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Highlights

- Passenger Safety System
- Automated Manual Transmission
- Development of DC Motor
- Design and Motion Analysis

Discovering Thoughts, Inventing Future

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Development of DC Motor Controlled Automated Manual Transmission (AMT)

By Mr. M. S. Kumbhar, Dr. Dhananjay Panchagade
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Abstract- Automated Manual Transmission (AMT) has been the best competitive solution to address the problem of increasing fuel prices and to meet the emission norms. Automotive world today mostly uses Automated Manual Transmission (AMT) based on hydraulic actuators. Hydraulic actuators are costly, complex in design, bulky and invite drastic design changes in existing gearbox. AMT system which is low cost and fuel efficient has been developed using DC motor controlled electro mechanical linear actuators. The AMT system consists of three electro-mechanical linear actuators, one for clutch and two for gear shift actuations which are controlled by Transmission control unit (TCU). The wear of synchronizers can be easily taken care by reprogramming the stroke lengths of linear actuators. This system can be retro fitted in vehicle with existing manual gearbox and involve minor design changes. The focus of paper is to introduce the system developed.

Keywords: *actuator, AMT, automated manual transmission, transmission.*

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Development of DC Motor Controlled Automated Manual Transmission (AMT)

Mr. M. S. Kumbhar [α], Dr. Dhananjay Panchagade [σ] & Mr. Kapil Baidya [ρ]

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Keywords: actuator, AMT, automated manual transmission, transmission.

I. Introduction

Today the automobile industry is ruled by two forms of transmission, the Manual Transmission (MT) and the Automatic Transmission (AT). The MT is the most efficient transmission available as it lends itself to providing good fuel economy for the vehicles it is employed in. The MT is relatively easy to manufacture because it has very few parts. Another plus point is that the MT is reliable and easy to maintain. However, the major drawback with the MT is that it is less easy to drive than an AT especially, in congested traffic as it requires the driver to operate the clutch for each gear shift. There has been clear trend in automotive industry in recent years towards increased ride comfort and fuel efficiency keeping cost factor in mind. As the power transmission unit, transmissions play an important role in vehicle performance and fuel economy. There are currently several types of transmissions and associated technologies that offer different priorities in vehicle. Manual transmission (MT) has overall efficiency of 96 percent which is highest in all types. Belt type CVT (Continuously variable Transmission) has overall efficiency of 85 percent. Automatic Transmission has efficiency of 86 percent and Automated manual transmission (AMT) has efficiency par with manual transmission. AMT is essentially a MT with an automated control system [1]. Combining the fuel efficiency of an MT with the seamless shifting of an AT, this approach shows excellent promise as a compact and cost-effective transmission for future vehicles.

If a transmission could have the benefits of both the MT and AT and the weaknesses of either, this would introduce a new option to the existing market segment. Many researches and studies are directed towards developing AMT. To avoid torque interruption by use of Assist clutch (ACL) by replacing fifth gear synchronizer in gearbox is add-on feature in AMT system [1]. System that allows gear shift in zero seconds was developed, thus eliminating torque interruption during gear shifting [2]. Many researches on AMT Drivetrain modeling and control have also been carried out. In studies devoted to gear shift control [3], considered reduced-order driveline models, clutch and gearbox actuator dynamics have been described by simple models or have been neglected.

Traditionally, the AMT has good fuel economy, inferior performance as compared to the MT. The latter can be optimized by refining control strategy. By automating the MT, a cheap and economic transmission is developed. The aim of this paper is to introduce the concept of DC motor controlled AMT. This paper is split into following sections: First, the objective and feature are discussed. Secondly, the concept and working principle are explained. Then gear shifting strategy is discussed. Finally the system performance is evaluated by discussing simulation based results of DC motor controlled AMT.

II. Objective and Features

The objective of this project was to develop a system that can be retro fitted on vehicle with existing MT. The developed system should be compact, simple to manufacture, low cost and should have efficiency par with MT. The developed DC motor controlled electro-mechanical AMT has many advantages over conventional hydraulic AMT in terms of cost and complexity.

The Low cost AMT has three electro-mechanical linear actuators that are retro fitted on existing MT vehicle. Clutch actuation is done by clutch actuator by modifying existing clutch cable whereas gear select and shift actuation is done by select and shift actuators by modifying existing gear select and shift cables. The actuators are controlled by Transmission control unit

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(TCU). This system helps in reducing torque interruption during gear shifts. Thus a low cost, simple and efficient AMT system has been developed which can be retro fitted on existing MT vehicle.

III. Concept and Working Principle

Fig. 1 shows DC motor based AMT system concept which uses a conventional MT, actuators and TCU to automate the process of clutch actuation and gear shifting. The clutch actuator is connected to clutch lever via clutch cable. Similarly the gear shift and select lever are connected to gear shift and select actuators via shift and select cable respectively. The driver command for gear shift is received by TCU and the corresponding command for actuators are generated after processing all input signals through a gear shifting control strategy.

