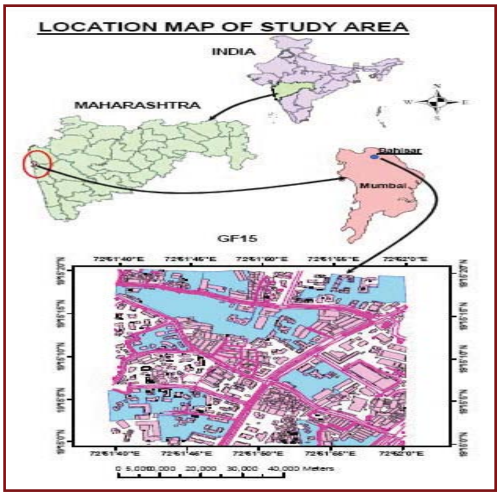


Fig.1 : Location Map

IV. Database & Methodology

Data for present research is used from both primary and secondary sources. From primary source, Ground control Points (GCPs) have been generated by using the GPS. Cadastral map (G F/15) of Mumbai city at 1:1000 scale has been used as a base map. Aerial photographs at 1:6000 scale of the same region have been acquired to generate 3D model. Apart from these, the utility information like apartment name, stores, their utility (Office, Bank, Commercial, Residential etc.) has been collected from National Informatics Center (NIC). This information is further used to create land use/ land cover map of the study area by using ARCGIS software. Aerial photo orthorectification is one of the essential task of our study. Orthorectification is a processing step in which aerial photos are adjusted to correct distortions due to topographic relief, lens distortion, and camera tilt. Using fifteen well distributed GCPs, orthorectification was carried out. The points which can be easily identified on aerial photographs and on ground have been considered for GCPs. For this, mainly road Intersections, corners of buildings, corner of open land plots etc were chosen for GCPs in the stereoscopic neat model area. After Image Orthorectification, images were precisely overlapped on each other which are further used for vecterisation to extract building shape as it gives 3D view of study area.

After feature extraction in LPS software, the data which was in '.dgn' format has been converted in Shape file (.shp) to generate a new personal Geodatabase in ARCGIS software. After generating the personal Geodatabase map of study area, the attribute data of utility information has been attached with feature class with unique id number. Various queries have been generated to assess the utility infrastructure of Dahisar area in SQL.

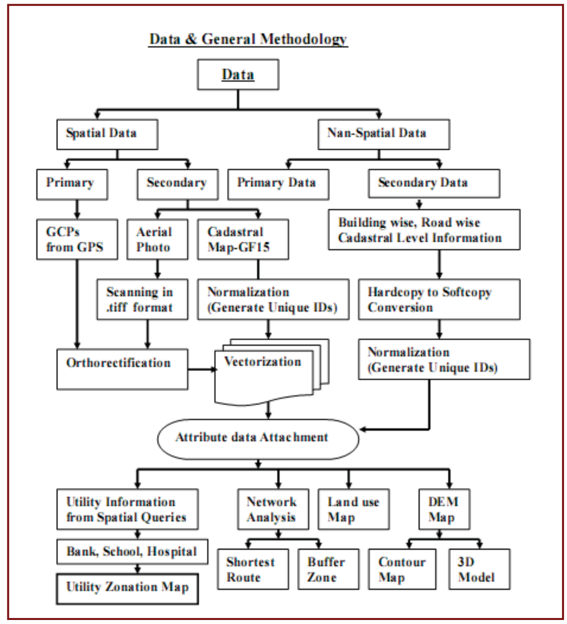


Fig. 2 : Flow Chart of Research Methodology

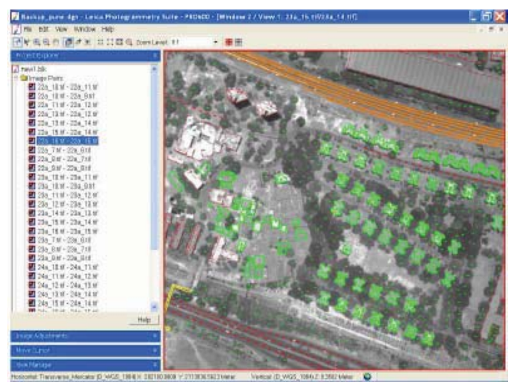


Fig. 3 : Feature Extraction

V. Result and Discussion

a) 3D City model

Three-dimensional city models are usually comprises information about terrain, streets and vegetation in build-up areas. Now a day, interest in 3D city models has risen significantly. These models are very useful to identify illegal constructions with respect to sanctioned FSI. It can also be used for property tax collection. Telecommunication companies use such type of model to find out suitable locations for antenna.

To develop 3D city model, it is important to choose appropriate data and suitable method (Kobayashi, 2007). Instead of airborne laser scanning data, Aerial photographs are mainly used to create 3D city model for the present study. In this research, aerial photographs are used in order to produce DTM or base of the 3D city model. In addition, the other entities that can be placed in 3D city model such as streets, trees, and parking lot have been extracted from same stereo-pairs. The main processes which have been carried out to generate the 3d city model includes orthorectification, stereo model creation, vectorisation, layer extraction and base model development. First of all, orthorectification of aerial photograph has been carried out by using fifteen well distributed GCPs. The points which can be easily identified on aerial photographs and on ground have been considered for GCPs. After Orthorectification, aerial photographs were precisely overlapped on each other and stereo model has been created by using LPS software. Stereo model processing is the process to orient aerial images. The stereo images are then used for the vectorization stage by digitizing the building outline with the help of topomouse and LCS glasses and 3D points have been extracted. These 3d points have local coordinate (x, y) and height information (z). In order to complete the base model for 3D city model, the DTM are generated from 3D points and the buildings outline are draped onto the DTM. Figure 2 shows the process of DTM generation and Figure 3 shows the building outline on DTM. The geometry and the height of the buildings are based on the buildings outlines. At this stage, landscape effect has been added to the model to make the model more realistic by using ArcScene software.

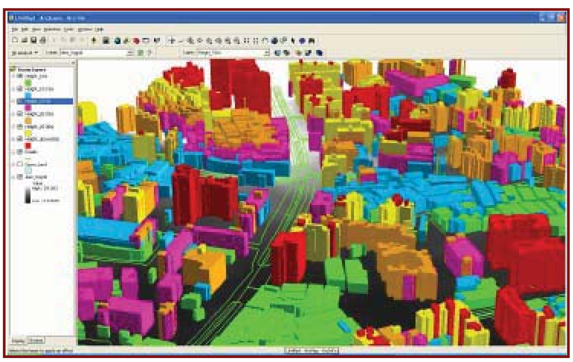


Fig. 5 : Vertical Growth Distribution

By using the 3 D model, the vertical growth map has been created to classify various buildings according to their height as per figure 5, the minimum elevation of a building is 4.5 m and maximum is 60.5 m. With respect to their elevation, build up area is being classified in to six classes. The analysis reveals that 10 per cent buildings are between 10 to 15 m height.

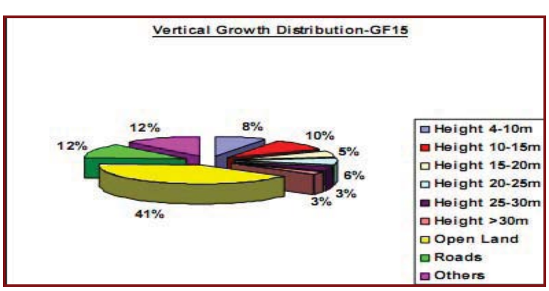


Fig. 4

b) Assessment of Urban Utility Information

GIS is emerging as an important planning, management and operations tool for the utility industries. Utility being the nerve centre and basic infrastructure requirement and authority/ planner must ensure that all the components are functional with no breakdown. The authorities should ensure regulation in consumer services. To facilitate management of such a system, the task is made substantially flexible and the system condition if presented visually on a geographical data, it facilitates easy tacking and attention. Executing a GIS with a defined system design basis will go a long way in successful utility management. By joining spatial and aspatial data like utility information, various queries can be generated to assess utility infrastructure by applying utility information system. With this we can easily identify the locations of various utilities like hospitals, schools, banks, petrol pump, ATM centers, public toilets, government offices, markets etc. The area with sufficient utilities can be easily marked out by applying queries with the help of SQL.

