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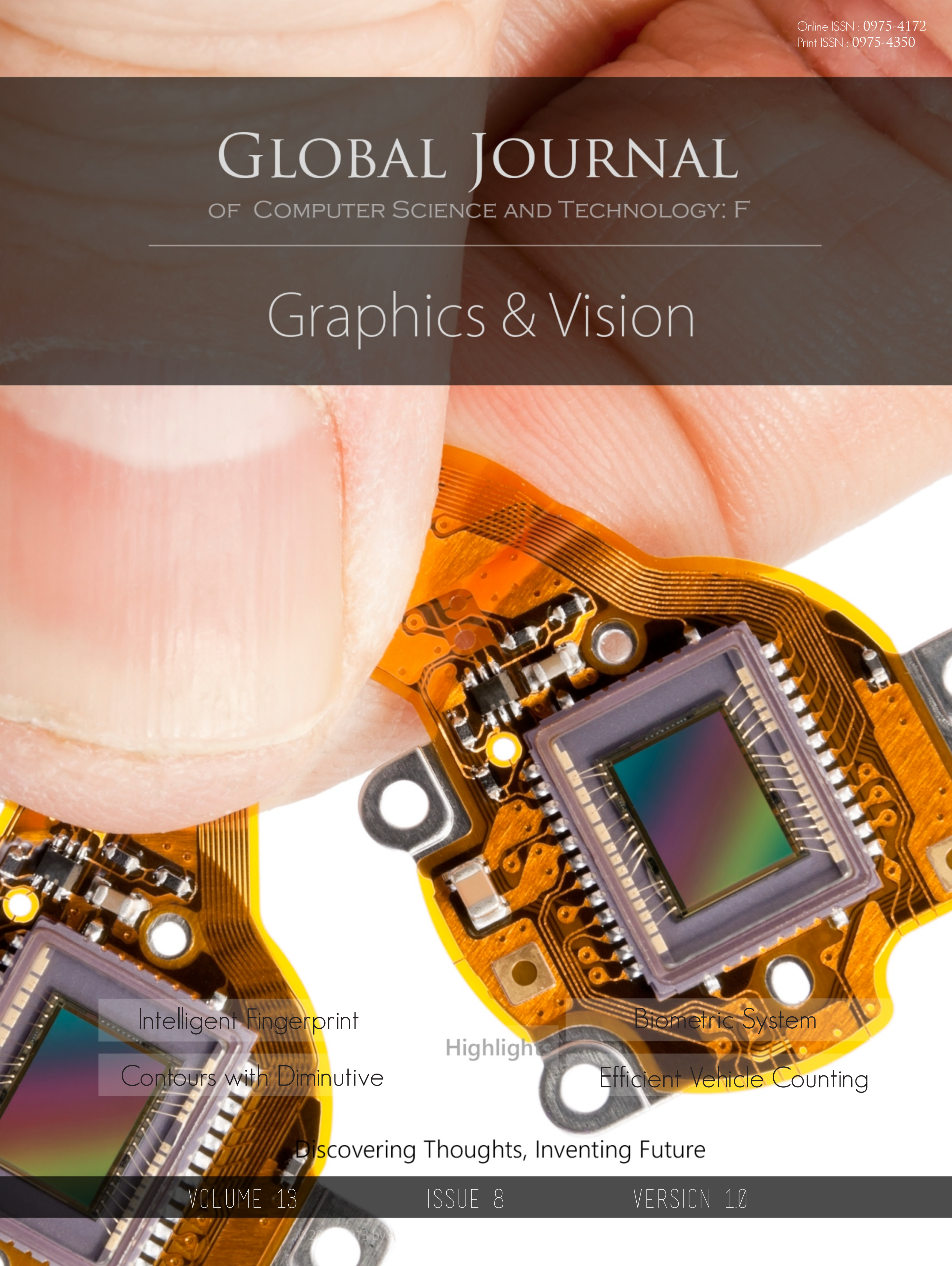

Highlights

Intelligent Fingerprint

Contours with Diminutive

Biometric System

Efficient Vehicle Counting

Discovering Thoughts, Inventing Future

VOLUME 13 ISSUE 8 VERSION 1.0

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University of Barcelona

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A Intelligent Fingerprint based Biometric System for Personal Identification-A Survey

By Mohammed Fakruddin Sk, B. Sunitha Devi & S. M. Riyazoddin
CMR Institute of Technology, India

Abstract- Today, because of the vulnerability of standard authentication system, law-breaking has accumulated within the past few years. Identity authentication that relies on biometric feature like face, iris, voice, hand pure mathematics, handwriting, retina, fingerprints will considerably decrease the fraud. so that they square measure being replaced by identity verification mechanisms. Among biometrics fingerprint systems are one amongst most generally researched and used. it\'s fashionable due to their easy accessibility. During this paper we tend to discuss the elaborated study of various gift implementation define strategies together with their comparative measures and result analysis thus as realize a brand new constructive technique for fingerprint recognition.

Keywords: *biometrics, FP detection, FP recognition, ANN, etc.*

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AINTELLIGENTFINGERPRINTBASEDBIOMETRICSYSTEMFORPERSONALIDENTIFICATIONASURVEY

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A Intelligent Fingerprint based Biometric System for Personal Identification-A Survey

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Keywords: biometrics, FP detection, FP recognition, ANN, etc.

I. Introduction

Humans have used body characteristics like face, voce, finger prints, Iris, etc. to acknowledge one another. Automatic recognition of those characteristics referred to as a biometrics; currently days it\'s become a full of life analysis space in pattern recognition. Over a decade\'s fingerprint is one amongst the oldest style of identification due to their individuality, consistency, the intrinsic ease in acquisition, distinctiveness, persistence and high matching accuracy rate. As we know, No 2 folks have an equivalent set of fingerprints even identical twins fingerprints. Finger ridge patterns don\'t amendment throughout the lifetime of a personal. This property makes fingerprint a wonderful biometric symbol and can also be used as rhetorical proof. it\'s received a lot of and a lot of attention throughout the last amount because of the necessity for society in a very big selection of applications. Among the biometric options, the fingerprint is taken into account one amongst the foremost sensible ones. Fingerprint recognition needs a lowest effort from the user and provides comparatively sensible performance. Fingerprint recognition refers to the machine-controlled technique of corroborative a match between 2 human fingerprints. Fingerprints square measure one amongst several kinds of bioscience accustomed establish people and verify their identity.

Authors α σ ρ: CMR Institute of Technology, Hyderabad, Andhra Pradesh. e-mail: fakruddin21@gmail.com

Figure 1 : Sample Finger Prints

Basically Skin of human fingertips consists of ridges and valleys and that they compounding along type the distinctive patterns. A fingerprint is that the composition of the many ridges and furrows. Fingerprints largely aren't distinguished by their ridges and furrows however square measure distinguished by point that square measure some abnormal points on the ridges. point is split in to 2 elements such as: termination and bifurcation. Termination is additionally referred to as ending and bifurcation is additionally referred to as branch. There are more point consists of ridges and furrows natural depression is additionally referred as follows:

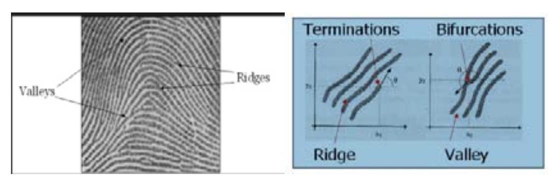

Figure 2 : Ridges and Valleys with Termination and Bifurcations

The human fingerprint is comprised of varied varieties of ridge patterns, historically classified in step with The decades-old Henry system: left loop, right loop, arch, whorl, and tented arch.

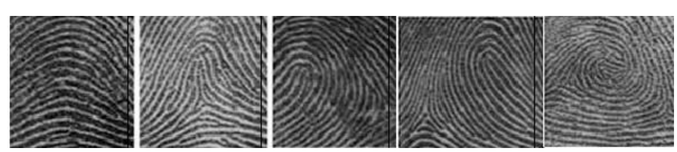

Figure 3 : Left loop, right loop, arch, whorl, and tented arch of a Fingerprint

Fingerprint recognition system has been triple-crown for several application areas like laptop login, checking account recovery and cheque process. However the fingerprint recognition system still faces with defect in accuracy rate. The first objectives of the projected system can perform a lot of accuracy rate.

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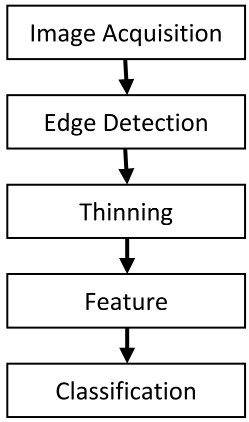

Figure 4 : Fingerprint Identification

a) Image Acquisition

In any vision system the primary stage is that the image acquisition stage that is hardware dependent. variety of strategies square measure accustomed acquire fingerprints. Among them, the inked impression technique remains the foremost fashionable one. Inkless fingerprint scanners also are gift eliminating the intermediate digitization method. During this method we tend to usually use trivia extraction algorithmic program achieved by Binarization technique.

b) Edge Detection

An edge is that the boundary between 2 regions with comparatively distinct grey level properties. The set of pixels obtained from the sting detection algorithmic program rarely characterizes a boundary fully due to noise, breaks within the boundary and alternative effects that introduce spurious intensity discontinuities. Thus, edge detection algorithms usually square measure followed by linking and alternative boundary detection procedures designed to assemble edge pixels into meaning boundaries.

c) Thinning

Generally this technique is employed to neutralize all the constituent by examining the neighborhood of every constituent within the binary image and supported a specific set of pixel-deletion criteria. It conjointly checks whether or not the constituent is deleted or not. These sub-iterations continue till no a lot of pixels is deleted. the applying of the cutting algorithmic program to a fingerprint image preserves the property of the ridge structures whereas forming the binary image skeleton. This skeleton image is then utilized in the following extraction of trivia. Specially the cutting algorithmic program is employed to represent the structural form of a plane region is to scale back it to a graph. This reduction could also be accomplished by getting the skeleton of the region via cutting algorithmic program. However in broad spectrum the cutting algorithmic program is employed for edge detection. The cutting algorithmic program whereas deleting unwanted edge points ought to not:

- take away finish points.
- Break connectedness
- Cause excessive erosion of the region

d) Feature Extraction

Extraction of applicable options is one amongst the foremost necessary tasks for a recognition system. we tend to square measure exploitation back propagation algorithmic program to try to to this feature extraction. Feature Extraction is performed by following techniques.

1. Gauss Network technique.
2. Gradient technique.
3. Numerical technique.
4. Directive adaptive strategies.

Feature extraction cares with the quantification of texture characteristics in terms of a set of descriptors or quantitative feature measurements typically stated as a feature vector. it\'s fascinating to get representations for fingerprints that square measure scale, translation, and rotation invariant. Scale unchangingness isn't a major drawback since most fingerprint pictures may be scaled as per the dpi specification of the sensors. the current implementation of feature extraction assumes that the fingerprints square measure vertically bound. In reality, the fingerprints in our info aren't precisely vertically bound; the fingerprints could also be oriented up to removed from the assumed vertical orientation. This image rotation is part handled by a cyclic rotation of the feature values within the Finger Code within the matching stage.

e) Classification

RBF Neural Network classifier have a capability to be told from their expertise is that the key part within the drawback finding strategy of a pattern recognition task. A neural networks system is seen as Associate in information processing system and scientific discipline. System composed of an outsized range of interconnected processing components. Every process part conjointly referred to as node, vegetative cell calculates its activity domestically on the idea of the activities of the cells to that it\'s connected. The strengths of its connections square measure modified in step with some transfer perform that expressly determines the cell’s output, given its input. The educational algorithmic program determines the performance of the neural networks system. It ought to be noted that this network configuration is meant to just accept the load values that square measure obtained by protruding a take a look at pictures into image-space.