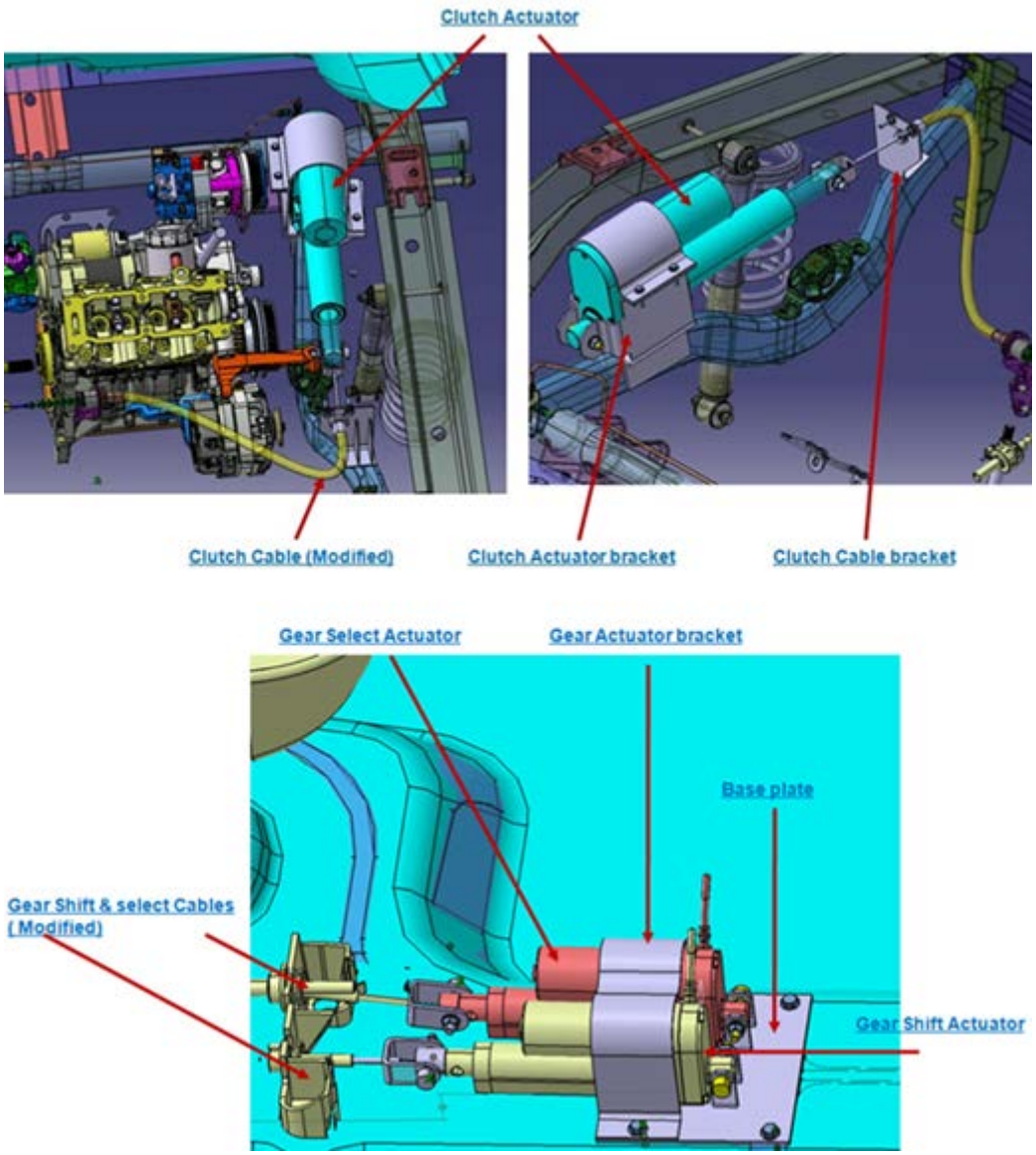

Figure 1 : DC motor controlled AMT system concept

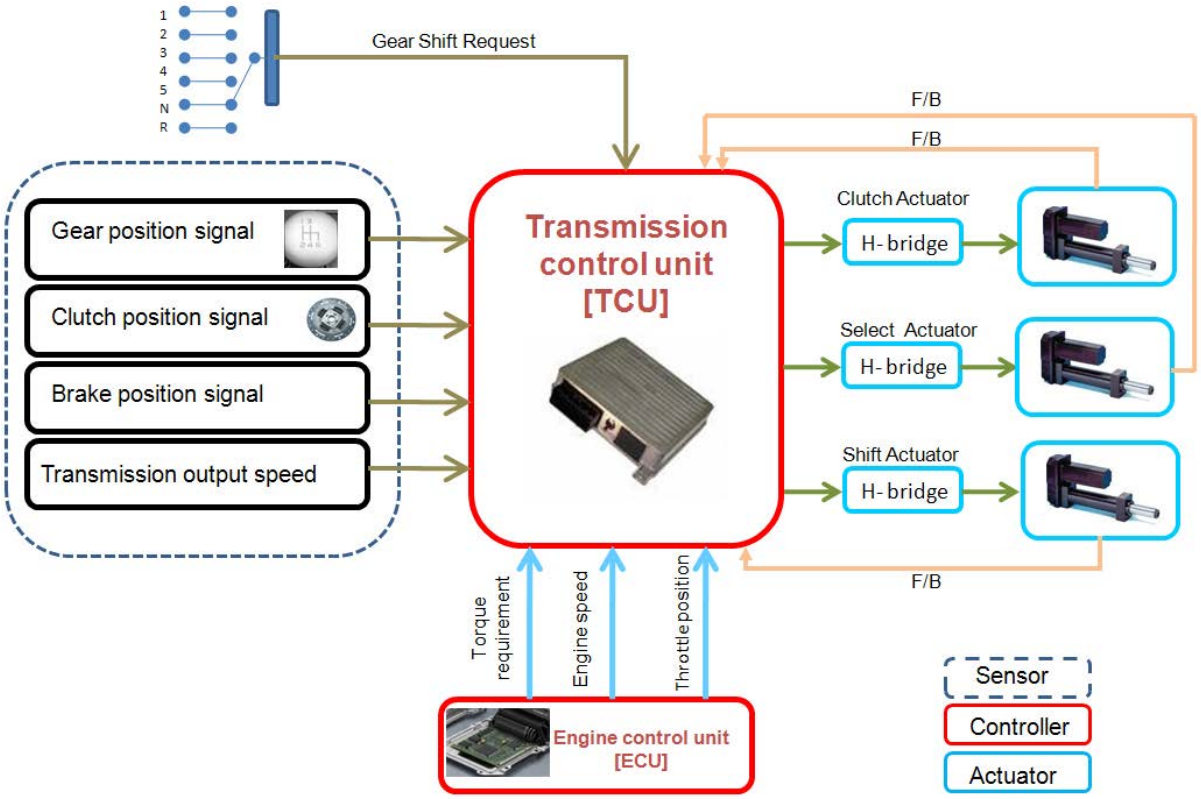

Figure 2 : DC motor controlled AMT system configuration

Fig. 2 shows the system configuration of developed DC motor controlled AMT. It consists of sensors, processors and actuators. The processor, TCU (Transmission Control Unit) gets the input signals from various sensors like gear position sensor, clutch position sensor, brake position sensor, transmission output speed and also vehicle related signals like torque requirement, engine speed and throttle position from ECU (Engine control unit) along with driver shift commands. The TCU has a gear shifting control strategy which on receiving the input signals, generates the output command signals to clutch actuator and gear shifting actuators.