Each utility centre provides facilities to surrounding area which comes under its service zone. In study region, two hospitals are available for providing health facility. Those are Mulgaonar hospital and Sanjeevan hospital. These hospitals are located in south-western part of the study region. By using buffer analysis method, a zone of 150 m has been demarcated. It shows that Mulgaonkar hospital and Sanjeevan Hospital covers 51629.09 sq.m and 48972.46 sq.m area respectively. These areas can be termed as 'Single facility zone' because it has only one source for health facility. The area which comes under two hospital zones (18884.9 sq.m) is known as 'Dual facility zone' because it has two options to avail health facility from both centres. The northern and eastern part is basically lacking in health services.

With respect to school facility, there are four schools in Dahisar area. A buffer zone of 200 m has been created from the school location.

The analysis shows that 52% area has only one school facility, 22.5% area has dual source and 0.5% area has got maximum school facility from three sources. The south-eastern part is having poor school facility. The bank facility is quite satisfactory in western part but it is lacking towards eastern part.

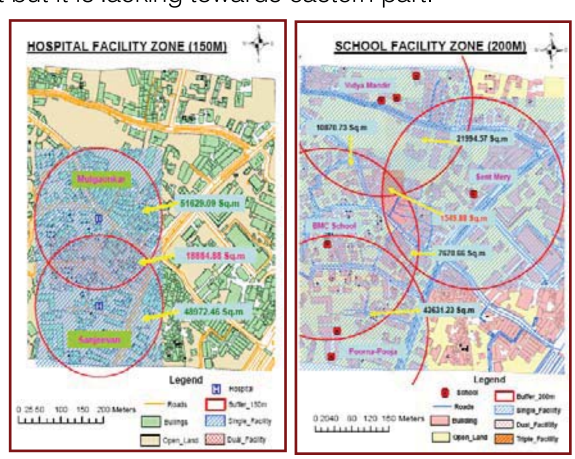


Fig. 6 : Hospital & School Utility Zone

c) Land Use / Land Cover Map

Land use/ land cover information is prerequisite for many urban planning projects. In this study area, Land is used for various purposes like Residential, Industrial, Commercial, Slum, Open land, roads and other purposes. The land use/ land cover map has been prepared by taking help of ancillary data of NIC and aerial photographs in ARCGIS. Land use map is most important thematic map as it provides information about the present status of land use.

The analysis reveals that Dahisar sub-urban area is dominated by open land with 41 per cent as it indicates lots of future scope for planned development. Out of the total area, residential area is 27.72 per cent and industrial area is only 5.22 per cent.

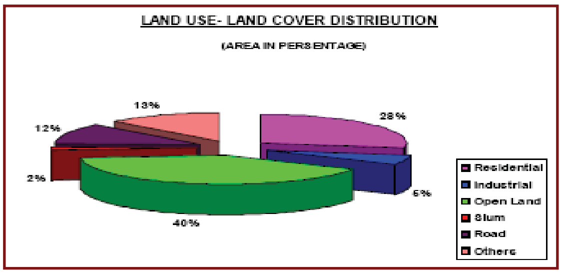


Fig.7 : Land Use/ Land Cover Distribution

d) TIN Map

TIN model of the study region has been generated to study surface topography of the area. To create this model, feature extraction tool of LPS has been used to estimate surface height of the area by point layer. Then this layer has been imported in ArcGIS and according to that TIN model has been generated. The analysis shows that elevation increases from north to south and the average height of this area is 10 m.

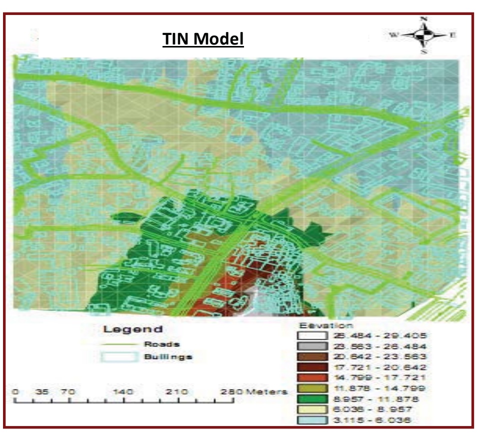


Fig. 8 : TIN Model

VI. Conclusion

In Dahisar region, residential area dominates with respect to other type of land use. The utilities like school and bank are better towards western and south-western part. Hospital services are poor in Dahisar region and there is urgent need to establish some new hospitals in the area. Digital photogrammetry with GIS modelling results in more accurate creation of 3D city model. These models with precise utility information are vital for urban planning and infrastructure development.

Acknowledgment

We are grateful to Major General V.R. Mahendra (Additional Surveyor General, GDC, Pune) for their guidance and for providing lab facility to complete the research work.

References Références Referencias

1. Jalli, R., D, P. K. 2007. 3D City Models for Urban GIS. GIS Development. 11(4) (pp 64-66).
2. Kobayashi, L 2007. Photogrammetry and 3D city modeling. Arizona State University, USA.
3. Meenar, M., Ambrus, A., 2006. Three-Dimensional Models Encourage Public Participation. ArcUser, 9(2) (pp. 34-37).
4. Naidoo, S., Mohamed, B. 2007. 3D Mapping in South Africa:Status & Usage. GIS development. 11 (4) (pp 51).

Global Journal of Researches in Engineering
General Engineering
Volume 12 Issue 3 Version 1.0 Year 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4596 & Print ISSN: 0975-5861

Sisvaznat: Natural Flows Reconstitution System as a Support for Water Resources Management

By Prof. Antonio Ferreira da Hora, Prof. Mônica de Aquino Galeano Massera da Hora & Prof. Eduardo Marques

Shivaji University, Kolhapur, India

Abstract - This paper presents a general system for the reconstitution of natural flows series to support the SNIRH (Brazilian acronym for National Water Resources Information System). There is a need for system structuring due to the fact that streamflows may suffer human modifications which difficult to carry out water resources management. In order to make a reliable assessment, it is essential to determine the socalled "natural flow series" i.e. the flows that would have occurred prior to human action. The SisVazNat system was applied in the Tocantins watershed, located in the Amazon Region, and in order to validate the proposed methodology, the results were compared with those published by the Electric System National Operator (ONS). The mean percent differences obtained in each hydropower plant were, respectively: UHE Serra da Mesa (3.2%); UHE Cana Brava (5.6%); UHE Lajeado (4.2%) and UHE Tucuruí (4.4%), allowing the validation of the tool.

Keywords : SisVazNat, water resources, natural flow reconstitution.