II. Literature Survey

Masayoshi et al. (1993) projected is Associate in Nursing ANN primarily based approach wherever a neural network for the classification of fingerprint pictures is made which may classify the difficult fingerprint pictures. It uses a ballroom dancing learning technique to coach the four bedded neural network that has one sub-network for every class. It carries out the principal element analysis (PCA) with relevance the unit values of the second hidden layer and conjointly studies the fingerprint classification state depicted by the interior state of the network. Consequently, the strategy confirms that the fingerprint patterns square measure roughly classified into every class within the second hidden layer and also the effectiveness of the ballroom dancing learning method. However, just in case of larger knowledge sets this technique is found to convey restricted results.

Karu et al. (1996) projected Associate in Nursing approach which finds the ridge direction at every constituent of Associate in Nursing input fingerprint image. Then the algorithmic program extracts international options specified singular points i.e. cores and deltas within the fingerprint image and performs the classification supported the quantity and locations of the detected singular points. Here, the singular point(s) detection is Associate in Nursing reiterative regularization method till the valid singular points square measure detected. If the pictures square measure of poor quality the algorithmic program classifies those images as unknown varieties supported some threshold values. However, the algorithmic program will discover the labeled pictures with top quality solely.

Ballan et al. (1998) printed a quick machine-controlled feature-based technique for classifying fingerprints. The technique extracts the singular points i.e. deltas and cores within the fingerprints supported the directional histograms. It finds the directional pictures by checking the orientations of individual pixels, computes directional histograms exploitation overlapping blocks within the directional image, and classifies the fingerprint into the Wirbel categories whorl and twin loop or the Lasso categories (arch, tented arch, right loop, or left loop). The complexness of the technique is that the order of the quantity of pixels within the fingerprint image. However, it takes abundant time for classification.

Prabhakar et al. (1999) mentioned a classification technique for fingerprint wherever the fingerprint pictures square measure classified into 5 categories: whorl, right loop, left loop, arch, and tented arch. The algorithmic program uses a completely unique illustration (Finger Code) and relies on a 2 stage classifier to create a classification. The two-stage classifier uses a k-nearest neighbor classifier in its 1st stage and a group of neural network classifiers in its second stage to classify a feature vector into one amongst the 5 fingerprint categories. This algorithmic program suffers from the necessity that the region of interest be properly settled requiring the correct detection of center purpose within the fingerprint image. Otherwise, the algorithmic program is found to be terribly effective.

Cho, Kim et al. (2000) projected a fingerprint classification algorithmic program that uses solely the data associated with the core points. The algorithmic program detects core point(s) candidates roughly from the directional image and analyzes the close to space of every core candidate. during this core analysis, false core points created by noise square measure eliminated and also the sort and also the orientation of core point(s) square measure extracted for the classification step. exploitation this info, classification was performed. However, it is found to be terribly tough to eliminate the false singular point(s) that has been used for sophistication call. It demands for a lot of refined strategies to eliminate those false core points towards a noise-tolerant arrangement.

Rajharia et al. (2012) projected a technique during which they used feed forward back propagation neural network for finger print recognition. Here, every image is split into four equal elements and their bar chart values square measure obtained. Then feed forward BP neural network are accustomed train, take a look at and validate the network for every a part of the image. However there square measure a number of the processes that are done manually ought to be machine-controlled.

Basha et al. (2008) projected a technique during which they used spectral trivia fingerprint recognition. They introduce 2 feature reduction algorithms: the Column Principal element Analysis and also the Line separate Fourier rework feature reductions. The spectral trivia fingerprint recognition may be a technique to represent a trivia set as a set length feature vector, that is invariant to translation, and during which rotation and scaling become translations, so they will be simply paid. This quick operation renders our system appropriate for a large-scale fingerprint identification system, therefore considerably reducing the time to perform matching. However the spectral trivia algorithmic program isn't strong to the caliber fingerprints. The fingerprint outliers can degrade the popularity accuracy, that limits the applying of the spectral trivia algorithmic program.

Min et al.(2008) developed a brand new technique during which they used Fingerprint Recognition System which mixes each the options extraction by applying a applied mathematics and pure mathematics approach system illustrates the process by considering elementary geometric terms, applied mathematics computation and conjointly it checks all of the options for input fingerprint image to attain higher accuracy share and to provide the connected info of input image properly from info. This technique takes less time for recognition of input image. but by exploitation non-minutiae primarily based algorithmic program this technique will any be improved with a lot of authentications and fewer area memory usage.

Qijun Zhao et al.(2009) projected pore matching technique that with success avoids the dependency of pore matching on point matching. Such dependency limits the pore matching performance and impairs the effectiveness of the fusion of point and pore match scores. so as to match the pores on 2 fingerprint pictures, they square measure ,1st pair-wise compared and initial correspondences between them are established supported their native options. The initial pore correspondences square measure then refined by exploitation the RANSAC (Random Sample Consensus) algorithmic program to convey the ultimate pore matching results. A pore match score is finally calculated for the 2 fingerprint pictures supported each the initial and final pore correspondences. Thus, the fusion of the point and pore match scores more practical in rising the fingerprint recognition accuracy. however this technique is its complexness in describing the pores.

Dayashanka Singh et al.(2010) projected a completely unique technique of fingerprint matching supported embedded Hidden Andrei Markov Model (HMM) that's used for modeling the fingerprint's orientation field. This HMM primarily based fingerprint matching approach exploitation solely orientation angle parameters. It includes 2 kinds of random finite method. One may be a Markoff process of finite state, that describes the transfer from one state to another; the opposite describes the chances between states and observation knowledge. What's necessary to statistically characterize a HMM may be a state transition likelihood matrix, Associate in Nursing initial state likelihood distribution, and a group of likelihood density functions related to the observations for every state usually a HMM may be a 1-D structure appropriate for analyzing 1-D random signals. The embedded HMM includes 3 super states, that represent 3 elements of a finger print from the highest to bottom. every super state consists of 5 sub states (embedded states) horizontally. The performance is nice and strong. it\'s less sensitive to the noise and distortions of a fingerprint image than the traditional approaches during which the dependent parameters embody a lot of fingerprint details. However this approach skipped the processes of cutting the ridge image and choosing trivia which can facilitate any noise reduction.

Chander Immanuel Kant et al. (2010) developed a brand new technique during which they used minutiae-based and correlation primarily based approach. During this method fingerprint image is obtained within the enrollment section. at that time verification method takes place by a inputting the sample of the user's fingerprint at detector. This approach has been given for fingerprint matching in an efficient thanks to cut back time. However as we all know it\'s terribly tough to extract the trivia points accurately once the fingerprint is of caliber. conjointly this technique doesn't take under consideration the world pattern of ridges and furrows therefore this correlation primarily based system won\'t work if we tend to try and match fingerprint of finger or pinky.

H.B. Kekre et al. (2011) projected a technique in that they used texture-based fingerprint matching approach and Walsh rework which may be a powerful tool of linear system analysis for separate signals. This technique deals with fingerprint identification within the rework domain and also the main focus is on the reduction of the time interval. during this approach 1st the mean of rows (or columns) of the fingerprint image is computed, this converts a 2 dimensional image signal into one dimension. Then one dimensional Walsh rework of the row (or column) vector is generated and is distributed in a very complicated plane that is subjected to sectorization to get the feature vector. The feature vector of a given take a look at image is compared to those gift within the info. The scores from row and column rework strategies square measure united exploitation OR and Georgia home boy functions. Technique is computationally terribly easy and quick because it relies on 1-D rework instead of 2-D rework. it\'s conjointly significantly freelance of shift and rotation of fingerprint pictures.

Arjun V Mane et al.(2011) developed a filterbank primarily based technique during which they used technique of score level fusion exploitation multiple enrollment and multiple testing impressions to attain higher accuracy. They mix matching score of multiple instance of same finger collected by same fingerprint detector, as a result of use of 2 completely different sensors and different biometric traits will increase system verification time and inconvenience to the user and discovered that the fusion of multiple impressions of same finger at enrollment or testing level increase the system performance. However this method take long-standing so as to perform all the steps multiple times.

Shashi Kumar D R et al.(2011) projected a brand new technique during which they used DWT primarily based Fingerprint Recognition exploitation Non trivia (DWTFR). during this three level DWT is applied on fingerprint pictures.

1. The Directional info options like Coherence and Dominant native orientation angle θ,
2. Centre space options and Canny's Edge parameters square measure computed from DWT sub bands.
3. The euclidian Distance is employed to verify the take a look at Fingerprint with knowledge base fingerprint.

Then the fingerprint image is rotten into multi resolution illustration exploitation DWT. The 3 level Daubechies ripple is applied and options square measure extracted from LL, LH, hectoliter and HH sub bands for the verification of fingerprint. simple to form a info for security purpose. However an equivalent algorithmic program could also be used for abstraction domain and alternative rework domains.

Zin Mar Win et al. (2012) projected a hybrid fingerprint matching algorithmic program by combining orientation options and also the native texture pattern obtained employing a bank of physicist filters for caliber pictures and revolved pictures with low computation time. Here 1st the input fingerprint is preprocessed to get rid of noise. Then the core purpose of the fingerprint is detected from orientation image and keeping the core purpose because the center purpose, the image of size w×w is cropped. The orientation options of the fingerprint square measure extracted and compared with all the fingerprints within the info. The minimum matching score is calculated that is any utilized in hard final matching supported the euclidian distance between the Finger Codes Effective and economical for each high and caliber fingerprints. However this filterbank-based matching algorithmic program isn't strong to spot the caliber fingerprints like fingerprints from NRC cards and it\'s not rotation-invariant.

Subrat Kumar Sahu et al. (2012) projected a brand new technique for fingerprint image improvement yet as matching algorithmic program supported directional curvature technique (DCT) of native ridges and a changed Tree primarily based matching approach. during this technique in preprocessing stage, the Fingerprint is De-noised, Binarized, cut and also the approximate core points square measure calculated by DCT algorithmic program. The trivia points square measure extracted by guide filtering over the image. characteristic all the trivia accurately yet as rejecting false trivia. Here they focused on the cutting and matching algorithmic program for the identification method wherever cutting method uses a changed approach of reiterative Rotation Invariant cutting algorithmic program (RITA) that is ensures the properly characteristic the trivia purpose.

Madhuri et al.(2012) printed a SURF (Speeded up strong Features) primarily based technique during which they used native strong options for fingerprint illustration and matching as SURF (Speeded up strong Features) are reported to be strong and distinctive in representing native image info and located to be rotation-invariant interest purpose detector and descriptor. This approach perform person recognition in presence of revolved and partial fingerprint pictures and would be expeditiously able to differentiate between real and shammer matches of accuracy and speed. however fails once we image with the less quality is taken.