The linear actuators used in our system are DC motor based. For downsizing, weight and cost reduction DC motor based linear actuators are used. DC motor requires H-Bridge circuitry. The H-Bridge circuitry receives the command signal from TCU and controls the linear actuators. The software for microcontroller is developed in such way that it gives PWM signals to the driver IC. The analog feedback signals from actuators are given to the microcontroller in H-Bridge circuitry to analyze and control linear movement of actuator. ADC (Analog to Digital converter) of microcontroller reads this analog value.

Actuators are selected based on force and linear speed required for gear shift operation. The forces were experimentally measured on clutch lever, gear shift lever and gear select lever and linear speed was finalized from benchmarked standards. Accordingly the linear actuators were selected to suit the purpose.

IV. Gear Shifting Stratergy

Fig. 3 shows the core of control strategy for gear shifting process. First, control is transferred from the driver to the TCU, entering the torque control phase. The engine is controlled to a torque level corresponding to zero transferred torque in the transmission when the clutch is disengaged by clutch actuator. The gear shift actuator actuates followed by actuation of select gear actuator for rank selection and neutral gear is engaged. Then the speed synchronization phase is entered. Here the engine speed is controlled to track the transmission speed as per new gear desired, and the new gear is engaged after select and shift actuator actuations. Finally, the torque level is transferred back to the level that the driver demands when clutch is engaged with help of clutch actuator. It is important to minimize the total time needed for a gear shift to reduce the torque interruption. The shifting strategy is written such that gear shifting takes place in most efficient zone of engine operating condition.

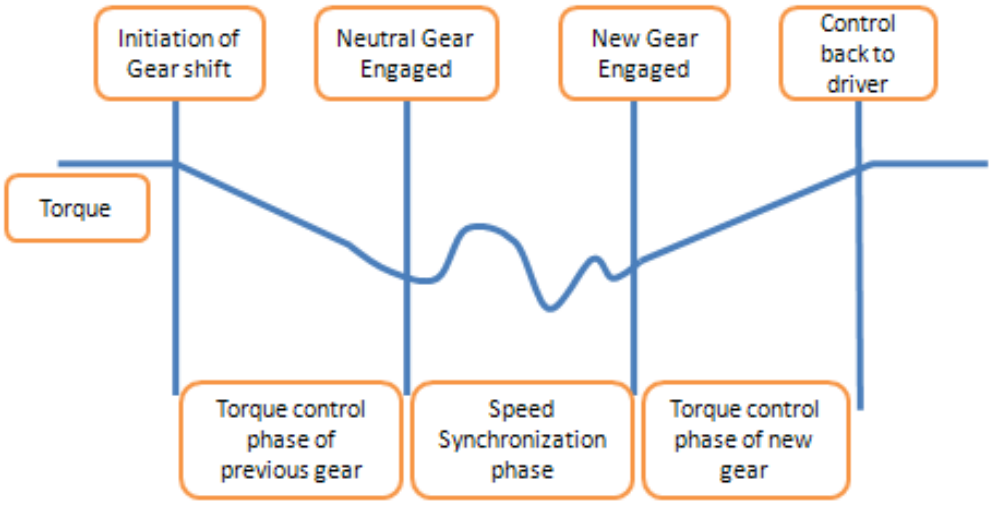

Figure 3 : Phases in Gear Shifting

V. System Performance

In this section we will summarize our assessment of how well the DC motor controlled AMT achieves the seamless shifting of an AT and the fuel economy of an MT. Fig. 4 shows the torque interruption in AMT and AT. It can be seen that the total shifting time of AMT is less than MT. So traction loss is less in case of AMT and hence greater efficiency.