GJRE-J Classification : FOR Code: 070101

SISVAZNATNATURALFLOWSRECONSTITUTIONSYSTEMASASUPPORTFORWATERRESOURCESMANAGEMENT

Strictly as per the compliance and regulations of:

Sisvaznat: Natural Flows Reconstitution System as a Support for Water Resources Management

Prof. Antonio Ferreira da Hora [α], Prof. Mônica de Aquino Galeano Massera da Hora [σ] & Prof. Eduardo Marques [ρ]

Abstract - This paper presents a general system for the reconstitution of natural flows series to support the SNIRH (Brazilian acronym for National Water Resources Information System). There is a need for system structuring due to the fact that streamflows may suffer human modifications which difficult to carry out water resources management. In order to make a reliable assessment, it is essential to determine the so-called "natural flow series" i.e. the flows that would have occurred prior to human action. The SisVazNat system was applied in the Tocantins watershed, located in the Amazon Region, and in order to validate the proposed methodology, the results were compared with those published by the Electric System National Operator (ONS). The mean percent differences obtained in each hydropower plant were, respectively: UHE Serra da Mesa (3.2%); UHE Cana Brava (5.6%); UHE Lajeado (4.2%) and UHE Tucuruí (4.4%), allowing the validation of the tool.

Keywords : SisVazNat, water resources, natural flow reconstitution.

I. Introduction

This paper presents a general system for the reconstitution of mean monthly natural flows in watersheds to support the SNIRH (Brazilian acronym for National Water Resources Information System) in charge of the National Water Agency (ANA). The system, called SisVazNat (Natural Flow System), was developed in Delphi platform, because it has a better performance in the implementation of software for desktop environments and provides resources that allow the best graphic designs [1].

The need for system structuring is due to the fact that flows may suffer the influence of human modifications, which affect the natural flow regime impairing the assessment of water availability of a particular reach of a stream. In order to make a reliable assessment, it is essential to determine the so-called "natural flow series".

The reconstitution of natural flow series demands careful analyses and procedures, among which the water balance stands out. In short, the method considers that natural flows are calculated from data of inflows that are turbinated and released from hydropower plants, water traveling time between those power plants and the arrangement of the set of power plants. Losses by evaporation of the flooded areas in each reservoir in relation to conditions that already existed before its implementation, a phenomenon called net evaporation, is also considered in this calculation.

The particular objective of this project was to develop automated tools that facilitate the reconstitution of those natural flows. The software developed also allows the extraction of metric and topological information on the millionth scale.

II. The New Brazilian Model of Water Resources Management

Water resources availability and multiple uses as well as the conflicts that arise from their use, currently represent a major challenge for society. In this context, Brazil is facing the challenge of creating legal and administrative mechanisms to harmonize the use of water resources with sustainable economic and social development.

The new model of water resources management is based on Law nº 9.433/97, which establishes the principle of multiple uses as one of the bases of the National Water Resources Policy to allow different user sectors the right of access to water. In order to establish this policy, the federal government created ANA which is entrusted with implementing the management tools, among which SNIRH stands out. SNIRH development is based on a strategy of joint construction, participatory and decentralized involving the federal and state spheres of the government.

A monitoring network composed of gauging stations to provide continuous data, the so-called historical discharge series, is needed to characterize water supply. On the other hand, demand is obtained from an updated registry of users. The balance between supply and demand, which is called water availability, indicates the scarcity or abundance of water in a watershed. Characterizing water availability and determining its relationship with current and future demands is crucial to define the rules for the allocation of water resources among different users [2].

Author α σ : Author Dept. of Agricultural and Environmental Engineering, Fluminense Federal University, Rio de Janeiro, Brazil.
E-mail : dahora@vm.uff.br
Author ρ : Author Institute of Science and Technology, Fluminense Federal University, Rio de Janeiro, Brazil.
E-mail : emarques at puro.uff.br

Thus, the historical discharge series are essential data for water resources management. However, stream flows are affected by human modifications such as dams, irrigation, withdrawals for human, animal or industrial supply. The consumptive water uses can affect the natural flow regime impairing or even preventing the correct evaluation of water availability. Thus, it is important to determine the "natural flow series" i.e., those that occurred before human actions. This process receives the name of reconstitution of natural flow series.

III. System Structure

The SisVazNat was structured into five modules: SisVAP, SisPEx, SisEL, SisReNat and SisUSO. Fig. 1 shows the interconnection between the SisVazNat modules for the natural flow series reconstitution process.

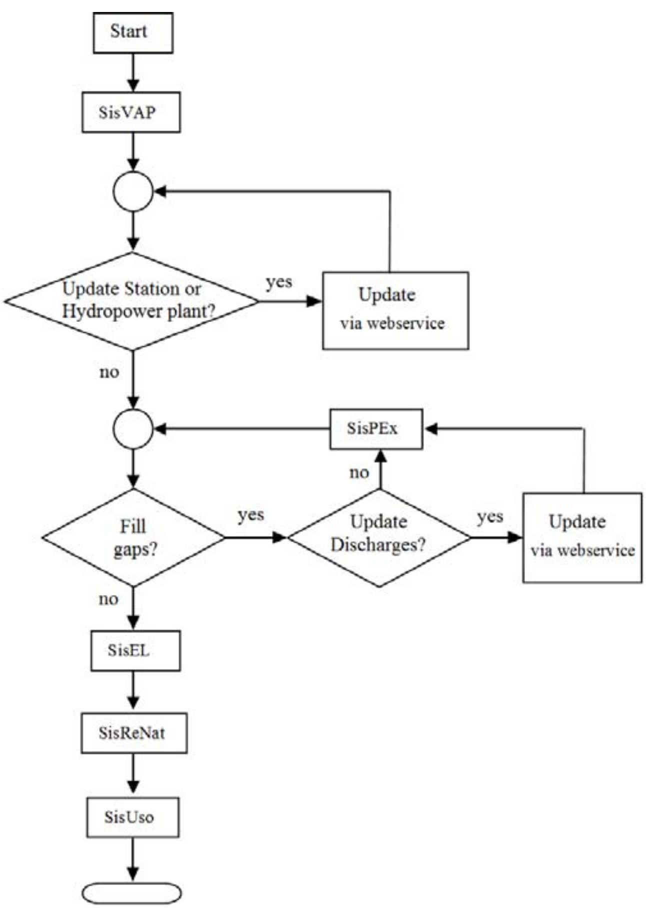


Fig.1 : Interconnection between the SisVazNat modules

SisVAP is a tool for editing and selecting the basin which contributes to the point defined by the user, as well as, from the local database, associating with the existing climate, gauging and raingauge stations and hydropower plants on the selected basin. Its objectives are:

– Interaction with the hydro reference base on a 1:1.000.000 scale.
– Segmentation of incremental basins.
– Identification and location of the contributing basin to the point defined by the user.
– Identification and location of the climate, gauging and raingauge stations and hydropower plants in the contributing basin to the point defined by the user.
– Possibility of edition of the arrangement of the hydropower plants and stations automatically identified by the tool, allowing the user to define which arrangement he/she wishes to use in the reconstitution of the natural flows, as well as recording and restoring, in digital mode, different built arrangements.

Given the huge amount of data, the separation per hydrographical unit was chosen for the incorporation of the integrated hydro reference base on a 1:1.000.000 scale, provided by ANA. Each project corresponds to a basin or sub-basin in national territory, as shown in fig. 2. As an example, fig. 3 presents the Tocantins river basin, located in the Amazon Region. Current and forecasted hydropower plants, climate, gauging and raingauge stations are presented in this figure.