III. Conclusion

Based on our survey related to fingerprint classification, it has been observed that most of the existing works are aimed to classify the fingerprint database based on the minutiae sets, singular points and other techniques.

On the other hand these systems need to have on hand databases By considering these two facts there is need of some constructive, robust secured intelligent method which give the more accurate results and should reduce the FAR and FRR with great accuracy of recognition which we would be trying in future course of our dissertation work.

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Efficient Vehicle Counting and Classification using Robust Multi-Cue Consecutive Frame Subtraction

By CH. Manaswini
JNTUK, India

Abstract- The ability to count and classify vehicles provides valuable information to road network managers, highways agencies and traffic operators alike, enabling them to manage traffic and to plan future development of the network. Increased computational speed of processors has enabled application of vision technology in several fields such as: Industrial automation, Video security, transportation and automotive. The proposed method in this paper is a robust adaptive multi-cue frame subtraction method that detects foreground pixels corresponding to moving and stopped vehicles, even with noisy images due to compression. First the approach adaptively thresholds a combination of luminance and chromaticity disparity maps between the learned background and the current frame. The segmentation is further used by a two-step tracking approach, which combines the simplicity of a linear 2-D Kalman filter and the complexity of 3-D volume estimation using Markov chain Monte Carlo (MCMC) methods. The experimental results shows that the proposed method can count and classify vehicles in real time with a high level of performance under challenging situations, such as with moving casted shadows on sunny days, headlight reflections on the road using only a single standard camera.

Keywords: *3D volume estimation, tracking, vision technologies.*

GJCST-F Classification: *I.4.0*

EFFICIENTVEHICLECOUNTINGANDCLASSIFICATIONUSINGROBUSTMULTICUECONSECUTIVEFRAMESUBTRACTION

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Keywords: 3D volume estimation, tracking, vision technologies.

I. Introduction

The continuous increase in the congestion level on public roads, especially at rush hours, is a critical problem and a challenging situation for vehicle tracking used to count and classify vehicles. The existing methods for traffic management, surveillance and control are not adequately efficient in terms of the performance, cost and the effort needed for maintenance and support. Vision-based video monitoring systems offer a number of advantages for traffic flow surveillance combine information from cameras with other Intrusive technologies [1]. Though it has some complexities, computer vision can be used to obtain richer information, such as analyzing the visual features apart from geometry of the vehicle. Background subtraction forms an important component in many of these applications. The central idea behind this representation is that can then be utilized for the classification of a new observation.

Author: Department of ECE, V R Siddhartha Engineering College. e-mail: manaswini1323@gmail.com

The information provided by such a module can then be considered as a valuable low-level visual cue to perform high-level object analysis tasks such as object detection, tracking, classification and event analysis.

II. Related Work

The main contributions of the proposed approach are background subtraction and the tracking of vehicle.

a) Background Subtraction

A procedure used in video image processing to subtract away persistent noise patterns generated in the video camera or the optical system. Also used to display motion as changes between the current and old "background" video images Background subtraction is a computational vision process of extracting foreground objects in a particular scene. A foreground object can be described as an object of attention which helps in reducing the amount of data to be processed as well as provide important information to the task under consideration. Often, the foreground object can be thought of as a coherently moving object in a scene. We must emphasize the word coherent here because if a person is walking in front of moving leaves, the person forms the foreground object while leaves though having motion associated with them are considered background due to its repetitive behavior. In some cases, distance of the moving object also forms a basis for it to be considered a background, e.g. if in a scene one person is close to the camera while there is a person far away in background, in this case the nearby person is considered as foreground while the person far away is ignored due to its small size and the lack of information that it provides. Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. A common approach is to perform background subtraction, which identifies moving objects from the portion of video frame that differs from the background model. Methods that model the variation of the intensity values of

Figure 1 : Sample of Vehicles with Shadows in Sunny Daylight

background pixel. **[2]Unimodal Distribution:** Unimodel distributions play an important role in background subtraction modeling scheme and gives satisfactory classification rate. They are fast and simple but are not able to adapt to multiple backgrounds, e.g., when there are trees moving in the wind. *Drawbacks*: This approach works only under static background but not in dynamic background scenario. **[3]The mixture of Gaussian:** In compensation to the unimodel distributions to handle dynamic background most researchers proposed several works on adaptive background modeling approach. Sophisticated adaptation methods are required to solve major two problems in dynamic scene: changes of illumination and changes of background content. Among several approaches proposed Mixture of Gaussian (MOG) model can solve several problems occurred in dynamic background, especially in case of repetitive background motion such as waving tree. MOG and other methods proposed update background models using linear model which is not adequately adapted according to the changes in the background scene. *Drawbacks:* They cannot handle fast variations with accuracy using a few Gaussians, and therefore, this method has problems for the sensitive detection of foreground regions. **[4]The nonparametric kernel density estimation:** This model uses pixel intensity as the basic feature for modeling the background. This model keeps a sample of intensity values for each pixel in the image and uses this sample to estimate the density function of the pixel intensity distribution, therefore able to estimate the probability of any newly observed intensity value. This model can handle the situations where the background of the scene is cluttered and not completely static but contain small motions. The model is updated continuously and adapt to the changes in scene background. *Drawbacks:* This method is time consuming because pixel based technique assume that the time series of observation is independent of each pixel. **[5]Codebook based methods:** The most sensitive color-based background subtraction methods, applied both indoors and outdoors scenarios, even with some motion in the background. Codebook (CB) background subtraction algorithm was intended to sample values over long times, without making parametric assumptions. The key features of our algorithm are in the followings: (1) Resistance to artifacts of acquisition, digitization and compression,(2) Capability of coping with illumination changes,(3) Adaptive and compressed background models that can capture structural background motion over a long period of time under limited memory, (4) Unconstrained training that allows moving foreground objects in the scene during the initial training period. The CB algorithm adopts a quantization/clustering technique, to construct a background model. Samples at each pixel are clustered into the set of code words. The background is encoded on a pixel by pixel basis. *Drawback:* Codebook method does not evaluate probabilities, which is computationally very expensive. Approaches using **Gradient cues:[6]**Use of gradient cues instead of intensity values improves the robustness against illumination changes. However, plain regions that may be present in some vehicles are not extracted and still need further processing for discriminating shadows. Shadows in the real world belong to so-called global illumination effects, because the light ray on its way from the light source to the camera is affected by more than only one refection on an object surface. In Fig. 1, the formation of a cast shadow is shown. The light coming from a single light source reaches the background only partially due to a moving object. The darkened region on the background is called cast shadow. **Umbra** is the shadow that receives illumination coming only from diffuse ambient light, **Penumbra** receives illumination from both the ambient light and a portion of direct light. Penumbra has more chromatic similarity with respect to its original color than in the case of umbra.

According to the taxonomy proposed in **[7],** shadow suppression methods can be classified as **deterministic** and **statistical**. **Deterministic methods** uses on/off decision processes It can be subdivided into **Model** and **Non model** based. **Model-based methods:** Model-based method requires more acknowledge about environment and are computationally more demanding. They use explicit models of the vehicles to be tracked and also of light sources. *Drawbacks* in model-based deterministic techniques can obtain better results for shadow suppression, but it should be remarked that these are excessively cumbersome for a practical implementation in outdoor traffic surveillance. **Nonmodel-based methods** do not use explicit models of the vehicles to be tracked and also of light sources. Advantages of Nonmodel based deterministic approaches are most suitable for outdoors applications **Statistical models:** A probability function is used when decision making for different membership groups (is shadow or not). This method can be subdivided into **parametric** and **nonparametric**. **Parametric** approaches use a series of parameters that determine the characteristics of the statistical functions of the model

Nonparametric approaches automate the selection of the model parameters as a function of the observed data during training. Advantage nonparametric statistical methods are best for indoors, since the scene is more constant, and thus their statistical description is more effective. More recently in[8], it is shown that the improved hue, luminance, and saturation (IHLS) color space is better suited for change detection and shadow suppression than HSV and normalized red, green, and blue (RGB).

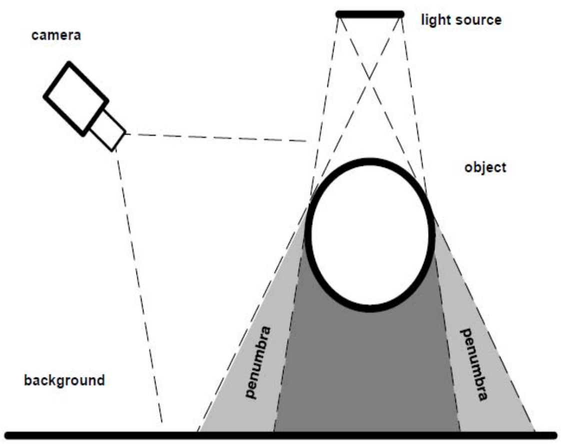

Figure 2 : Cast shadow generation: The scene grabbed by a camera consists of a moving object and a moving cast shadow on the background. The shadow is caused by a light source of certain extent and exhibits a penumbra

III. Multicue Frame Subtraction

A simple method of subtracting one movie frame from another will provide information about which parts of the scene have changed (generally due to motion). This method was performed on each frame of the movie, with consecutive frames being subtracted from each other. First, the scene is converted to an array of pixel values. These pixel values are the averaged **Red, Green, and Blue (RGB)** values for each pixel. The pixel values of the previous frame are then subtracted from the current frame's pixel values, and the absolute value of the values is taken. The result is an array of values that represent how much each pixel has changed between the two frames, with higher values representing more change. The amount of change in a region of pixels can be interpreted as the amount of motion that is taking place in that region. These data can then be used to determine where in the scene the most motion is taking place. Multiple cues play a crucial role in image interpretation. A vision system that combines shape, colour, motion, prior scene knowledge and object motion behavior is described. Grimson et al [6] expound on the benefits of using multiple cues to disambiguate complex scenes. They use depth from stereo and colour as attentional mechanisms to identify candidate regions in the image which are then subjected to detailed shape analysis for object recognition purposes. In our recent work in computer vision we have also embarked on an approach which exploits multiple cues to reduce the computational complexity of image interpretation to a manageable level[9] [10] .

The term "cue" is understood in a very general sense and can mean also prior knowledge or contextual information whether spatial or temporal. Our approach differs from other attempts to exploit multiple cues not only in the extent but also in the scope of cues used and the flexibility of their combination. In other words, cues are not combined in a preprogrammed (fixed) way but rather their combination depends on the goal of interpretation, on the image content and on the stage of interpretation. All three are dynamically changing. In addition to the usual image properties such as shape, motion and colour, our interpretation scheme is unique. Fusing different cues has been proven to be the current best approach to obtain accurate background subtr-action results. Two main issues arise at this point: 1) which cues are to be used and 2) in which way they are fused. Typical useful cues are pixel color, pixel intensity (gray level), and edges (obtained from image gradients). The sequential steps to be given for the proposed Multicue Frame Subtraction. In this algorithm, I is the current image ($Iy\ xy$, $Icx\ xy$, and $Icy\ xy$ are the luminance and chromaticity coordinates for each xy pixel in the IHLS color space); B is the mean background ($By\ xy$, $Bcx\ xy$, and $Bcy\ xy$ are the luminance and chromaticity coordinates for each xy pixel in IHLS color space); Σl is the background luminance variance; Σc is the background chromaticity variance; kl and kc are the proportionality constants for determining the background/ foreground disparity maps (Dl and Dc); ol, oc, os, and ow are the offsets applied for pixel classification; and finally, tg and tf are the thresholds.