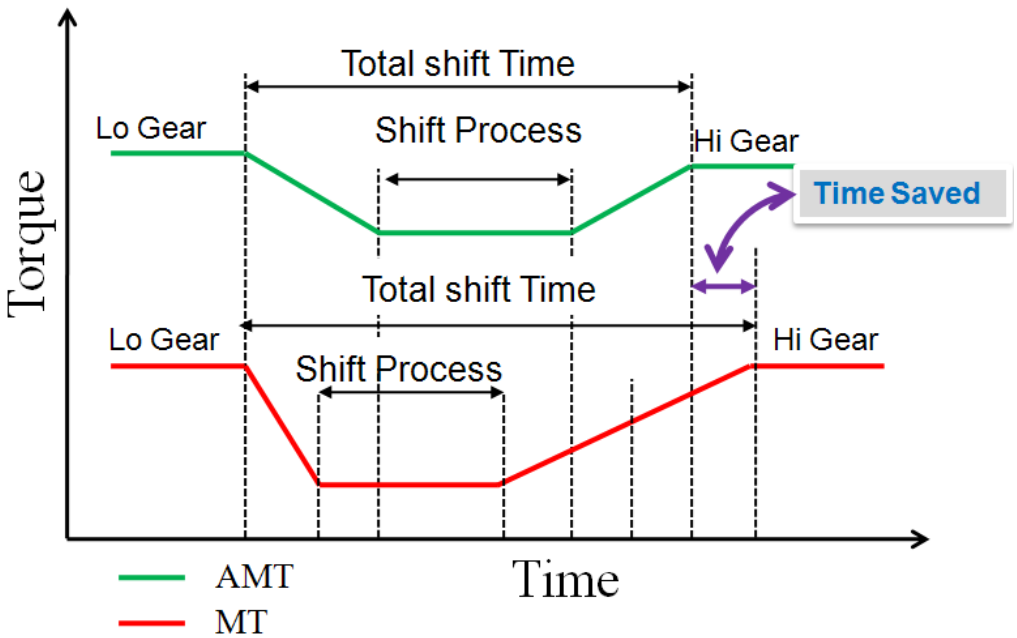

Figure 4 : Torque interruption in AMT and AT

Fig. 5 compares the DC motor controlled AMT with a conventional AT across six different performance measures which are made from the practical data collected on field. It can be seen that the up and down-shifting performance of the DC motor controlled AMT is almost the same as the AT. As there is no slippage from the torque converter that is required by an AT, the fuel efficiency and acceleration response of the DC motor controlled AMT are significantly better. On the other hand, the torque converter on the AT gives somewhat smoother starts and more power when accelerating as compared to the DC motor controlled AMT unit but we believe based on this overall assessment that the DC motor controlled AMT has excellent potential as a compact and fuel-efficient next-generation transmission that is also affordable. This DC motor controlled unit can be a good alternative for conventional AT unit. Cost is a major factor which can lead to a breakthrough in the

Asian Market with this DC motor controlled AMT serving as the future technology for car manufactures. With minimum modification made to the existing MT unit it is a highly feasible option in the market in terms of its reliability and easy service.

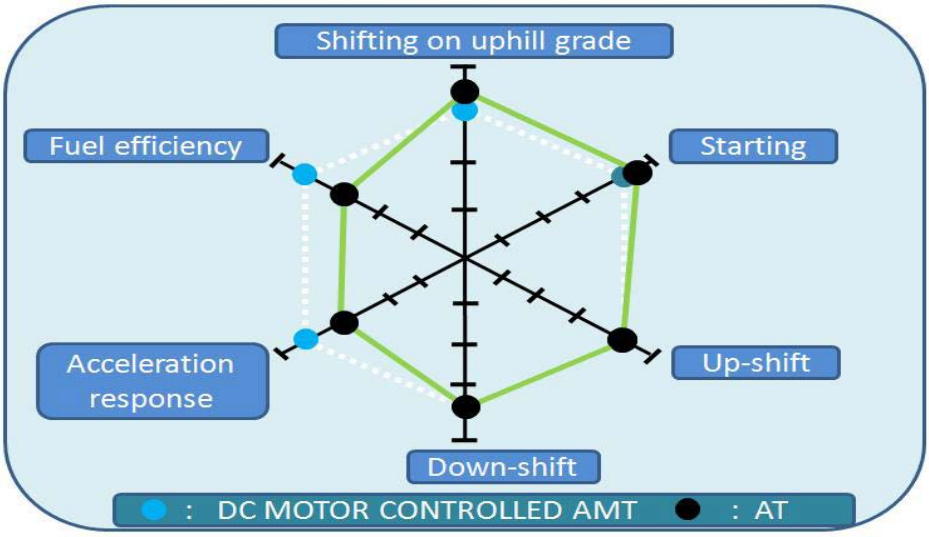

Figure 5 : Performance of Dc motor controlled AMT

A simulation was designed in the ADVISOR (2001) [4], a simulating software tool used in Matlab in order to check Engine performance between MT and our AMT system. Receiving the vehicle speed-time history as input, the simulation works backwards and calculates motion parameters as outputs. The vehicle subsystems in the simulation include engine, clutch, gearbox, differential, wheels, and axles of a default small passenger vehicle with 1400 kg vehicle mass and SI engine. Simulation was carried out on BS-IV Indian drive cycle (Urban part) with conventional vehicle model and our AMT vehicle model with similar configurations in terms of engine and gear box parameters. Fig. 6 shows the Engine efficiency graph for MT and our AMT for urban part of BS-IV Indian drive cycle. It can be clearly seen that Engine efficiency is high in most part of drive cycle for our AMT as compared to MT for same vehicle thus confirming that in DC motor based AMT optimized gear shifting takes place in most efficient engine efficiency operating zone.