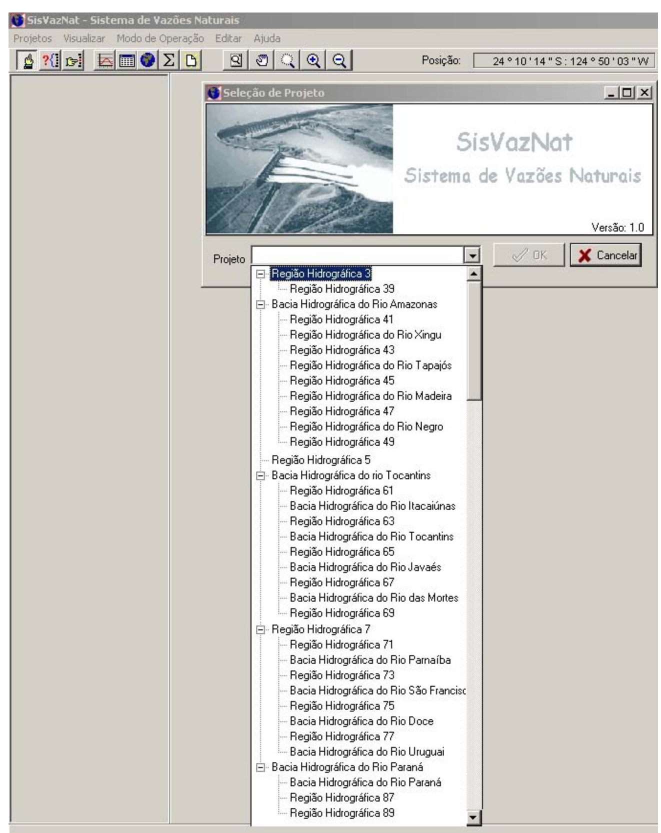


Fig. 2 : SisVazNat start screen

Global Journal of Researches in Engineering (J) Volume XII Issue III Version I Year 2012

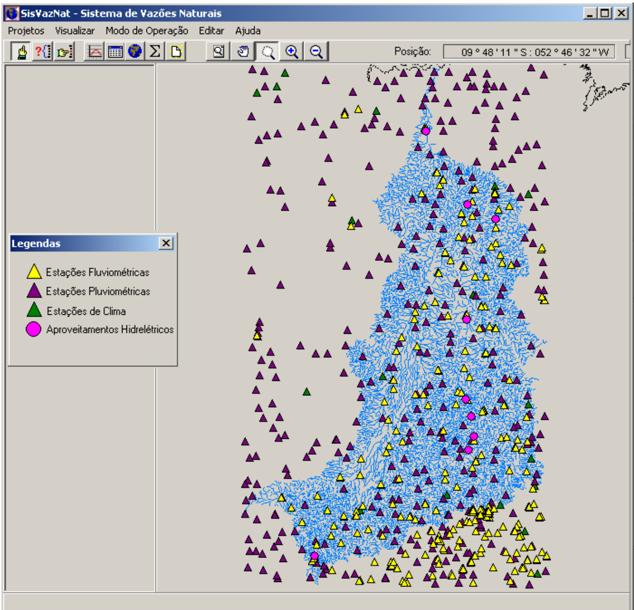


Fig.3 : Tocantins river basin

The hydro reference methodology is based on the concept of segmentation of incremental basins, which is defined from the difference between the surrounding drainage areas of each pair of successive points of interest located in a certain section of the river, for example, "P1" and "P2" points in fig. 4. The calculation of the surrounding areas of each point of interest was defined from the sum of all basin areas upstream of the section which contains the point, added of the area directly proportional to the ratio between the distance from the beginning of the section up to the point and the total length of the section.

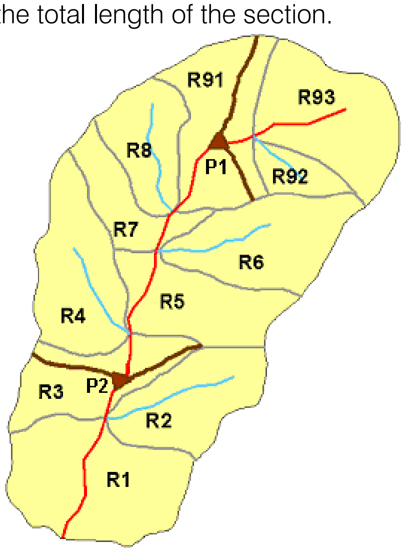


Fig.4 : Incremental areas for P1 and P2 points of interest

The SisVAP allows the user to visualize the contributing basin of the river sections and identify and locate the raingauge, climatic and gauging stations, and the hydropower plants upstream of the selected point. In addition, the lengths of the reaches and the drainage areas to the point selected by the user are provided, as shown in fig. 5.

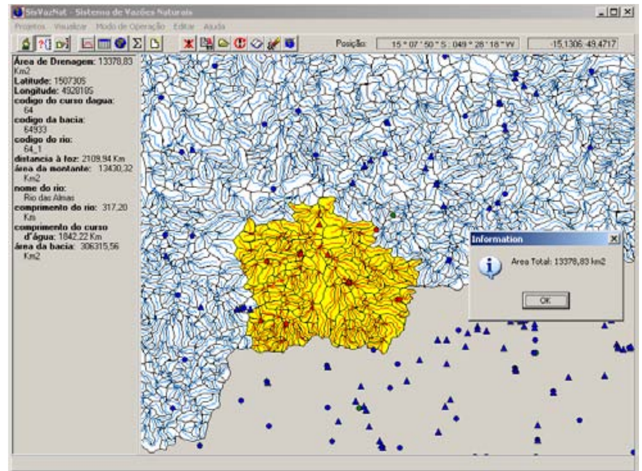


Fig.5 : Incremental basin segmentation located upstream of a point of interest

The second module is SisPEx, which was built for automatic filling and extension of the mean monthly average discharges series in each gauging station. Its main objectives are:

- Allowing the management of gauging station database registries of mean monthly discharges.
- Visualization of the registries (graphs and tables).
- Extension or gap filling the discharge series by linear regression or relationship between drainage areas or multiple correlations.

It allows the user to visualize the gauging stations, as well as the data availability period within a certain river basin, fig. 6. In addition, it is possible to select the stations of interest, and import, partially or completely, the discharge series, being only necessary that the user types the dates of beginning and ending. This option was created to help the user in deciding which base stations may be used for gap filling and/or series extension.

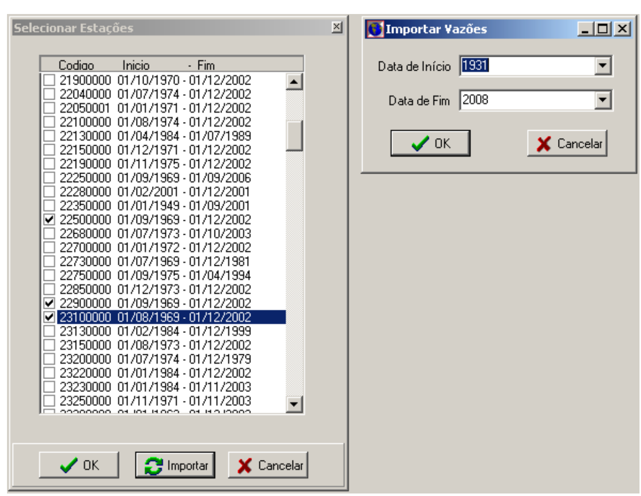


Fig.6 : Station Selection for Filling and/or Extension of Flow Series

The evaluation of the mean monthly discharge series may be done from the visual analysis of the hydrographs generated by SisPEx for one or more selected stations, as shown in fig. 7, or even through tabulated values, fig. 8.

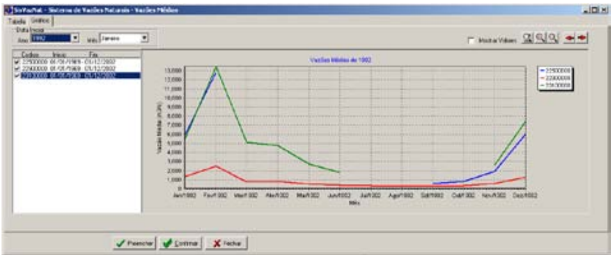


Fig. 7 : Mean discharge hydrograph

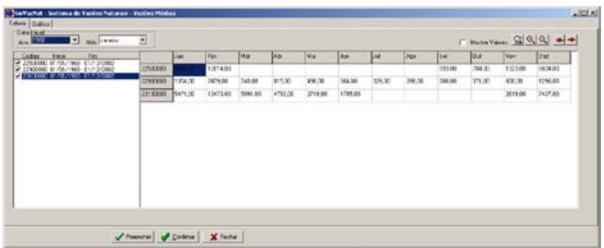


Fig. 8 : Mean monthly discharge tabulated values

The automatic gap filling and/or extension may be done through:

– Relationship between drainage areas: Developed to be used, at least, between 2 stations, one of which serves as a base, located in the same water course or the same basin, and the other which has its gaps filled and/or extended.