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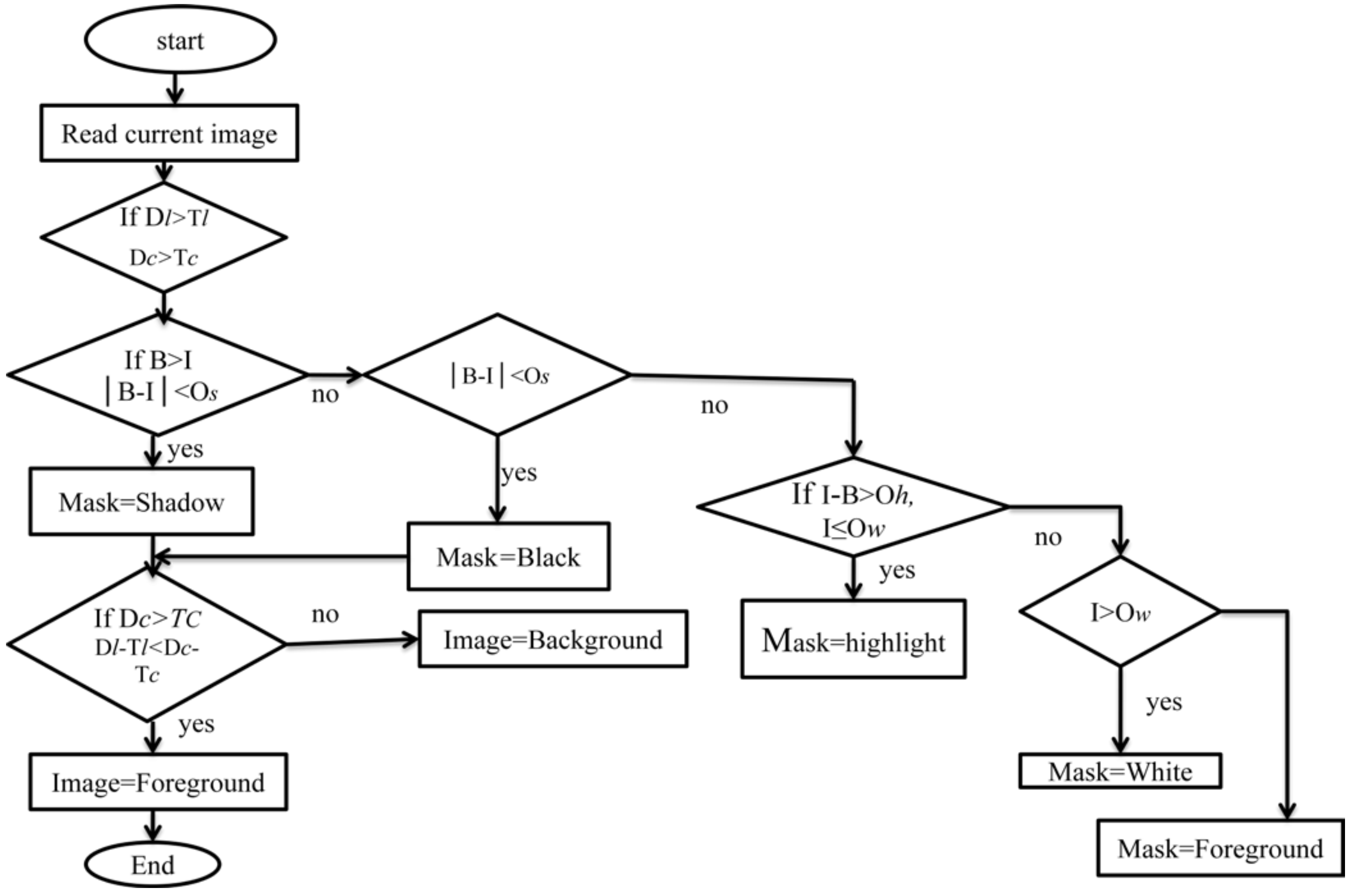

Figure 3 : Multi-cue Frame Subtraction Flowchart

The novelty of our approach relies on a Multi-cue Frame Subtraction procedure in which the segmentation thresholds can adapt robustly to illumination changes, maintaining a high sensitivity level to new incoming foreground objects and effectively removing moving casted shadows and headlight reflections on the road. A tracking module provides the required spatial and temporal coherence for the classification of vehicles, which first generates 2-D estimations of the silhouette of the vehicles and then augments the observations to 3-D vehicle volumes by means of a Markov chain Monte Carlo (MCMC) method.

IV. Highlight Cropping

The mask will be processed to remove highlighted regions corresponding to sudden illumination changes due to weather variability or vehicle headlights. Additionally, the blob mask in between are filled by applying the watershed procedure [11] to *foreground*, *highlight* and *white* in between, filling them with *foreground*. Ignoring the darker regions to build vehicle blob candidates for the tracking stage, but highlighted regions require further processing to remove those generated by sudden illumination changes coming from weather variations or headlights. Taking into account lane geometry, where x is the direction along the lane, and y is the transversal in the images these directions match with x and y of the image. Inside a lane, the pixels corresponding to a line perpendicular to the lane are summed, and if all non background pixels correspond to the *highlight* category, then those pixels are set to *background*. Vehicle projections usually have more than one pixel category in lines perpendicular to lanes, and therefore, using this approach, blobs can be cropped per lane, removing fully highlighted areas but not the vehicles. Lane geometry is considered in this process as there can be vehicles in different lanes, parallel to highlighted regions, which could interfere in the cropping.

V. Vehicle Tracking

The Multicue mask is used as the observation of the tracking process that estimates the position and volume of vehicles. Tracking is carried out in a two-step process that first obtains 2-D bounding boxes of the projection of the vehicles in the road plane and then estimates their 3-D volume according to the calibration of the camera[12].

a) Camera Calibration

From a mathematical point of view, an image is a projection of a three dimensional space onto a two dimensional space. Geometric camera calibration is the process of determining the 2D-3D mapping between the camera and the world coordinate system [13]. Therefore, obtaining the taken with fixed internal parameters; the rigidity of the scene provides sufficient information to recover calibration parameters.

Regarding 2-D tracking schemes, the Kalman filter has been shown to offer great estimation results in rectified images, where the dynamics of the vehicles are undistorted and thus can be assumed to be linear 2-D estimations lack the required accuracy in classification strategies: The viewpoint of the camera is a critical aspect for these strategies. The perspective effect is reduced, and the length and width of vehicles can be measured with lower error. However, more flexible approaches should consider several potential road viewing angles. This issue directly affects the maximum accuracy that a 2-D approach can provide, and only 3-D methods can reliably determine vehicle measurements in such situations.

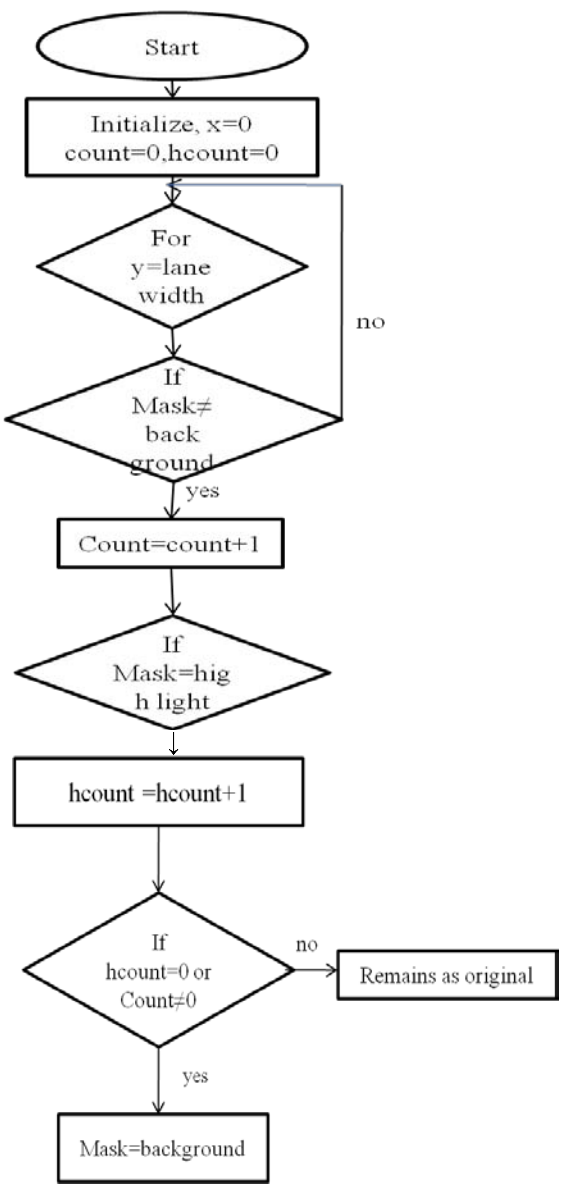

Figure 4 : Highlight cropping algorithm

b) 3D Volume Estimation

[13]The proposed solution is based on a Markov Chain Monte Carlo (MCMC) method, which models the problem as a dynamic system and naturally integrates the different types of information into a common mathematical framework. This method requires the definition of a sampling strategy, and the involved density functions (namely, the likelihood function and the prior models). Typically, the complexities of these kind of sampling strategies are too high to run in real time MCMC methods have been successfully applied to different nature tracking problems They can be used as a tool to obtain maximum a posteriori (MAP) estimates provided likelihood and prior models. Basically, MCMC methods define a Markov chain, $\{\mathbf{x}_t^i\}_{i=1}^{N_s}$, over the space of states, $\mathbf{x}$, such that the stationary distribution of the chain is equal to the target posterior distribution $p(\mathbf{x}_t \mid Z_t)$. A MAP, or point estimate, of the posterior distribution can be then selected as any statistic of the sample set (e.g. sample mean or robust mean), or as the sample, $\mathbf{x}_t^i$, with highest $p(\mathbf{x}_t^i \mid Z_t)$, which will provide the MAP solution to the estimation problem. The analytical expression of the posterior density can be decomposed using the Bayes' rule as:

$$p(\mathbf{x}_t \mid Z_t) = k p(\mathbf{z}_t \mid \mathbf{x}_t) p(\mathbf{x}_t \mid Z_{t-1}) \qquad (1)$$

Where $p(\mathbf{z}_t \mid \mathbf{x}_t)$ is the likelihood function that models how likely the measurement $\mathbf{z}_t$ would be observed given the system state vector $\mathbf{x}_t$, and $p(\mathbf{x}_t \mid Z_{t-1})$ is the prediction information, since it provides all the information we know about the current state before the new observation is available. The constant k is a scale factor that ensures that the density integrates to one. For each image, the observation is the current 2D silhouette of the vehicle projected into the rectified image [13].