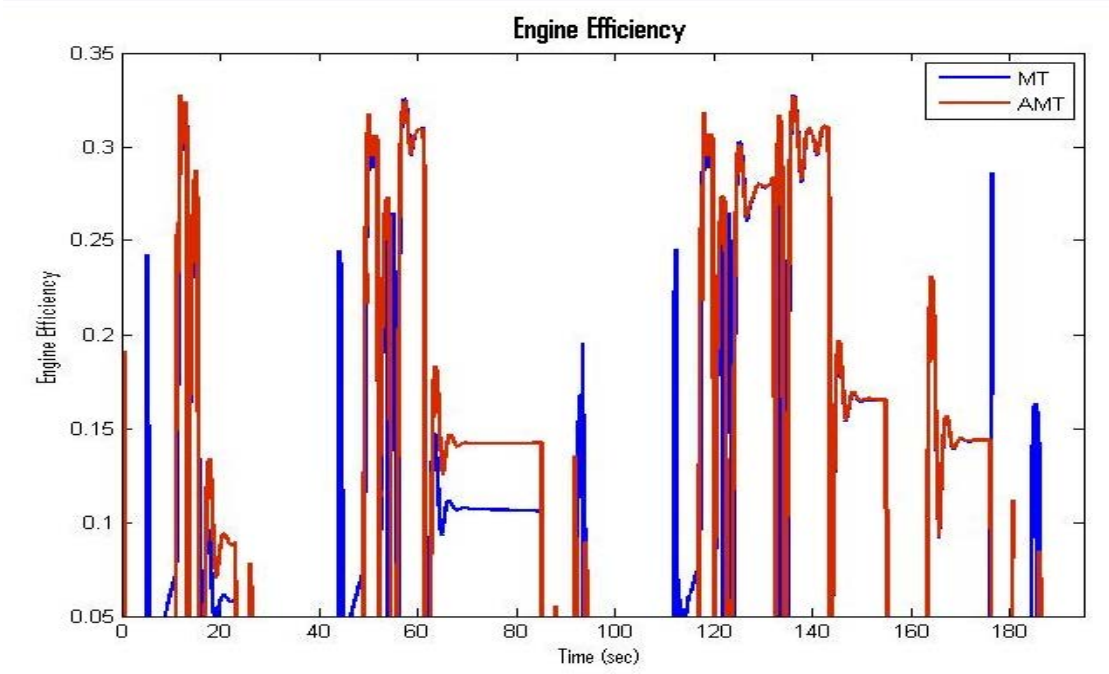

Figure 6 : Engine efficiency profile based on simulation

VI. Conclusion

A low cost DC motor controlled AMT concept was developed and performance was evaluated by simulation results. The simulation clearly indicates that DC motor controlled AMT is efficient as compared to MT. Low cost coupled with high efficiency makes the DC motor controlled AMT an extremely appropriate alternative for the conventional AMT. This type of alternative is a much desired and awaited demand of Asian and European Markets. Simplicity in packaging and uncomplicated serviceable design makes this concept a technology for future. This has the potential to become the next big tech revolution in the automobile world.

The Conversion of an Existing MT to DC motor controlled AMT has the Following Benefits

- Automated gear shift in optimum engine efficiency zone with improved shift quality.
- Improved fuel economy compared with torque converter AT.
- Improved acceleration performance and less traction losses.
- Easy to manufacture and is retro fit to install.

Since this concept of AMT system separates the actuator from the gearbox, the actuators can be designed independently and applied to different types of manual transmission with the same capacity. However, non-ideal mechanical connection between the actuator and gearbox brings some technical difficulties, such as cable wear, elasticity and mechanical clearance that need to be overcome.

In conclusion, the low cost DC motor controlled AMT is technically feasible, but there is still a great deal of research to be performed before commercialization.

VII. Acknowledgements

This project would not have been possible without the support and guidance of Mr. S. Govindarajan, General Manager, Tata motors ltd and Mr. P. Sarkar, Assistant General Manager, Tata motors ltd. We would like to give special thanks to Mr. Ashish Ranjan, Manager, Tata motors ltd and Mr. Sandeep Mante, Manager, Tata motors ltd. for their co-operation and support.

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Vehicle Anti-Theft and Passenger Safety System

By Sagnik Basu Choudhuri, J. Sam Jeba Kumar, B. Venkatesh & Rishabh Kumar Pandey
SRM University, India

Abstract- In pursuit of improving the safety of automobile, many companies have invested in developing various systems. Engine Immobiliser is one such innovation. Eventually, the RFID based Engine Immobiliser is becoming prone to getting hacked which compromises the very purpose of the device. Ethical hacker Karsten Nohl of Security Research Labs was able to crack the Hitag 2 car immobiliser algorithm used by Dutch firm NXP Semiconductors in around six hours. The need of the hour is to design an infallible system which enhances the security of the vehicle. We propose a system with a Face Recognition System which replaces the RFID based system. Additionally, a Passive Defense System (PDS) is also implemented that further reduces the chances of vehicle theft. The system also has a Driving Assistant Module (DAM) to help the driver drive in reduced visibility conditions like torrential rainfall, dense fog and the like. Another addition is the alcohol detection which is useful in avoiding drunken driving.

Keywords: engine immobiliser, RFID, encryption, passive defence system, WrisTAS, Driving While Impaired, ultrasound guidance system.

GJRE-B Classification : FOR Code: 290401

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I. Introduction

a) Engine Immobilisers

The present day vehicles have a Radio Frequency Identification Device (RFID) based Engine Immobiliser. An RFID immobiliser is a chip embedded in the top part of an ignition key. This chip sends out an encrypted string of radiofrequency signals, basically a particular number of impulses broadcast on various radio frequencies to create a specific code, when the driver inserts it into the ignition-key slot. Without this code, the car either won't start or won't activate the fuel pump.

Early RFID systems, used 32-bit encryption. That means they sent a code of 32 impulses. With 32 bits in the code, there are billions of possible combinations. In newer schemes, including remote starters that let you start a car with the push of a button, the codes have 40 bits, which increases the possibilities. With so many possible codes, the system seems unbeatable (Julia Layton, 2009).

A report published by the United Nations Office on Drugs and Crime (UNODC) in 2011 highlights the large number of Vehicle Theft cases reported in India.

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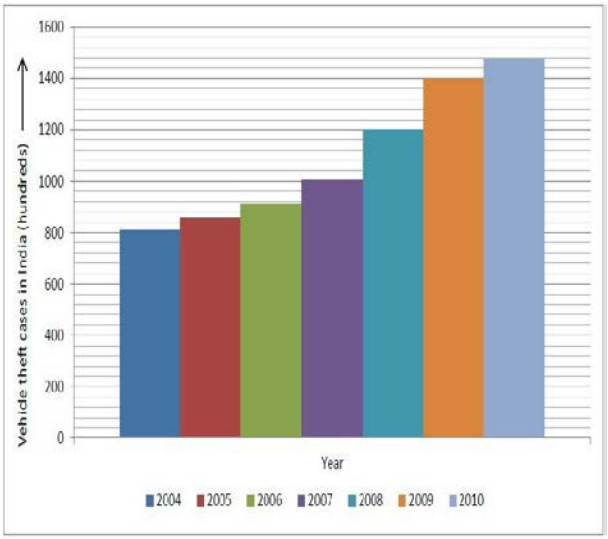

Figure 1 : Number of Vehicle Theft Cases in India

Hence, Fig 1 highlights it is a logical conclusion that the RFID Engine Immobilisers are failing in their basic task of protecting against vehicle theft.