– Multiple correlations: It is a generalization of the relationship between drainage areas where the user may define the multiplier coefficients of the base stations, and where the use of more base stations for filling and/or extension of flow gaps is possible.

– Linear regression: Forecasted to be performed between one or more base stations and that which will be filled and/or extended, as shown in the example in fig. 9.

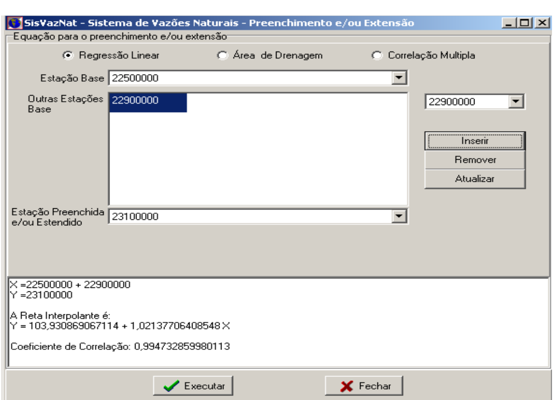


Fig. 9 : Linear regression equation

When the user clicks the button "*Executar*", the values for gap filling and/or extension of the series of the gauging station shall be automatically calculated. In addition to the tabular output, fig. 10, the SisPEx allows the user to verify, through a summary board, from the complete series of the station, the number of months that were filled and/or extended, how many could not be filled ("*Valores indeterminados*") and the number of months of observation for a certain station ("*Valores consolidados*"), fig. 11.

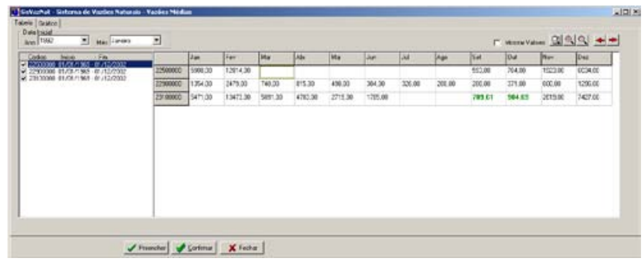


Fig. 10 : Filling results tabulated values

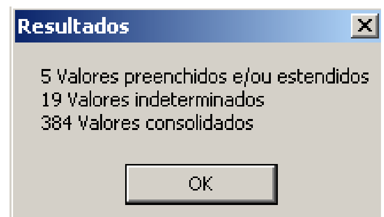


Fig. 11 : Filling results summary board

The third module is the SisEL, which allows visualization of climatic data (temperature, wind velocity, evaporation, rain, sun exposure and humidity) and the insertion of new information. It calculates the climatic variables involved in the natural flow series generation process (reservoir water balance).

The water balance of the reservoirs formed by the hydropower plants is a function of the net evaporation loss during a period of time (EL). The net evaporation loss, as defined by [3] is the difference between the evaporation from the reservoir and the evapotranspiration from the reservoir site (before the reservoir formation). In the scenario prior to the lake formation, there is ground cover which demands water for its needs, named effective precipitation. According to [4], the effective precipitation corresponds to the precipitation share stored in the influence zone of the cultivated roots and available for them to fulfill their demands. In this way, the effective precipitation (Pe) is the share of total precipitation (P) which does not flow superficially nor runs off below the root zone of said vegetation, and can be calculated through the USDA method below, according to [5], by the following equations:

$$Pe = \frac{P \cdot (125 - 0{,}2 \cdot P)}{125}, \text{ for } P < 250 \text{ mm} \qquad (1)$$

$$Pe = 125 + 0{,}1 \cdot P, \text{ for } P > 250 \text{ mm} \qquad (2)$$

Besides, in this situation, the vegetation transpiration process and soil evaporation in its surroundings, named real evapotranspiration (ETR), which corresponds to the amount of water the atmosphere can effectively remove from the soil-plant system must be taken into account. To calculate it, the SisEL allows the user to choose between the formulation proposed by [6] and the CRAE model from [7]. As the method from [6] is a function of the potential or referential evapotranspiration (ETo), SisEL allows the user to estimate ETo through the Penman-Monteith [8], Hargreaves-Samani [9] and Blaney-Cridle [10] methods.

The processes which govern the scenario after the lake formation are precipitation and lake evaporation, once there is no more ground cover nor, consequently, the effective precipitation and actual evapotranspiration processes. In this case, the phenomenon may be represented by:

$$EL = ELa - ETR \qquad (3)$$

Where: ELa is the lake evaporation; and ETR the real evapotranspiration before the implementation of the reservoir. The lake evaporation may be calculated through the Linacre [11], Kohler et al [12] and Morton CRLE model methods, or yet through class A tank.

The fourth module is the SisReNat, which allows automatic generation of the monthly natural flow series from a particular point of interest located in a certain river reach. The calculation of the monthly natural flow series for any point in the hydrographic network may be performed in three different ways: entering the name of the hydropower plant, clicking on the hydrography or entering the coordinates of the point of interest.

If the point of interest defined by the user is a hydropower plant, the system will use Eq (8) for calculating the natural flow series.

Otherwise, the natural flow is calculated from the transferral of the inflows to a hydropower plant located on the same river reach or, in case of lack thereof, from the transferral of the gauging station discharges located on the same river of a nearby basin. In both situations, the transference process is done based on the relationship between drainage areas. In case of a hydropower plant, the value transferred corresponds to the difference between the natural flow (estimated through Eq (8)) and the consumptive water use at the location of the plant, and the result is added of the consumptive water use at the point of interest. In a similar manner, in the case of gauging stations, the consumptive water uses are added up after the transference of the observed gauging station flows to the point of interest, Eq (9) and (10). For the calculation process, the system informs which the hydropower plants (fig. 12) or gauging stations (fig. 13) are on the river reach or basin where the chosen point is located, as well as the availability of operational data and/or series of historical discharges of the selected period.

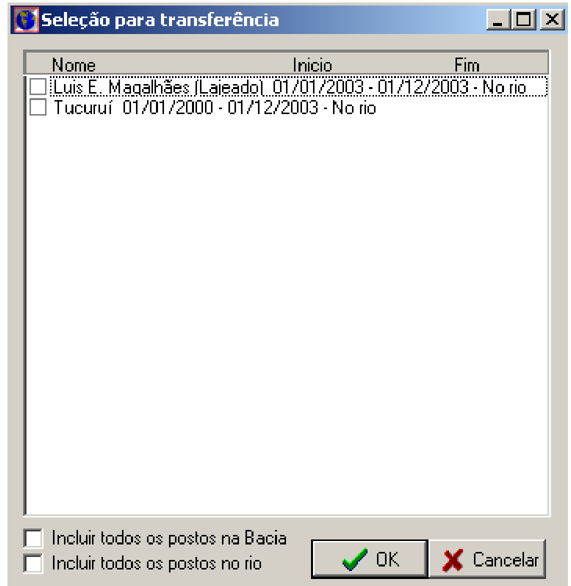


Fig. 12 : List of hydropower plants located within the same river reach of a point of interest