Considering the cuboid-model of the vehicle, and that the yaw angle is approximately zero we can reproject a 3D ray from the far-most corner of the projected cuboid and the optical center. the likelihood function must be any function that fosters volume hypotheses near the reprojection ray. For the sake of simplicity, we choose a normal distribution on the point-line distance. The covariance of the distribution expresses our confidence about the measurement of the 2D silhouette and the calibration information. The likelihood function can be written as

$$p(z_t / x_t) \propto \exp((y_t - x_t)^T s^{-1}(y_t - x_t))$$

Where $\mathbf{x}_t$ is a volume hypothesis, and $\mathbf{y}_t$ is its projection onto the reprojection ray. The position of $\mathbf{y}_t$ can be computed from $\mathbf{x}_t$ as the intersection of the ray and a plane passing through $\mathbf{x}_t$ and whose normal vector is parallel to the ray. For this

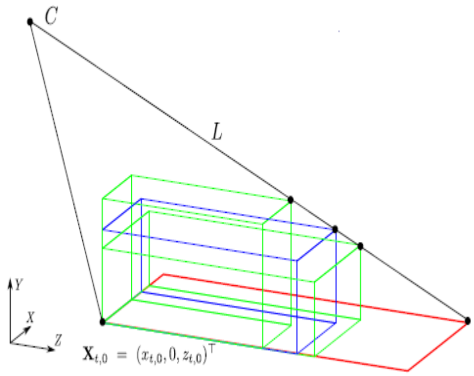

Figure 5 : Projective ambiguity: a given 2D observation in the OXZ plane (in red) of a true 3D cuboid (blue)may also be the result of the projection of a family of cuboids (in green) with respect to camera C

purpose we can represent the ray as a Plücker matrix $L_t = \mathbf{a}\mathbf{b}^T - \mathbf{b}\mathbf{a}^T$, where **a** and **b** are two points of the line, e.g. the far-most point of the 2D silhouette, and the optical center, respectively. These two points are expressed in the *WHL* coordinate system (i.e.,width, length, height). Therefore, provided that we have the calibration of the camera, we need a reference point in the 2D silhouette. We have observed that the point with less distortion is typically the closest point of the quadrilateral to the optical center, whose coordinates are $\mathbf{X}_{t,0} = (x_{t,o}, 0, z_{t,0})^T$ in the *XYZ* world coordinate system. This way, any *XYZ* point can be transformed into a *WHL* point as $\mathbf{x}_t = R_o \mathbf{X}_t - \mathbf{X}_{t,o}$. Nevertheless, the relative rotation between these systems can be approximated to the identity, since the vehicles typically drive parallel to the *OZ* axis. The plane is defined as $\Pi_t = (\mathbf{n}_t^T, D_t)^T$, where $\mathbf{n}_t = (n_x, n_y, n_z)^T$ is the normal to the ray L_t, and $D_t = -\mathbf{n}_t^T \mathbf{x}_t$. Therefore, the projection of the point on the ray can be computed as $\mathbf{y}_t = L_t \Pi_t$.

VI. Vehicle Counting and Classification

An images of the video used for the test is a sunny day where vehicles project shadows are taken. The duration of the video is 3min, and the traffic flow is dense with several vehicles passing in parallel. The vehicle types include cars, motorbikes, heavy trucks, articulated trucks, vans, and buses, but for this test, we consider three classes, depending on tracked region geometric characteristics: *Two Wheels*, *Light Vehicle*, and *Heavy Vehicle*. In this test, we have compared our segmentation approach with other vision-based recent alternative, maintaining the same tracking procedure i.e., Modified Codebook (MCB), This method have been adapted to our context to update the background and use adaptive luminance and chromaticity thresholds in the same way as ours, which is referred in the test as Adaptive Multicue Frame Subtraction (AMC).

The main differences between MCB with respect to the color-only part of the AMC come from the use of cylindrical RGB color space instead of IHLS and the segmented categories. In the *Sunny* sequence, the main difficulty comes from the detection of dark vehicles that project shadows. In some cases, there may be some dark vehicles that do not have sufficient gradient features to identify that they are vehicles. MCB has particular problems in distinguishing these cases as it does not take into account cues other than color. In this case, it might have seemed desirable to apply extra morphologic operations, such as erosion, but it was not appropriate because other good regions would have been lost for the test. Thus, the proposed approach for improving the segmentation by estimating the shadow direction shows its relevance in this scenario [15].

Figure 6 : Sample vehicles of the test video for classification

VII. Conclusion and Future Scope

This paper introduces a real-time method to augment 2D vehicle detections into 3D volume estimations by using prior vehicle models for efficient counting and classification of vehicles in sunny day(including passing vehicles cast shadows). This system distinguishes itself from other computer-vision-based approaches in the way in which it can handle casted shadows without the need for any hardware other than cameras, such as GPS to estimate the direction of the shadows. Hence, we believe that this is a viable alternative to replace other vision based approaches and intrusive technologies whose installation and maintenance are more cumbersome than using cameras only.

The extension to the approach can be done for vehicles in different weather conditions and tracking under severe occlusion can be achieved by adding Markov Random Field factors to the posterior distribution expression the 3-D model can understand the image projections of two or more vehicles if intersected.

VIII. Results for the Proposed Method

Figure 7 : Resutls for Muticue Frame Subtraction

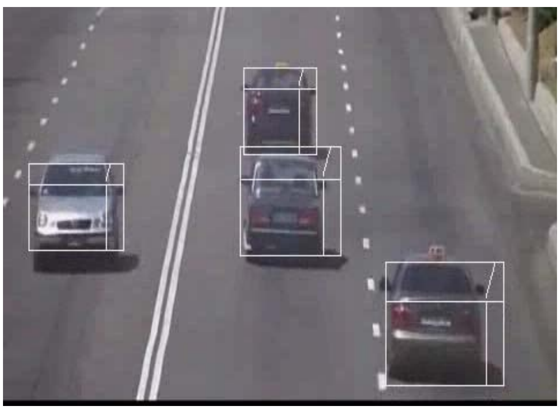

Figure 8 : Results for 3D tracking

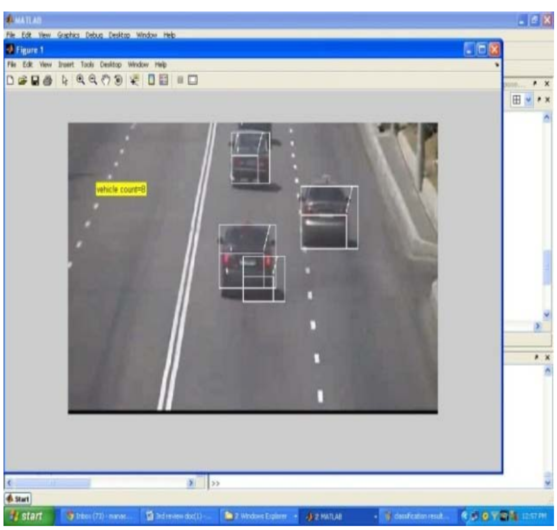

Figure 9 : The yellow bar shows the counting results passing in the video

Classification Results for the Proposed Method.

Vehicle	Width	Length	Height
TW	20	10	17.35
LV	39	17	23.2941
HV	66	32	35

The overall performance of the proposed method is 92% when compared to the Modified codebook method (MCB) which is 84%. These results show that our proposed method yields good results compared to other vision-based alternative approaches.

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Projecting Active Contours with Diminutive Sequence Optimality

By D. Baswaraj, Dr. A. Govardhan & Dr. P. Premchand
CMR Institute of Technology, India

Abstract- Active contours are widely used in image segmentation. To cope with missing or misleading features in image frames taken in contexts such as spatial and surveillance, researchers have commence various ways to model the preceding of shapes and use the prior to constrict active contours. However, the shape prior is frequently learnt from a large set of annotated data, which is not constantly accessible in practice. In addition, it is often doubted that the existing shapes in the training set will be sufficient to model the new instance in the testing image. In this paper we propose to use the diminutive sequence of image frames to learn the missing contour of the input images. The central median minimization is a simple and effective way to impose the proposed constraint on existing active contour models. Moreover, we extend a fast algorithm to solve the projected model by using the hastened proximal method. The Experiments done using image frames acquired from surveillance, which demonstrated that the proposed method can consistently improve the performance of active contour models and increase the robustness against image defects such as missing boundaries.

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PROJECTINGACTIVECONTOURSWITHDIMINUTIVESEQUENCEOPTIMALITY

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Projecting Active Contours with Diminutive Sequence Optimality

D. Baswaraj [α], Dr. A. Govardhan [σ] & Dr. P. Premchand [ρ]

Abstract- Active contours are widely used in image segmentation. To cope with missing or misleading features in image frames taken in contexts such as spatial and surveillance, researchers have commence various ways to model the preceding of shapes and use the prior to constrict active contours. However, the shape prior is frequently learnt from a large set of annotated data, which is not constantly accessible in practice. In addition, it is often doubted that the existing shapes in the training set will be sufficient to model the new instance in the testing image. In this paper we propose to use the diminutive sequence of image frames to learn the missing contour of the input images. The central median minimization is a simple and effective way to impose the proposed constraint on existing active contour models. Moreover, we extend a fast algorithm to solve the projected model by using the hastened proximal method. The Experiments done using image frames acquired from surveillance, which demonstrated that the proposed method can consistently improve the performance of active contour models and increase the robustness against image defects such as missing boundaries.

I. Introduction

Image segmentation is a fundamental task in many applications. Among various techniques, the active contour model is widely used. A contour is evolved by minimizing certain energies to match the object boundary while preserving the smoothness of the contour [2]. The active contour is usually represented by landmarks [18] or level sets [20, 8]. A variety of image features have been used to guide the active contour, typically including image gradient [7, 31], region statistics [34, 8], color and texture [14].

In real purposes, the presentation of the active contour model is prone to be dishonored by missing or misleading features. For example, segmentation of the left ventricle in ultrasound images is still an unresolved problem due to the characteristic artifacts in ultrasound such as attenuation, speckle and signal dropout [23]. To improve the robustness of active contours, the shape prior is often used. The prior knowledge of the shape to be segmented is modeled based on a set of manually-annotated shapes to guide the segmentation. Previous deformable template models [32, 27, 17, 21] can be regarded as the early efforts towards knowledge-based segmentation. In more recent works, the shape prior was applied by regularizing the distance from the active contour to the template in a level-set framework [10, 24, 9]. Another category of methods popularly used for shape prior modeling is the active shape model or point distribution model [11]. Briefly speaking, each shape is denoted by a vector and regarded as a point in the shape space. Then, the principal component analysis is carried out to obtain the mean and several most significant modes of shape variations, which establish a low-dimensional space to describe the favorable shapes. During the segmentation of a new image, the candidate shape is constrained in the shape space [19, 29]. Also, dynamic models can be integrated to model the temporal continuity when tracking an object in a sequence [12, 35]. Other extensions of the active shape model include manifold learning [15] and sparse representation [3:5], to name a few.

While the shape prior has proven to be a powerful tool in segmentation, it has two limitations:

1. Previous methods for shape prior modeling require a large set of annotated data, which is not always accessible in practice.
2. It is often doubted that the existing shapes in the training set will be sufficient to model the object shape in a new image.