II. Image Acquisition & Processing

Our system involves the use of Face Recognition to authenticate if the driver if allowed to run the vehicle. This can be achieved by comparing the driver's face with pre-stored templates of three people who are authorised to run the vehicle. Our system requires a camera, software where we can carry out the desired image processing techniques and finally where we can achieve the Template Matching operation based on the matching of the template and the image obtained from the camera.

The acquired image is fed to NI LabVIEW with the help of Vision Acquisition Software (VAS), which is an additional toolkit to acquire, save and display images. According to National Instruments India (n.d.) one can use NI-IMAQ to acquire images from analog, parallel digital, Camera Link cameras & NI Smart Cameras. It can also be used with NI-IMAQdx with USB3 Vision, GigE Vision, IP (Ethernet) & IEEE 1394 devices.

After selecting the source of the acquisition we have to set the acquisition type. NI Vision Acquisition Software offers a variety of solutions, Single Acquisition with processing; Continuous acquisition with inline processing; Finite acquisition with inline processing; Finite acquisition with post processing. We are using the Single acquisition with processing mode. NI Vision Acquisition Software also gives us an option to alter the

resolution settings of the camera with the option enabling of image logging.

To operate the vehicle in the night, the template match has to be carried out in the dark. The external incident light must have excellent penetration of the skin on the face to perform template matching in the night. Medical studies have shown that near infrared light compared to other bands of light, such as visible light on human skin has strong penetration power and better absorption by haemoglobin so an infrared light supports template matching in the night (Guotian Yang, 2010). According to the research by Yuan and Tang (2011), the 850 nm near infrared light has excellent skin penetration ability, relative to other band infrared light and can be better absorbed by haemoglobin.

After the driver's image is acquired, we perform Image Pre-Processing techniques on it using the NI LabVIEW Vision Development Module (VDM). In the Vision Development Module, we convert the 64 bit image to Gray Scale which is a 8 bit image and reduce the Region Of Interest (ROI) to perform the Template Matching operation.

If the template match between the pre-stored template and the camera's image is successful, the car starts else it does not.

III. State Machine Implementation

Mathworks India (n.d.) states that a State Machine is a model which a finite set of states and behaviors and how the system transitions from one state to another when certain conditions are true.

The system first checks if all the doors of the vehicle have been latched and the driver has fastened the seat belt as well. If both the above conditions have been met, the State Machine executes the next state else it does not.

After the first state, the State Machine executes the case where the image acquisition process initiates. The driver's image is taken and is compared with the templates already stored in the system. If the template match is successful, the car starts. If the match is not successful in the first attempt the system runs the image acquisition process for an additional ten minutes. However, if the template match is not successful at all, the State Machine executes the Third Party Login.

The Third Party Login is a special case aimed to give temporary access to people who do not have their templates stored in the system yet want to run the vehicle. This system becomes very useful in specific cases like when the technician at the repair centre wants to test the car. The Third Party Login is authenticated using a four letter password which only the owner and his family know. The Third Party Login Password can be entered from a remote location as well. If the password matches the car will start else it does not. The salient feature of this system is that in the Third Party Access mode, the vehicle runs for a duration of one hour two times a day only. After the expiry of the allowed time, the vehicle automatically comes to a halt.

Further, the system also provides scope for a Passive Defence System (PDS) which comes into effect if the primary defence system, the Face Recognition and Authentication system fails to protect the car. The PDS interacts with the vehicle engine with the help of a redundant Controller Area Network Bus (CAN Bus) which gets activated only when the OTP is generated.

In case a thief steals the car, there is a separate system which generates a unique One Time Password (OTP). The OTP is mailed to the registered mail id of the owner using Simple Mail Transfer Protocol (SMTP), present in NI LabVIEW. The system also switches on a hidden camera when the OTP is generated. The hidden camera will take a set number of images of the thief without his knowledge. The image of the thief is stored in the memory which can be retrieved later and can be handed later to the concerned authorities. The image of the thief can also be sent to the nearest Police Station.

The system enables remote switching of the vehicle's engine off through the NI Data Dashboard App (Version 2.2), which helps us to remotely control the vehicle's engine (National Instruments, 2014). This app enables the owner to feed in the Third Party Access password or the One Time Password

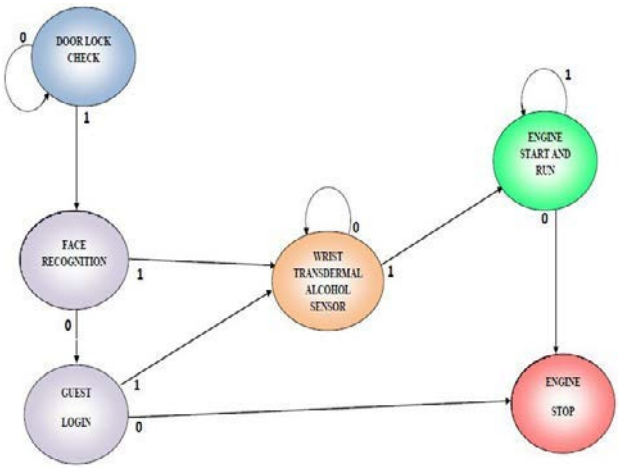

Figure 2 : Implementation of the State Machine

from a remote location. Alternatively, both the passwords can also be entered from an Internet Browser over a secured network.

IV. Need for Passive Defence System

When the RFID Engine Immobilisers came into the market everyone considered them to be a fool proof system that will keep vehicle theft in check. RFID based Engine Immobilisers are not safe anymore.