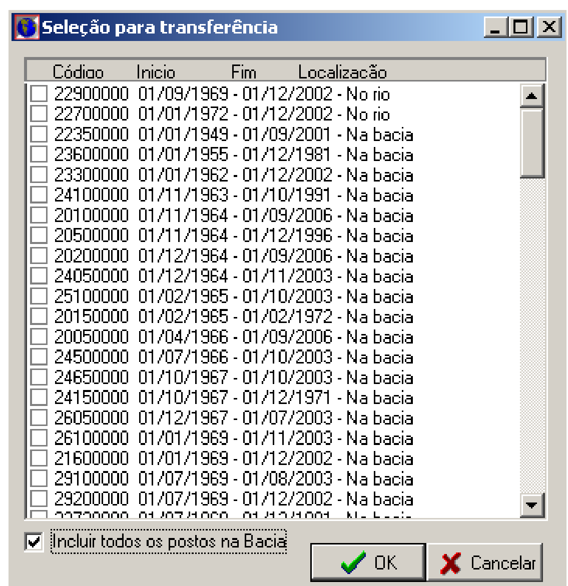
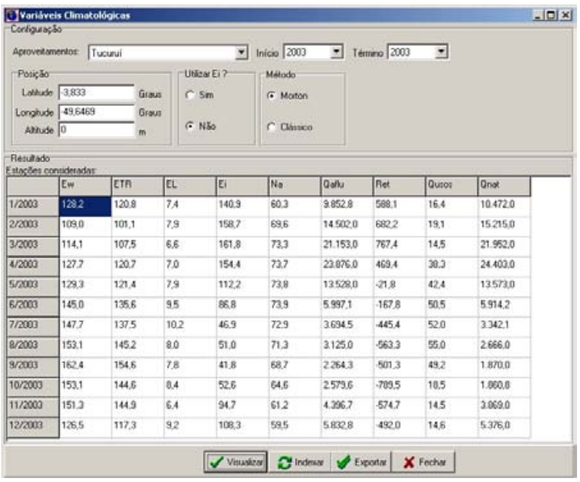


Fig. 13 : Gauging stations located on the river reach or basin of a point of interest

The fifth and last module is the SisUSO, which was developed to allow automatic water consumption flow estimate (water consumptive use). The calculation takes into account the sum of the various types of identified water uses in the basins upstream of the section which contains the point of interest, added of the sum of the sections where the point is inserted. The definition of consumptive water uses per basin was done by ANA and transferred to SisVazNat database.

Finally, once the hydropower plant or gauging station is selected, the SisVazNat automatically generates the natural flow at the point of interest defined by the user and presents the natural flow series for the chosen period, as shown in fig. 14.



	Ew	ETR	EL	Ei	Na	Qaflu	Ret	Qusos	Qnat
1/2003	128,2	120,8	7,4	140,9	60,3	9.852,8	588,1	16,4	10.472,0
2/2003	109,0	101,1	7,9	158,7	69,6	14.502,0	682,2	19,1	15.215,0
3/2003	114,1	107,5	6,6	161,8	73,3	21.153,0	767,4	14,5	21.952,0
4/2003	127,7	120,7	7,0	154,4	73,7	23.076,0	469,4	38,3	24.403,0
5/2003	129,3	121,4	7,9	112,2	73,8	13.528,0	-21,8	42,4	13.573,0
6/2003	145,0	135,6	9,5	86,8	73,9	5.997,1	-167,8	50,5	5.914,2
7/2003	147,7	137,5	10,2	46,9	72,9	3.694,5	-445,4	52,0	3.342,1
8/2003	153,1	145,2	8,0	51,0	71,3	3.125,0	-563,3	55,0	2.666,0
9/2003	162,4	154,6	7,8	41,8	68,7	2.264,3	-501,3	49,2	1.870,0
10/2003	153,1	144,6	8,4	52,6	64,6	2.579,6	-789,5	18,5	1.860,8
11/2003	151,3	144,9	6,4	94,7	61,2	4.396,7	-574,7	14,5	3.869,0
12/2003	126,5	117,3	9,2	108,3	59,5	5.832,8	-492,0	14,6	5.376,0

Fig. 14 : Natural flow series generated at a hydropower plant location

IV. METHODOLOGY

The method adopted by [13] in the reconstitution of the natural affluent flow of the hydropower plants is the reservoir water balance. The natural flow of each hydropower plant is obtained from the application of the following expression:

$$Qnat = Qnatp + Qinc \tag{4}$$

Where: Qnat is the natural flow at the location of the selected hydropower plant; Qnatp is the natural flow at the upstream reservoir(s); Qinc is the natural incremental flow between the selected hydropower plant and the upstream hydropower plant(s).

The flow of the incremental basin related to each hydropower plant (incremental natural flow) is calculated from:

$$Qinc = Qinf - Qrel + Quse + Qevp + Qdiv \tag{5}$$

Where: Qinc is the incremental natural flow, between the selected hydropower plant and the upstream hydropower plant(s). Qinf is the inflow to the selected hydropower plant reservoir; Qrel is the released flow of the upstream reservoir(s); Quse is the flow related to the consumptive uses of the incremental basin; Qevp is the flow related to the net evaporation; Qdiv is the flow diverted in the incremental basin, through channels, tunnels or bombing station.

The flow related to net evaporation is expressed by:

$$Qevp = \frac{EL}{2{,}6298 \cdot 10^6} \cdot [A_0 + A_1 \cdot h + A_2 \cdot h^2 + A_3 \cdot h^3 +$$

$$+ A_4 \cdot h^4] \cdot 1000 \tag{6}$$

Where: h is the reservoir average stage; $A_{0,1,2,3,4}$ are the coefficients of the stage-reservoir area equation; $2{,}6298.10^6$ is the number of seconds in a month.

The value of the diverted flow shall be accounted on the flow related to the consumptive uses of the incremental basin. Based on this, Eq (6) may be rewritten as follows:

$$Qinc = Qinf - Qrel + Quse + Qevp \tag{7}$$

The general equation of the natural flow in a hydropower plant "i" can then be expressed as:

$$Qnat_i = Qinf_i + \left[\sum_{j=1}^{n}\left(Qinf_j - Qrel_j\right)\right] + \left[\left(\sum_{j=1}^{n} Quse_j\right) + Quse_i\right] +$$

$$+ \left[\left(\sum_{j=1}^{n} Qevp_j\right) + Qevp_i\right] \tag{8}$$

Where: $\left[\sum_{j=1}^{n}\left(Qinf_j - Qrel_j\right)\right]$ is the sum of the difference between the inflows and release flows of the set of hydropower plants located upstream of the hydropower plant "i" (it corresponds to the "Ret" column in fig. 14); $\left[\left(\sum_{j=1}^{n} Quse_j\right) + Quse_i\right]$ is the sum of the incremental consumptive uses of the set of hydropower plants located upstream of the hydropower plant "i", including itself; $\left[\left(\sum_{j=1}^{n} Qevp_j\right) + Qevp_i\right]$ is the sum of the net evaporation flows of the hydropower plants reservoirs located upstream of the hydropower plant "i", including itself.

For the generation of the monthly natural flows in streams where there are no hydropower plants, the mean monthly flow data from the gauging station(s) upstream or downstream from the point of interest is used, transferred by relationship between drainage areas, added of the consumptive uses accrued up to the point of interest. The equation for the reconstitution of the monthly natural flow from the observed data is expressed as:

$$Qnat_i = Q_j \cdot \left(\frac{A_i}{A_j}\right) + Quse_i \text{, i downstream from j} \tag{9}$$

$$Qnat_i = Q_j \cdot \left(\frac{A_j}{A_i}\right) + Quse_i \text{ , i upstream from j} \qquad (10)$$

Where: Q_j is the mean monthly average discharge at the gauging station located at point "j"; A_i is the drainage area surrounding the point of interest "i"; A_j is the drainage area surrounding the gauging station located at point "j"; $Quse_i$ is the accrued monthly consumptive uses up to the point of interest "i".