In this paper, we propose to use the akin among diminutive sequence of images as a prior for segmentation. The contributions of this paper are:

1. We showed that the vectors representing a diminutive sequence of image frames would form a low-rank matrix, even if they are divergent due to certain spatial or surveillance coordinate transformations.
2. Based on the low-rank property of diminutive sequence, we proposed to use the central median to regularize the Diminutive sequence optimality of shapes in segmentation. The process of regularizing could be conveniently integrated into existing active contour models.
3. A computationally scalable strategy called hastened propinquity changeover (HPC) is devised that is motivated by Proximal Gradient (PG) [1][22] to solve the proposed model. The experiments showed that the proposed constraint made the active contour model better regularized and require minimal iteration to converge.

Author α : Associate Professor, CSE Dept, CMRIT, Hyderabad, India. e-mail: braj5555@yahoo.co.in
Author σ : Professor, CSE Dept, SIT, JNTUH, Kukatpally, Hyderabad, India. e-mail: Govardhan_cse@yahoo.co.in
Author ρ : Professor, CSE Dept, OUCOE, OU, Hyderabad, India. e-mail: drpremchand_P@yahoo.com

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4. We applied the proposed method to sequence of surveillance face images and demonstrated that the Diminutive sequence optimality regularization could significantly improve the robustness of the active contour model.

The rest of this paper is organized as follows: Section 2 introduces the basic theory and the formulation of our method. Section 3 describes the algorithm to solve our model. Section 4 demonstrates the merits of our method by experiments. Finally, Section 5 concludes the paper with some discussions.

II. Formulation

a) *Diminutive Sequence Optimality Measure*

To apply a Diminutive sequence optimality constraint to active contours, a proper measure to estimate that any of images are akin to source is desired. Characteristically, the akin among two contours is measured by scheming the distances between the equivalent points on the contours, and the minuscule sequence optimality can be calculated by the sum of pair-wise distances among contours. The main drawback of this technique is that the contour distance is not invariant below akin transformation.

Here, we propose to use the matrix rank to measure the Diminutive sequence optimality of shapes. Suppose each shape is represented by a vector. Multiple shapes form a matrix. Intuitively, the rank of the matrix measures the correlation among the shapes. For example, the rank equals to 1 if the shapes are identical, and the rank may increase if some shapes change. Moreover, we can show that the shape matrix is still low-rank if the shape change is due to the akin transformation such as translation, scaling and rotation.

For example, let vector $C = [x_{1,...,}x_p, y_{1,..,}y_p]^T \in R^{2p}$ represents a digitized parametric curve in the 2-D plane, where (x_i, y_i) is a landmark on the curve. Suppose there are n curves $C_1, C_2, ..., C_n$ and for each $i \neq 1$, C_i is generated from C_1 through affine transformation. Then, the matrix $[C_1, C_2, ..., C_n] \in \square^{2p\times n}$ has the following property

$$rank([C_1, ..., C_n]) \leq 6 \quad (1)$$

Intrinsically, the rank of the shape matrix describes the degree of freedom of the shape change. The low-rank constraint will allow the global change of contours such as translation, scaling, rotation and principal deformation to fit the image data while truncating the local variation caused by image defects.

b) *Energy Function*

Given a diminutive sequence of images $I_1, ..., I_n$, we try to find a set of contours $C_1, ..., C_n$ to segment the object in these images. To keep the contours similar to each other, we propose to segment the images by

$$\min_X \sum_{i=1}^{n} f_i(C_i) \text{ Subject to } rank(X) \leq K, \quad (2)$$

Where $X = [C_1, ..., C_n]$ and K is a predefined constant. $f_i(C_i)$ Is the energy of an active contour model to evolve the contour in each frame, such as snake [18], geodesic active contour [7], and region-based models [34, 8]. For example, the region-based energy in [8] reads

$$f_i(C_i) = \int_{\Omega_1} (I_i(X) - u_1)^2 dx + \int_{\Omega_2} (I_i(X) - u_2)^2 dx + \beta * length(C_i) \quad (3)$$

Where Ω_1 and Ω_2 represent the regions inside and outside the contour, and u_1 and u_2 denote the mean intensity of Ω_1 and Ω_2, respectively.

Since rank is a discrete operator which is both difficult to optimize and too rigid as a regularization method, we propose to use the following relaxed form as the objective function:

$$\min_X \sum_{i=1}^{n} f_i(C_i) + \lambda \|X\|_* \quad (4)$$

Here, rank(X) in (2) is replaced by the central median $\|X\|_*$, i.e. the sum of singular values of X. Recently, the central median minimization has been widely used in low-rank modeling such as matrix completion [6] and robust principal component analysis [5]. As a tight convex surrogate to the rank operator [16], the central median has several good properties: Firstly, the convexity of the central median makes it possible to develop fast and convergent algorithms in optimization. Secondly, the central median is a continuous function, which is important for a good process of regularize in many applications. For instance, in our problem, the small perturbation in the shapes may result in a large increase of rank(X), while $\|X\|_*$ may rarely change.

III. Algorithm

In this section, we will discuss how to solve the optimization problem observed in (Eq4). If regularizing process not opted $\|X\|_*$, (Eq4) can be locally minimized by changeover descent, which gives the curve evolution steps in typical active contour models. In our model, it is difficult to apply changeover descent directly due to the central median, which is coarse and its partial changeover is hard to compute.

Recently, the Proximal Gradient (PG) method [1, 22] is used to solve the following category of problems

$$\min_X F(X) + \lambda R(X) \tag{5}$$

Where $F(X)$ a differentiable is function and $R(X)$ corresponds to a convex penalty which can be coarse. Our problem is in this category with $F(X) = \sum_{i=1}^{n} f_i(C_i)$ and $R(X) = \|X\|_*$.The basic step in Proximal Gradient is to make the following quadratic approximation to F(X) based on the previous estimate $X^{'}$ per iteration.

Add Eq 6

$$\begin{aligned} Q_\mu(X, X') &= F(X') + \langle \nabla F(X'), X - X' \rangle + \frac{\mu}{2}\|X - X'\|_F^2 + \lambda R(X), \\ &= \frac{\mu}{2}\left\|X - [X' - \frac{1}{\mu}\nabla F(X')]\right\|_F^2 + \lambda R(X) + const \end{aligned} \tag{6}$$

Where $\langle \cdot,\cdot \rangle$ means the inner product, $\|\cdot\|_F$ denotes the Frobenius norm, and μ is a constant. It is shown in [22] that, if F(X) is differentiable with Lipschitz continuous gradient, the sequence generated by the following iteration will converge to a stationary point of the function in (5) with a convergence rate of $o(\frac{1}{k})$.

$$\begin{aligned} X^{k+1} &= \arg\frac{\min}{2} Q_\mu(X, X^k) \\ &= \arg\frac{\min}{2}\frac{1}{2}\left\|X - [X^k - \frac{1}{\mu}\nabla F(X^k)]\right\|_F^2 + \frac{\lambda}{\mu}R(X) \end{aligned} \tag{7}$$

The next question is how to solve the update step in (Eq7). For our problem, the lemma proven in [4] has been taken to define the proposed hastened propinquity changeover algorithm.

Lemma 1 Given $X \in \mathbb{R}^{m\times n}$, the solution to the problem

$$\frac{\min}{X}\frac{1}{2}\|X - Z\|_F^2 + \alpha\|X\|_* \tag{8}$$

is given by $X^* = D_\alpha(Z)$, where

$$D_\alpha(Z) = \sum_{i=1}^{\min(m,n)} (\sigma_i - \alpha) + u_i v_i^T \tag{9}$$

The intuition of our algorithm is that, per iteration, we first evolve the active contours according to the image- based forces and then impose the Diminutive sequence optimality regularization via singular value threshold. The overall algorithm is summarized here.

Hastened propinquity changeover algorithm

1. $Initialize: X^0 = X^{-1}, t_0 = t_{-1} = 1$
2. $for k = 0 \rightarrow$ Maximum number of iterations do
3. $Y^k = X^k + \frac{t^{k-1} - 1}{t^k}(X^k - X^{k-1})$
4. For $i = 1 \rightarrow n \quad do$
5. $y_i^k \leftarrow y_i^k - \frac{1}{\mu}\nabla f_i(y_i^k)$
6. end for
7. $X^{k+1} = D_{\frac{\lambda}{\mu}}(Y^k)$
8. $t^{k+1} = \frac{1 + \sqrt{1 + 4(t^k)^2}}{2}$
9. If $\left\|X^{k+1} - X^k\right\| < tolerance$ then
10. return
11. end if
12. end for

IV. Performance Analysis and Results Exploration

In this section, we evaluate the proposed method on both synthesized data and surveillance face image sequence. To demonstrate the advantages of the Diminutive sequence optimality constraint, we compare the results of the same active contour model before and after applying the proposed constraint. We select the region- based active contour in (3) as the basic model, which is less sensitive to initialization and has fewer parameters to tune compared with edge-based methods.

In our execution, we initialize the energetic contours as $X^0 = [C_{0,\ldots,}C_0]$, where C_0 is a coarse outline of the object placed manually in an image. Three parameters need to be selected in our algorithm. β in (Eq3) controls the smoothness of each contour, λ in (Eq4) controls the Diminutive sequence optimality of contours, and μ, in (Eq7) controls the step-length of curve evolution in each iteration. We choose the parameters empirically and use the same set of values for all experiments.

a) Surveillance Captured Face Segmentation

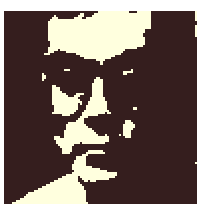
We apply our method to set of surveillance captured image sequence as shown in figure 1. The face recognition from surveillance image frames is a very challenging problem due to various misleading features in surveillance images.

(a) Input image

(b) Diminutive Sequence used for Training

(c) Segmented the Image without Preprocessing

(d) Segmented the iMage after Preprocess



(e) Segmented the image under self Trained Projection

(f) Segmented the image under diminutive sequence trained projection

Figure 1: Example surveillance capture face image formation by projecting the missing active contours.

In figure 2, set of frames uniformly placed through the sequence are selected to demonstrate the results. For each panel, the top row and the bottom row present the results of region-based active contours without and with the proposed constraint, respectively.

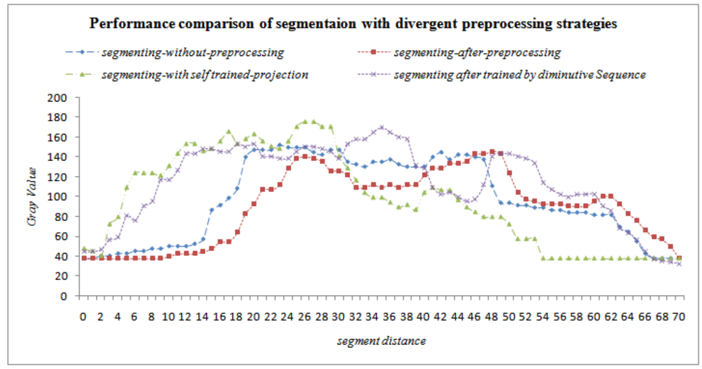


Figure 2 : Contour Projection Accuracy Comparison

b) Qualitative Comparison

Uniformly-selected frames of two sequences are displayed in Figure 2 to qualitatively evaluate the segmentation. The results of the region-based active contour without the proposed constraint are given in the top rows. The results are corrupted in several images. Moreover, the active contour is prone to be trapped by the misleading features.