The Passive Defence System (PDS) as highlighted earlier comes into operation only if the Face Recognition and Authentication is breached.

a) Conditions in which we may require the PDS

- The template database is stolen.
- The primary CAN Bus is corrupted.
- Attacks due to Biometric Sensor Overtness (Anthony Delehanty, 2011).

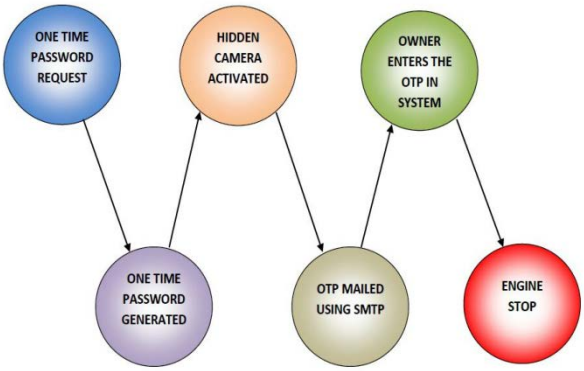

Figure 3 : The Passive Defence System (PDS)

V. Eliminating Driving while Impaired (DWI)

a) Introduction

Drinking While Impaired (DWI) is a serious offence which not only risks the driver's life but also of others on the road. Steps have to be taken to eliminate this menace. Most of the system available in the market today can detect whether the driver is drunk before starting the vehicle but they fail if the driver drinks while driving. Thus, if the driver drinks while driving, the vehicle does not stop.

In our quest to eliminate the above stated situation we advocate the use of Transdermal Alcohol Sensor (TAS) which tests for alcohol that is excreted through the skin. The two most effective TAS are:

- Secure Continuous Remote Alcohol Monitor (SCRAM)
- Wrist Transdermal Alcohol Sensor (WrisTAS)

Robertson (2006) *et al.* concluded that after more than 70 years of research and 22 peer-reviewed studies into the science underpinning this new technology, it has been established that ingested alcohol can be measured in perspiration through the process of Transdermal Alcohol Testing.

A research undertaken by Phillips & McAloon (1980) deduced that there was a statistically significant linear relationship between the concentration of ethanol in sweat and the average concentration of ethanol in blood, also called Blood Alcohol Concentration (BAC). Blood Alcohol Concentration is the amount of alcohol per fixed unit of blood.

After evaluating the needs of the system, we have selected the WrisTAS as the Alcohol sensor. The WrisTAS uses a constant hydrated platinum electrode maintained at a controlled potential and bathed in aqueous electrolyte held in a reservoir. In the WrisTAS, an electrode oxidizes the ethanol and forms acetic acid that diffuses into the reservoir. The current is converted to a digital signal that is averaged and stored at preset time intervals from 30 seconds to 10 minutes. Data can be downloaded to a computer serial port (Marques & McKnight, 2007). We have selected WrisTAS over SCRAM owing to the following reasons:

- Smaller Size of WrisTAS as compared to SCRAM.
- Paced drinking with food may not trigger an alert in SCRAM (Marques & McKnight, 2007).
- WrisTAS continuously scans for the presence of alcohol, while SCRAM does it every half an hour. SCRAM may not be able to protect against Drinking while Driving in all conditions.

b) WrisTAS Implementation

The WrisTAS can be interfaced with the car in a multitude of ways. The first method could be pasting an elongated WrisTAS patch on the steering wheel of the vehicle such that it covers it fully. This method is similar to what the Japanese Automobile giant, Nissan tried in one of its concept car.

The other method could be to connect the WrisTAS to the Controller Area Network Bus of the vehicle. When the driver wants to drive the vehicle, he has to wear the module. Marques & McKnight (2007) stated that the device has a skin resistance/conductance sensor and a temperature sensor. These sensors, when operative, can aid in determining if a person removed or blocked the device. When in service, data from the device are periodically downloaded to a computer via a serial port interface into the CAN Bus.

The temperature sensor attached to WrisTAS performs a secondary function as well. It checks if someone is trying to trick the Face Recognition and Authentication by uploading two dimensional images of the people in the stored templates into the system directly. Whenever a driver links up with the WrisTAS, the temperature sensor gives a high output. The NI LabVIEW reads the sensor values, if there is a high output the vehicle starts else it keeps rescanning the sensor output.

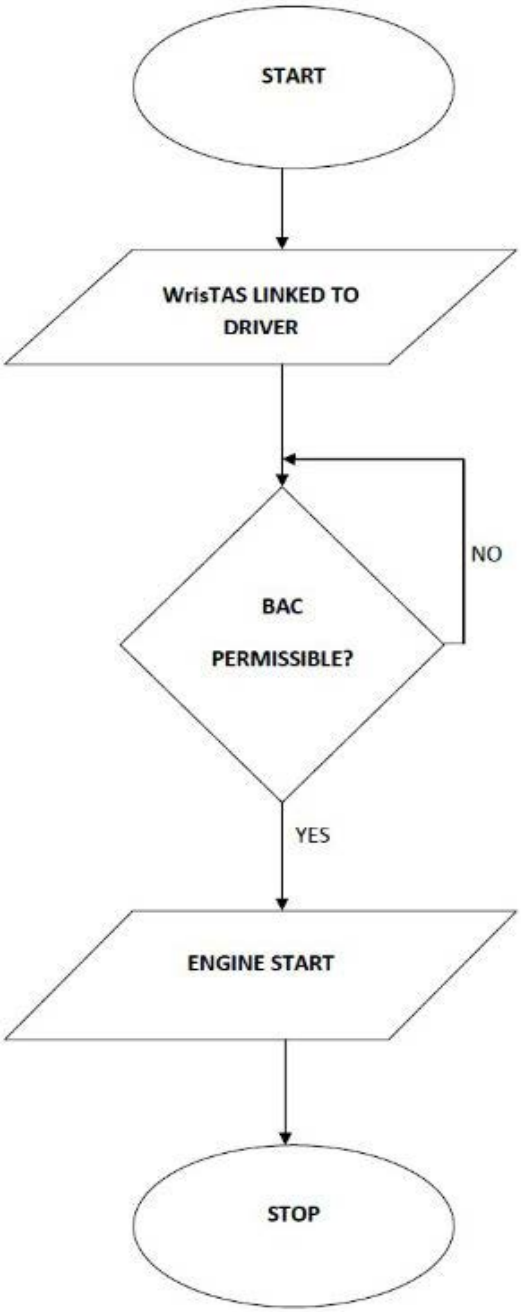

Figure 4 : Flow chart for eliminating Driving While Impaired (DWI)