In case of lack of gauging stations on the river reach, in which the point of interest "i" is located, the option of transference is granted to the user, through the relationship between drainage areas, from the gauging station(s) located on nearby basin(s).

In case the hydropower plant does not possess operational data, it shall be considered by the SisVazNat as a point of interest and the monthly natural flow is estimated from Eq (9) or (10).

V. RESULTS

The SisVazNat was applied in the Tocantins basin located in the Amazon Region. The basin has a drainage area of 767,000 km^2, or about 7.5% of the Brazilian territory. The geographic coordinates used to locate the operating hydropower plants in the basin are shown in Table 1.

Table 1 : Hydropower plants code and location

Hydropower Plant*	Lat	Long	Drainage Area (km^2)
UHE Serra da Mesa	-13.827	-48.307	51,233
UHE Cana Brava	-13.407	-48.142	58,022
UHE Lajeado	-9.756	-48.374	183,718
UHE Tucuruí	-3.833	-49.647	757,577

** UHE is the Brazilian acronym for hydropower plant.*

In order to validate the proposed methodology we considered the year of 2003 (January to December) for the simulations using the Morton model, and the results found were compared to the series of natural flows published by ONS. The choice of the Morton model sought to match the simulation of the SisVazNat to the criteria adopted by ONS regarding the generation of natural flows. The differences are shown in Tables 2 to 5.

Table 2 : Results obtained in UHE Serra da Mesa

Date	Natural Flow (m³/s)		Difference
	ONS	SisVazNat	(%)
Jan-03	1,197.0	1,142.4	4.6
Feb-03	1,056.0	1,068.9	1.2
Mar-03	1,140.0	1,138.9	0.1
Apr-03	919.0	917.4	0.2
May-03	425.0	415.6	2.2
Jun-03	293.0	272.8	6.9
Jul-03	206.0	196.6	4.6
Aug-03	135.0	130.1	3.6
Sep-03	167.0	164.2	1.7
Oct-03	139.0	134.9	2.9
Nov-03	283.0	289.6	2.3
Dec-03	340.0	369.1	8.6

Table 3 : Results obtained in UHE Cana Brava

Date	Natural Flow (m³/s)		Difference
	ONS	SisVazNat	(%)
Jan-03	1,319.0	1,293.8	1.9
Feb-03	1,188.0	1,173.1	1.3
Mar-03	1,276.0	1,281.1	0.4
Apr-03	1,095.0	1,028.2	6.1
May-03	485.0	453.3	6.5
Jun-03	330.0	297.1	10.0
Jul-03	231.0	205.4	11.1
Aug-03	154.0	135.2	12.2
Sep-03	185.0	180.8	2.3
Oct-03	158.0	165.8	4.9
Nov-03	311.0	328.6	5.7
Dec-03	381.0	399.9	5.0

Table 4 : Results obtained in UHE Lajeado

Date	Natural Flow (m³/s)		Difference
	ONS	SisVazNat	(%)
Jan-03	3,365.0	3,280.2	2.5
Feb-03	3,322.0	3,329.5	0.2
Mar-03	3,621.0	3,667.1	1.3
Apr-03	3,961.0	3,859.8	2.6
May-03	1,467.0	1,441.0	1.8
Jun-03	898.0	861.4	4.1
Jul-03	597.0	520.4	12.8
Aug-03	422.0	422.9	0.2
Sep-03	424.0	432.7	2.1
Oct-03	451.0	402.8	10.7
Nov-03	780.0	871.3	11.7
Dec-03	1.029.0	1.029.2	0.0

Table 5 : Results obtained in UHE Tucuruí

Date	Natural Flow (m³/s)		Difference
	ONS	SisVazNat	(%)
Jan-03	10,368.0	10,472.0	1.0
Feb-03	16,389.0	15,215.0	7.2
Mar-03	22,076.0	21,952.0	0.6
Apr-03	24,13.0	24,403.0	0.9
May-03	13,714.0	13,.573.0	1.0
Jun-03	5,853.0	5,914.2	1.0
Jul-03	3,231.0	3,342.1	3.4
Aug-03	2,279.0	2,666.0	17.0
Sep-03	1,759.0	1,870.0	6.3
Oct-03	1,796.0	1,860.8	3.6
Nov-03	3,525.0	3,869.0	9.8
Dec-03	5,404.0	5,376.0	0.5

Global Journal of Researches in Engineering (J) Volume XII Issue III Version I Year 2012

VI. CONCLUSION

The mean percent differences between the results obtained with the SisVazNat and the monthly natural flow series consolidated by ONS in each hydropower plant were, respectively: UHE Serra da Mesa (3.2%); UHE Cana Brava (5.6%); UHE Lajeado (4.2%) and UHE Tucuruí (4.4%). These small differences allowed the validation of the tool.

The application of the system to the case study was successful generating natural flows similar to those established by the electrical sector in Tocantins river basin. Thus, it is possible to infer that SisVazNat meets the proposed objectives, since it operates in an interactive way with the user, allowing frequent data updating, generating natural flows in any point of a watercourse in the Brazilian territory. The system may be used as a supporting tool that can help Governmental agencies, because it supplies an adequate representation of the water availability in a scenario that existed prior to human modifications in the basin allowing the water resources manager to use the natural flow series to define the criteria for a better allocation of water among multiple users.

The application of the SisVazNat to other Brazilian watersheds is recommended for future developments.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Hora, A. F.; Hora; M. A. G. M.; Marques, E. "SisVazNat 1.0: Sistema de Reconstituição de Séries de Vazões Naturais". 1ª edição, 2010. 75p. ISBN: 978-85-910-3330-0.
2. Hora, M. A. G. M. "Compatibilização da geração de energia em aproveitamentos hidrelétricos com os demais usos dos recursos hídricos". Editora da UFF, 2ª edição, 2012. 112p. ISBN: 978-85-228-0749-9.
3. MacMahon, T.; Mein, R. G. "Reservoir Capacity and Yield". Elsevier Scientific Publishing Company, 1978. 213p. ISBN 0-444-416670-6.
4. USDA-SCS "Chapter 2: Irrigation Water Requirements". Soil Conservation Service, United States Department of Agriculture. Part 623: National Engineering Handbook. 1993. p 142 – 154. Available at-<ftp://ftp.wcc.nrcs.usda.gov/wntsc/waterMgt/irrigation/NEH15/ch2.pdf>.
5. Smith, M. "CROPWAT. A computer program for irrigation planning and management". In: Irrigation and Drainage. FAO - Food and Agriculture Organization of the United Nations, 1992. Paper nº 46. 126p.
6. Thornthwaite, C. W.; Mather, J. R. "The water balance". Centerton, NJ: Drexel Institute of Technology - Laboratory of Climatology, 1955. 104p. (Publications in Climatology, vol. VIII, n.1).
7. Morton, F. I. "Operational Estimates of Lake Evaporation". Journal of Hydrology, Oct. 1983, v.66, n.114, p.77-100.
8. FAO "Crop Evapotranspiration (guidelines for computing crop water requirements)". In: Irrigation and Drainage, FAO - Food and Agriculture Organization of the United Nations, 1998. Paper nº 56. Available at-<<http://www.fao.org/docrep/x0490e/x0490e00.htm>>.
9. Hargreaves, G. H.; Samani, Z. A. "Estimation of potential evapotranspiration". Journal of Irrigation and Drainage Division ASCE, New York, v.108, n.3, p.225-230, 1982.
10. FAO "Irrigation Water Management: Irrigation Water Needs". In: Irrigation Water Management - Training manual nº 3, FAO - Food and Agriculture Organization of the United Nations, 1996. Paper nº 24. Available at-<<http://www.fao.org/docrep/S2022E/S2022E00.htm>>.
11. Linacre, E. T. "Data-sparse estimation of lake evaporation using a simplified Penman equation". Agricultural and Forest Meteorology, Elsevier, Amsterdam, v.64, n.3-4, p.237-256, 1993.
12. Kohler, M. A.; Noredenson, T. J.; Fox, W. E. "Evaporation from pans and lakes". U. S. Weather Bureau Research, 1955. 21p. Paper 38.
13. ONS "Módulo 23 – Critérios para Estudos – Submódulo 23.5 – Critérios para Estudos de Hidrologia Operacional". Relatório. Rio de Janeiro: ONS - Operador Nacional do Sistema. 11p. Julho de 2011.