The bottom row of figure 2 indicates the results obtained from different strategies. There are two comments worth mentioning. Firstly, the contour shapes are globally consistent with each other throughout the sequence, which is attributed to the Diminutive sequence optimality constraint. Hence, the contours are more resistant to local misleading features. Secondly, the constrained shape model is still flexible enough to adapt the deformation of the object shape. The problem of our method is that it cannot address the universal bias of the model. Therefore, the region-based active contours cannot attach closely to the true boundary. In practice, more appealing results can be obtained by including more energy terms such as edge- based energies, which is out of the scope of this paper.

c) Quantitative Evaluation

We compared the variation in segments under different distances of raw image, preprocessed image, and self trained projection with diminutive sequence trained projection. The table 1 explores the performance advantage of diminutive sequence trained contour projection.

Table 1 : Distance analysis

Distance	Segmenting-Without-Preprocessing	Segmenting-After-Preprocessing	Segmenting-with Self Trained-Projection	Segmenting after Trained by Diminutive Sequence
0	37.6667	37.6667	47.4921	44.8643
1	37.6667	37.6667	45.0357	44.8643
2	40.0941	37.6667	40.123	47.2636
3	40.0941	37.6667	72.0556	56.8605
4	42.5216	37.6667	79.4246	59.2597
5	42.5216	37.6667	108.9008	80.8527
6	44.949	37.6667	123.6389	76.0543
7	44.949	37.6667	123.6389	90.4496
8	47.3765	37.6667	123.6389	95.2481
9	47.3765	37.6667	121.1825	116.8411
10	49.8039	40.0659	131.0079	116.8411
11	49.8039	42.4651	143.2897	126.438
12	49.8039	42.4651	153.1151	143.2326
13	52.2314	42.4651	153.1151	143.2326
14	57.0863	44.8643	145.746	148.031
15	86.2157	47.2636	148.2024	148.031
16	91.0706	54.4612	155.5714	145.6318
17	98.3529	54.4612	165.3968	145.6318
18	108.0627	64.0581	153.1151	152.8295
19	139.6196	83.2519	158.0278	150.4302
20	146.902	92.8488	162.9405	152.8295
21	146.902	107.2442	155.5714	140.8333
22	146.902	107.2442	150.6587	140.8333
23	151.7569	112.0426	148.2024	138.4341
24	149.3294	128.8372	155.5714	138.4341
25	149.3294	138.4341	170.3095	145.6318
26	149.3294	140.8333	175.2222	150.4302
27	144.4745	138.4341	175.2222	150.4302
28	142.0471	136.0349	170.3095	148.031
29	146.902	126.438	170.3095	145.6318
30	146.902	126.438	140.8333	138.4341
31	134.7647	121.6395	128.5516	152.8295
32	132.3372	109.6434	116.2698	157.6279
33	129.9098	109.6434	103.9881	157.6279
34	134.7647	112.0426	99.0754	164.8256
35	134.7647	109.6434	99.0754	169.624
36	137.1922	112.0426	94.1627	164.8256
37	132.3372	109.6434	89.25	160.0271
38	129.9098	112.0426	91.7064	157.6279
39	129.9098	112.0426	86.7937	131.2364
40	129.9098	121.6395	103.9881	128.8372
41	139.6196	128.8372	108.9008	109.6434
42	144.4745	128.8372	106.4444	102.4457
43	137.1922	133.6357	106.4444	104.845
44	142.0471	133.6357	96.619	100.0465
45	142.0471	136.0349	89.25	95.2481
46	139.6196	143.2326	84.3373	97.6473
47	137.1922	143.2326	79.4246	112.0426
48	110.4902	145.6318	79.4246	140.8333
49	93.498	143.2326	79.4246	143.2326
50	93.498	124.0388	72.0556	143.2326
51	91.0706	104.845	57.3175	140.8333
52	91.0706	97.6473	57.3175	138.4341
53	88.6431	95.2481	57.3175	133.6357
54	88.6431	92.8488	37.6667	114.4419
55	86.2157	92.8488	37.6667	107.2442

56	86.2157	92.8488	37.6667	102.4457
57	83.7882	90.4496	37.6667	100.0465
58	83.7882	90.4496	37.6667	102.4457
59	83.7882	90.4496	37.6667	102.4457
60	81.3608	95.2481	37.6667	102.4457
61	81.3608	100.0465	37.6667	90.4496
62	81.3608	100.0465	37.6667	85.6512
63	69.2235	92.8488	37.6667	68.8566
64	64.3686	83.2519	37.6667	64.0581
65	54.6588	76.0543	37.6667	56.8605
66	42.5216	66.4574	37.6667	44.8643
67	37.6667	59.2597	37.6667	37.6667
68	37.6667	56.8605	37.6667	35.7584
69	37.6667	49.6628	37.6667	34.6185
70	37.6667	37.6667	37.6667	32.4567

The results are summarized in Table 1. Regarding the mean of the metrics, a smaller MAD/HD or a larger Dice coefficient indicates a more accurate segmentation. Generally, the performance with the proposed constraint is better than that without the constraint. The improvement in the diminutive sequence trained distance is the most notable, which measures the largest error for each contour. This is due to the fact that part of the segmentation result is corrupted by the missing boundary while this error can be corrected by adding the shape constraint. Regarding the standard deviation of the metrics, a smaller standard deviation indicates the more stable performance. The standard deviation with the proposed constraint is distinctly lower than that without the constraint, which shows the significance of the proposed constraint to improve the robustness of the active contour model. In our experiments, we selected λ empirically and applied the same λ to all sequences. The curve in Figure 4 shows that the accuracy changes smoothly over λ and the performance is stable in a wide range. Another alternative way is to choose a constant K specifying the degree of freedom allowed for shape variation and then solve the model with a decreasing sequence of λ until $rank(X)$ reaches K.

d) Convergence and Computational Time

Our algorithm is executed in java and tested on a desktop through a Intel i7 3.4GHz CPU and 3GB RAM. The experiments showed that the algorithm with the shape constraint converged faster than that without shape constraint. This can be explained by the fact that the added constraint will make the active contour model better regularized, which results in faster convergence and fewer iterations. The results indicating that the algorithm with the proposed constraint is even faster in computation compared to that without the constraint.

V. Conclusion

In this paper, we proposed a simple and effective way to regularize the Diminutive sequence optimality of shapes in the active contour model based on low-rank modeling and rank minimization. We use the position similarities to represent the contour instead of level sets. The reason is that the low-rank property in (Eq1) will not hold if the level-set representation is used. For instance, if there are n contours represented by the zero-level sets of n signed distance functions (SDFs) and the contours are identical in shape but different in location, the matrix consisting of the vector SDFs has a rank of n, which is full-rank. Other divergent methods for image segmentation also have this issue. A limitation of using the shape akin constraint is the possibility of removing frame-specific details of the shapes. The trade-off between noise removal and signal preserving is a fundamental challenge in many problems. A possible solution in our problem is to refine the segmentation by running an active contour model that is more sensitive to local features with our results being both initialization and templates to constrain the curve evolution. In future the formation and projection of the missing contour structure can be done by determining through support vector machines, which trained by the optimal contour features of the diminutive sequence.

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A Survey on Biometrics based Digital Image Watermarking Techniques and Applications

By D. Kannan & Dr. M. Gobi
Bharathiar University, India

Abstract- The improvements in Internet technologies and growing demands on online multimedia businesses have made digital copyrighting as a major challenge for businesses that are associated with online content distribution via diverse business models including pay-per-view, subscription, trading, etc. Copyright protection and the evidence for rightful ownership are major issues associated with the distribution of any digital images. Digital watermarking is a probable solution for digital content owners that offer security to the digital content. In recent years, digital watermarking plays a vital role in providing the apposite solution and numerous researches have been carried out. In this paper, an extensive review of the prevailing literature related to the Bio- watermarking is presented together with classification by utilizing an assortment of techniques. In addition, a terse introduction about the Digital Watermarking is presented to get acquainted with the vital information on the subject of Digital Watermarking.

Keywords: digital watermarking, image watermarking, watermark, copy right protection, visible watermarking, invisible watermarking, spatial domain, transform domain, biometrics.

GJCST-F Classification: K.6.5

ASURVEYONBIOMETRICSBASEDDIGITALIMAGEWATERMARKINGTECHNIQUESANDAPPLICATIONS

Strictly as per the compliance and regulations of:

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I. Introduction

In the information-oriented society, sounds, images, and videos are the various needs in the media form for protecting the information. Apart from of its media forms, the majority information is distributed as digital signals, especially via networks such as the Internet [1]. While the initiation of digital multimedia enables the creation and distribution of products swiftly via electronic means the rapid growth of the Internet makes communication easier and more extensive than before [2]. In current era, the rapid expansion of the interconnected networks [3] and the never-ending development of digital technologies have facilitated instant multimedia transmission and the creation of large-scale digital image databases [4]. The advantages of digitized images are that without considerable loss of quality, images can be easily manipulated and reproduced [6]. Nevertheless, these also entail that with malicious intentions [5] images can be modified easily and invisibly.

The utmost utilization of the interconnected networks for instantaneous transaction prevail and the power of digital multimedia processing tools for perfect duplication and manipulation augments, forgery and impersonation [8] turn out to be major concerns of the information era [7]. Especially when the media content is critical, the situation can be very stern for instance, once an image has been exploited as a part of evidence in the court, there has to be some ways to prove that the image is original or the semantics of the original image is well maintained. Such an application is considered as content authentication [11]. In the last decade, in response to these confronts, approaches conveying the authentication data in digital media have been proposed [7]. Hence the fortification and enforcement of intellectual property rights for digital media has become a significant issue [9] and therefore a few work requests to be made to extend security systems to protect the content of digital data [10].

Digital Rights Management (DRM) is one among the potential solutions for the abovementioned issue. DRM is a technique recognized by the administrators of the intellectual assets, such as license terms and usage agreements for honoring copyright provisions. The DRM comprises a set of technologies that are exploited by establishing privileges, specifically by means of content protection to put off exploitation of the digital content [12]. DRM is a compilation of technologies that provides content protection according to granted rights by enforcing the utilization of digital content. To protect their copyrights, it enables content owners and content providers and maintains control over distribution of and access to content [13].

The encryption, copy control, digital watermarking, fingerprinting, traitor tracing, authentication, integrity checking, access control, tamper–resistant hard– and software, key management and revocation as well as risk management architectures are also comprised in technologies which in turn applied for the DRM [14]. To achieve rights management, Digital watermarking is a promising technology employed by a variety of Digital Rights Management (DRM) systems. It aids copyright information (such as the owner's identity, transaction dates, and serial numbers) to be embedded as insignificant signals into digital contents [15]. Digital watermarking has observed rapid escalation in recent times [16].

In the past few years, several researches are performed in the digital watermarking by a huge number

Author α : Research Scholar, Department of Computer Science, CGAC, Tirupur, Tamilnadu, India. e-mail: kd.khannan@gmail.com
Author σ : Assistant Professor, Department of Computer Science, CGAC, Tirupur, Tamilnadu, India.

of researchers. In this paper, we present a comprehensive review of extremely important researches on Digital image watermarking together with their processing and analysis methods. The popular literature existing in the digital image watermarking is categorized and reviewed comprehensively. Here, we present a wide-ranging review of image watermarking which is robust against diverse attacks. A broad review on the study of significant research methods in Digital Image Watermarking is presented in section.