The temperature sensor attached to WrisTAS performs a secondary function as well. It checks if someone is trying to trick the Face Recognition and Authentication by uploading two dimensional images of the people in the stored templates into the system directly. Whenever a driver links up with the WrisTAS, the temperature sensor gives a high output. The NI LabVIEW reads the sensor values, if there is a high output the vehicle starts else it keeps rescanning the sensor output.

VI. The Driving Assistant Module

The Driving Assistant Module (DAM) is essentially a range finder module. The Driving Assistant Module will supplement the driver when he or she is driving by providing information about the surroundings of the vehicle. When the driver knows about the obstacles surrounding of the car, the chances of accidents are bound to reduce. The system will be particularly useful while driving in adverse weather conditions like torrential rainfall, dense fog and conditions of reduced visibility like driving in the night.

In our prototype, we have used an Ultrasound sensor module to detect obstacles in the surrounding of the car. Ultrasound sensors transmit ultrasonic waves from its sensor head and again receive the ultrasonic waves reflected from an object which is the obstacle (SensorCentral.com, n.d.).

By measuring the length of time from the transmission to reception of the sonic wave, it detects the position of the object. The process is shown in Fig. 6.

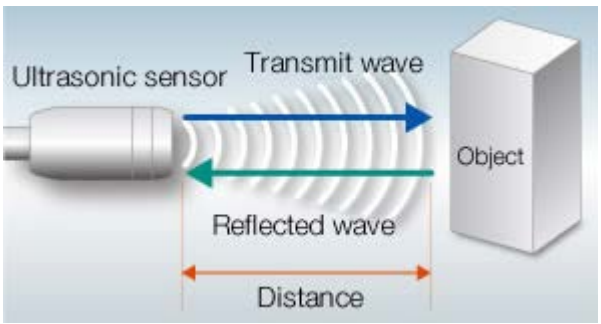

Figure 5 : Basic operation of an Ultrasound Sensor

After the data is retrieved from the sensor, it is fed to the Processing and Arduino Integrated Development Environment (IDE).

Processing is an open source programming language based on Java language and Integrated Development Environment built for the electronic arts, new media art, and visual design communities with the purpose of teaching the fundamentals of computer programming in a visual context, and to serve as the foundation for electronic sketchbooks (Wikipedia, n.d.). The user interface for the Ultrasound Sensor is made using Processing 2 IDE.

Let us consider an example which illustrates the how the distance is calculated using an ultrasound sensor.

The sensor sends an ultrasonic ping at a time t_1 and receives the bouncing ping at a time t_2.

If we know the speed of sound, the time difference $\Delta t = t_2 - t_1$, can give us an idea of the distance of the object from the Ultrasound sensor.

If Δt = 500 μs, we know it took 250 μs for the ping to hit the object and another 250 μs for it to come back and strike the receiver.

The approximate speed of sound in dry air is given by the formula:

$$c = 331.3 * \sqrt{(1 + T/273)}$$

Where, c= Speed of sound in dry air

T= Temperature of dry air

At T= 20°C, c = 343.5 m/s

Converting the speed of sound from m/s into cm/μs:

$$c = 343.5 * 100 / 10\text{^}6$$

At T= 20°C, c = 0.03435 cm/μs

Hence, the formula to find the distance, D is

$$D = (\Delta t/2) * c$$

D = 250 * 0.03435 = 8.6 cm

Thus in this particular case the object is at a distance of 8.6 cm from the Ultrasound Sensor.

Figure 6 : Proposed display of Driver Assistant Module

VII. Conclusion

The primary focus was to replace the existing RFID based engine immobiliser with a better and foolproof system which was achieved by implementing Face Recognition as the primary defense mechanism against vehicle theft, using NI LabVIEW and its toolkits. A Third Party Access mode also been developed to help people who do not have their templates stored in the system to run the vehicle for a pre- programmed amount of time. The Passive Defense System (PDS), which includes the OTP generation and it's mailing, is also implemented using the State Machine in NI LabVIEW. A Transdermal Alcohol Sensor interface is proposed which adds to the safety of the driver and the surroundings by avoiding Driving in Impaired condition. Apart from these, an ultrasonic sensor based guidance system is also integrated to the vehicle so as to provide a guidance system to the driver during adverse cases such as heavy fog or poor visibility. All these systems work as a package and offers greater passenger safety while reducing the risk of vehicle theft.

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

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

(h) Brief Acknowledgements.

(i) References in the proper form.

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

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

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

Format

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

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

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

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

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

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Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

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

Key Words

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

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

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

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

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

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

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

Acknowledgements: Please make these as concise as possible.

References

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

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

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

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

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

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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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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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.

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To make a paper clear

· Adhere to recommended page limits

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- 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

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

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

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

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

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

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

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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.

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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.

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- 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)

Approach:

- Single section, and succinct
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- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
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- 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:

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- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
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- 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.

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- 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.

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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.
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- 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.
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- 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.
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- If you desire, you may place your figures and tables properly within the text of your results part.

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- 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
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- In spite of position, each table must be titled, numbered one after the other and complete with heading
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- 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
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- 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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- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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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

INDEX

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