Global Journals Inc. (US) Guidelines Handbook 2012

www.GlobalJournals.org

FELLOW OF ASSOCIATION OF RESEARCH SOCIETY IN ENGINEERING (FARSE)

- 'FARSE' title will be awarded to the person after approval of Editor-in-Chief and Editorial Board. The title 'FARSE" can be added to name in the following manner. eg. Dr. John E. Hall, Ph.D., FARSE or William Walldroff Ph. D., M.S., FARSE
- Being FARSE is a respectful honor. It authenticates your research activities. After becoming FARSE, you can use 'FARSE' title as you use your degree in suffix of your name. This will definitely will enhance and add up your name. You can use it on your Career Counseling Materials/CV/Resume/Visiting Card/Name Plate etc.
- 60% Discount will be provided to FARSE members for publishing research papers in Global Journals Inc., if our Editorial Board and Peer Reviewers accept the paper. For the life time, if you are author/co-author of any paper bill sent to you will automatically be discounted one by 60%
- FARSE will be given a renowned, secure, free professional email address with 100 GB of space eg.johnhall@globaljournals.org. You will be facilitated with Webmail, Spam Assassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.
- FARSE member is eligible to become paid peer reviewer at Global Journals Inc. to earn up to 15% of realized author charges taken from author of respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account or to your PayPal account.
- Eg. If we had taken 420 USD from author, we can send 63 USD to your account.
- FARSE member can apply for free approval, grading and certification of some of their Educational and Institutional Degrees from Global Journals Inc. (US) and Open Association of Research, Society U.S.A.
- After you are FARSE. You can send us scanned copy of all of your documents. We will verify, grade and certify them within a month. It will be based on your academic records, quality of research papers published by you, and 50 more criteria. This is beneficial for your job interviews as recruiting organization need not just rely on you for authenticity and your unknown qualities, you would have authentic ranks of all of your documents. Our scale is unique worldwide.
- FARSE member can proceed to get benefits of free research podcasting in Global Research Radio with their research documents, slides and online movies.
- After your publication anywhere in the world, you can upload you research paper with your recorded voice or you can use our professional RJs to record your paper their voice. We can also stream your conference videos and display your slides online.
- FARSE will be eligible for free application of Standardization of their Researches by Open Scientific Standards. Standardization is next step and level after publishing in a journal. A team of research and professional will work with you to take your research to its next level, which is worldwide open standardization.

- FARSE is eligible to earn from their researches: While publishing his paper with Global Journals Inc. (US), FARSE can decide whether he/she would like to publish his/her research in closed manner. When readers will buy that individual research paper for reading, 80% of its earning by Global Journals Inc. (US) will be transferred to FARSE member's bank account after certain threshold balance. There is no time limit for collection. FARSE member can decide its price and we can help in decision.

MEMBER OF ASSOCIATION OF RESEARCH SOCIETY IN ENGINEERING (MARSE)

- 'MARSE' title will be awarded to the person after approval of Editor-in-Chief and Editorial Board. The title 'MARSE" can be added to name in the following manner. eg. Dr. John E. Hall, Ph.D., MARSE or William Walldroff Ph. D., M.S., MARSE
- Being MARSE is a respectful honor. It authenticates your research activities. After becoming MARSE, you can use 'MARSE' title as you use your degree in suffix of your name. This will definitely will enhance and add up your name. You can use it on your Career Counseling Materials/CV/Resume/Visiting Card/Name Plate etc.
- 40% Discount will be provided to MARSE members for publishing research papers in Global Journals Inc., if our Editorial Board and Peer Reviewers accept the paper. For the life time, if you are author/co-author of any paper bill sent to you will automatically be discounted one by 60%
- MARSE will be given a renowned, secure, free professional email address with 30 GB of space eg.johnhall@globaljournals.org. You will be facilitated with Webmail, SpamAssassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.
- MARSE member is eligible to become paid peer reviewer at Global Journals Inc. to earn up to 10% of realized author charges taken from author of respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account or to your PayPal account.
- MARSE member can apply for free approval, grading and certification of some of their Educational and Institutional Degrees from Global Journals Inc. (US) and Open Association of Research,Society U.S.A.
- MARSE is eligible to earn from their researches: While publishing his paper with Global Journals Inc. (US), MARSE can decide whether he/she would like to publish his/her research in closed manner. When readers will buy that individual research paper for reading, 40% of its earning by Global Journals Inc. (US) will be transferred to MARSE member's bank account after certain threshold balance. There is no time limit for collection. MARSE member can decide its price and we can help in decision.

ANNUAL MEMBER

- Annual Member will be authorized to receive e-Journal GJRE for one year (subscription for one year).
- The member will be allotted free 1 GB Web-space along with subDomain to contribute and participate in our activities.
- A professional email address will be allotted free 500 MB email space.

PAPER PUBLICATION

- The members can publish paper once. The paper will be sent to two-peer reviewer. The paper will be published after the acceptance of peer reviewers and Editorial Board.

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.

(II) Choose corresponding Journal.

(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

(B) If you are using Internet Explorer, then Direct Submission through Homepage is also available.

(C) If these two are not conveninet , and then email the paper directly to dean@globaljournals.org.

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.

MANUSCRIPT STYLE INSTRUCTION **<u>(Must be strictly followed)</u>**

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, “Abstract” word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

You can use your own standard format also.
Author Guidelines:

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript’s Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

1. GENERAL

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

Scope

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

Journals Inc. (US) are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

2. ETHICAL GUIDELINES

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.

Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals Inc. (US) and Editorial Board, will become the copyright of the Global Journals Inc. (US).

Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission

The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.

2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.

Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5.STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

Structure

All manuscripts submitted to Global Journals Inc. (US), ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Color Charges: It is the rule of the Global Journals Inc. (US) for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.

Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .

the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. **Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. **Think technically:** Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page

- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including <u>definite statistics</u> - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.

- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals Inc. (US)

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

Index

A

Agile · 1, 12, 13, 14, 15, 16, 17
Arrays · 2

C

Collimator · 2, 3, 4, 6

D

Deviatoric · 23, 24
Domain · 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

E

Elastoplasticity · 18

H

Hydrography · 37

L

Lime · 1, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28

M

Metrics · 12

O

Orthorectification · 29, 30, 31

P

Photogrammetry · 1, 29, 30, 31, 32

S

Scrum · 12, 13, 14
Shielding · 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
Sisvaznat · 1, 33, 34, 35, 36, 37, 38, 40, 41

T

Tomography · 2, 7, 10

U

Urban · 1, 29, 30, 31, 32

V

Vectorisation · 31

save our planet

Global Journal of Researches in Engineering

Visit us on the Web at www.GlobalJournals.org | www.EngineeringResearch.org
or email us at helpdesk@globaljournals.org

ISSN 9755861