II. Literature Survey

Both watermarking and cryptography are necessary for effective Digital Rights Management (DRM) of multimedia in the framework of embedded systems have presented a system in the form of a digital camera has been presented by Mohamed Zuhair *et al.* [17] which embeds biometric data into an image. In the digital camera, they have incorporated both the encryption and watermarking together that has been assisted for protecting and authenticating image files and Watermarking the digital content with origin information or intended recipient identification secures content from electronic data theft. An invisible watermarking algorithm has been employed which allows verification of the image as well as the identity of the carrier. Towards the development of the complete digital camera, they have presented architecture and hardware efficient FPGA based invisible watermark module.

When compared with the conventional personal identification approaches such as passwords and PIN codes, automated biometrics authentication offers a suitable and reliable technique in diverse applications, but their validity must be assured. Watermarking approaches may be a solution to assure the validity of biometrics. In this paper, a new approach of protecting hidden transmission of biometrics using authentication watermarking is proposed by Shum in Ding et al., [18]. Five watermark bits constructed from each DCT block are split into two segments such as authentication bits and hidden bits. The four authentication bits are used to verify the reliability of each image block; the hidden bit is used as a hidden channel to transmit the biometric data. At the receiver, the reliability of each block is verified through authentication watermarking. The biometrics data is derived from the block which has been noticed as innocent. Redundancy embedding and voting approach are utilized as improving the correctness of extracte biometrics data. Theoretical analysis and experimental results reveal that the proposed approach protects hidden transmission of biometrics and can competently recover the biometrics when the watermarked-images suffer from malicious tamper.

Digital rights management (DRM) system is the significant approach for digital transactions. An efficient authentication approach of DRM system for remote users based on multimodal biometrics (such as iris and face feature) verification and watermarking and smart cards is proposed by Desong Wang et al., [19], which comprises of two authentication phases, i.e. the client server authentication and the server authentication. For the client server authentication, the author combine watermarking technique and multimodal biometric system depending on extremely secure iris recognition and face recognition to offer more secure and reliable personal recognition. In watermarking algorithm, face image is selected to be the host image, iris feature is chosen to use as watermark hidden in the host face image. For the server authentication, the proposed approach is an extended and generalized form of ElGamal signature approach whose security depends on discrete logarithm problem, which is not yet forged. So, the proposed technique can attain the rights management of digital content exactly using the illegal user access control. In the meantime, the bimodal biometrics (iris and face) recognition offers the enhancement in the accuracy performance of the system.

The strong advancement of digital technologies has demanded the owners to pay immense attention in securing their digital contents. Recently, watermarking has been exploited by researchers for the security of digital documents. But, the embedded watermark data can be hacked by the hackers and therefore it is a threat to protection of digital content. This approach by Rao et al., [20] is an efficient approach for protecting the copyrights of digital images with the integration of both biometrics and digital watermarking. The proposed approach exploits the fingerprint biometric feature of the proprietor to generate the watermark. The minutiae points are attained from the fingerprint and the co-ordinates of the minutiae points are shuffled. Then, a vector is generated from the shuffled coordinates of minutiae points and is ultimately used as watermark. The embedding and extraction of watermark is executed in the DCT-SVD domain. If any ownership clashes arise on the image, the watermark is obtained from the watermarked image and assessed against the vector generated from the shuffled co-ordinates of minutiae points which are attained from the fingerprint of the person asserting ownership. If they go with each other, the claiming person is considered to be the rightful owner of the image. Thus, the biometric feature used in this scheme establishes that the information is very safe. Moreover, it is not necessary to execute the information; it is not possible for the hackers to hack it as well.

A novel authentication approach to set up Digital Rights Management (DRM) based on multimodal biometric verification and watermarking technique is proposed Edward et al., [21]. The biometric features used in this approach are iris and face. In this watermark, face image is considered to be the host image and the iris feature is chosen as the watermark hidden in the host image. Such that, iris feature watermark not only defend face biometric data but also can be utilized as covert recognition. The transformation utilized for watermark is ridgelet transform. The embedding is carried out based on the HVS characteristic features. In this consideration, data is embedded based on two usual perceptual rules disturbances that are less visible in the highly textured regions, and they are more easily apparent around edges than in textured areas, but less easily than in uniform regions. The data is embedded based on these rules. Initially, enrollment process of the victim face and iris features in the available database. Secondly, authentication process is carried out through comparing the features of face image with the features of the face image in the data base. When it matches the iris feature is compared with data base if the iris image is also matched then the person is authenticated. This type of biometric provides better authentication and security.

Bio-watermarking systems were proposed as the synergistic integration of biometrics and digital watermarking to guarantee the integrity, authenticity and confidentiality of digitized image documents, and biometric templates. The influence of watermarking attacks on the performance of offline signature verification is evaluated in the context of significant bio-watermarking systems. The considered system depends on incremental learning computational intelligence, and multi-objective formulation that facilitates optimizing parameters based on watermark quality and robustness simultaneously. In this approach by Rabil et al., [22], Extended Shadow Code features are obtained from digitized offline signatures, collected into feature vectors, and discretized into binary watermarks preceding to being embedded into high resolution grayscale face image. The influence on biometric verification performance of quantization and different intensities of attacks are taken into account, and the effect of using only some areas of face images of higher texture Region Of Interest (ROI) for embedding the watermark is also observed. Experimental results reveal the optimal discretization, and better watermark fitness and verification performance when embedding in ROI. In order to enhance the performance, more reference signatures are to be embedded, efficient ROI identification approaches have to be used and finally novel formulation to add biometrics verification fitness to the watermark quality and robustness fitness during embedding optimization. The proposed system can be used to verify individuals crossing borders using offline signatures, or protecting biometric templates.

Biometrics security technique using wavelet based watermarking is proposed by Jong Gook Ko et al., [23]. Two types of techniques are presented that increase privacy protection level. First technique is to embed ID watermark data to biometric image like fingerprint, face for backtracking when image missing. Secondly, as multi bio watermarking, fingerprint feature data are embedded to face image for hiding private biometric information. The proposed technique for bio watermarking depends on the wavelet transform and reduces recognition performance loss owing to watermark data embedding.

[24] Liu Hui et al., [24] proposed a novel biometrics watermarking approach in the host as notice of genuine. In the watermark embedding process, the wavelet coefficients of the host image are assembled into wavelet trees and each watermark bit is embedded using two trees. The trees are so quantized that they show a large adequate statistical difference, which will later be used for watermark extraction. The experimental results reveal that the proposed approach is effective and robust to common image processing functions and some geometric operations such as JPEG compression, JPEG2000 compression, filtering, adding Gaussian noise and row-column removal.

Tuan Hoang et al., [25] proposed a multi-biometrics authentication system depending on the proposed priority-based watermarking technique. Tuan Hoang et al., examined how the watermarking approach influence the container, which is facial image exploited in additional authentication steps. The author conducted experiments on facial and fingerprint features by means of both priority-based watermarking technique and non-priority-based technique. It is revealed that the proposed priority-based watermarking technique has minimized data retrieval errors from the facial image after decoding, thus it has also minimized authentication error rates.

Cheng-Yaw et al., [26] presented a novel biometric watermarking approach to embed handwritten signature invisibly in the host as a sign of genuine ownership. The author proposed to adaptively integrate Least Significant Bit (LSB) and Discrete Wavelet Transform (DWT) approaches into a unison framework, which to be known as LSB-DWT approach. The performance of LSB-DWT approach is evaluated against simulated frequency and geometric attacks, particularly JPG compression, low pass filtering, median filtering, noise addition, scaling, rotation and cropping through visual inspection, Peak Signal to Noise Ratio (PSNR) and watermark distortion rate. The experiment results show that LSB-DWT approach is effectively robust even in the existence of calculated distortions.

Vatsa et al., [27] presented a multimodal biometrics system using watermarking approach with two levels of security for concurrently verifying an individual and protecting the biometric template. Iris template is watermarked in face, such that the face is visible for verification and the watermarked iris is used to cross authenticate the individual and secure the biometrics data as well. The accuracy of the multimodal biometrics system is around 96.8%. This approach is also resistant to common attacks on biometric templates.

Tuan Hoang et al., [28] proposed a novel remote multimodal biometric authentication structure based on fragile watermarking for transmitting multi-biometrics over networks to server for authentication. A facial image is exploited as a container to embed other numeric biometrics features. The proposed framework improves security and minimizes bandwidths. To minimize error rates from embedding numeric data, the author proposed a new technique to find out bit priority level in a bit sequence denoting the numerical information to be embedded and integrate with the present amplitude modulation watermarking technique.

Kang Hui et al., [29] proposed an approach based on the fingerprint watermark, and attempt to establish biometrics in the watermark system. The author wished to combine the digital watermarking technology with the fingerprint identification technology. The approach depends upon the spatial domain, DCT domain of multi-bits embedded watermark techniques to embed and obtain the information of the fingerprint characteristic, and it is better to obtain the simplicity in the robustness and embedded technique. The experiment has revealed the fact that the approach is feasible and effective.

III. Direction for the Future Research

In this review paper, numerous Bio-watermarking techniques utilized for the digital image watermarking have been analyzed thoroughly. In addition, the performance claimed by the Bio-watermarking techniques has also been evaluated. As a result of this analysis, it has been evident that use biometrics data for digital image watermarking in copyright protection has given significant results. As biometric data are unique for each person, providing the biometrics data as the watermark has the potential to attain better results and may lead to the evolution of watermarking technique as a noteworthy research area. But, still advanced biometric techniques have to be incorporated with the watermarking technique for providing better security. This paper will be a healthier foundation for the budding researchers in the digital image watermarking domain to get acquainted with the techniques available in it.

IV. Conclusion

Digital image watermarking is a rising research area that has received great attention from the research community over the past decade. In this paper, a comprehensive survey of the significant researches and techniques existing for digital watermarking has been scrutinized. Here, existing researches that are robust against attacks are analyzed. An introduction about the digital watermarking and its applications has also been presented and the existing researches are organized according to the techniques implemented. This survey paves the way to the budding researchers to know about the numerous techniques available for Bio-watermarking.

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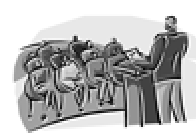

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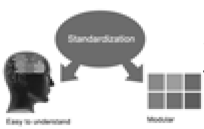

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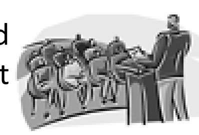

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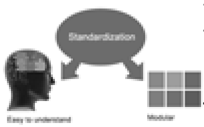

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The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

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.

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- 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.
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- 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.
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- 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.
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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

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

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

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Research articles: These are handled with small investigation and applications.

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

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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:

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(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.

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(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.

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

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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.

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- 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.

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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.

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TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish 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.

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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.

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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.

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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.

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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

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

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

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· 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

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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 definite statistics - 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)

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- 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:

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- 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.

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	A-B	**C-D**	**E-F**
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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

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