



3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

Number of papers published in national/ international conference proceedings

INDEX SHEET

2016-2017

Sl. No	Name of the teacher	Title of the paper	Publication No.
1	Ms.Diana Davis	Haar wavelet transform based histogram concatenation model for finger print spoofing detection	98
2	Dr. Wajeed	Adopting Ant Colony Optimization for Supervised Text Classification	99
3	Bindhu K. Rajan	Braille code conversion to voice in Malayalam	100
4	Bindhu K. Rajan	Text recognition and face detection aid for visually impaired person using Raspberry PI	101
5	M. Ponmani Raja	WSN based industrial parameter monitoring using smartwatch	102
6	Ms. Nyni K. A	Wireless Health Monitoring System for ECG, EMG and EEG Detecting	103
7	Neethu Rose	Power management system in vessel	104
8	Jenson Jose	A novel three phase three level step up multilevel inverter topology for aircraft applications.	105
9	Kapildas K S	Improved Nonisolated Bidirectional DC-DC Converter with high voltage for PV Hybrid Power Systems.	106
10	Reshma Raj, Aathira K V, Jarin T	Methods for Assimilating Non-Deterministic Features in PWM Tactics of Induction Motor Drives and FPGA based Experimental Presentation.	107
11	Dr.Anitha Jacob	Crash Prediction Modelling of Rural Highway Curves Using Consistency Index,	108
12	Jisha Akkara	Design Consistency Evaluation for Two - Lane Rural Roads: A Case Study from Kerala	109
13	Dr.Anitha Jacob	Effect of Consistency on Safety of Non-Urban Highway	110
14	Dr.Anitha Jacob	Operating Speed Model Development for Two-Lane Rural Highways	111

Haar Wavelet Transform Based Histogram Concatenation Model for Finger Print Spoofing Detection

Susan Shaju and Diana Davis

Abstract—Biometrics in general is basically a measure to analyze the identity of a person by means of the person's bodily characteristics. Biometric authentication has now a day's been a very important part of the digital world. Among the several biometric authentications fingerprints are the most widely accepted one due to its uniqueness factor. But overtime the biometric system has become intensively vulnerable to the various kinds of attacks by the imposters. The finger prints can be easily fabricated using the materials such as gelatin, latex or silicon etc. So here we are proposing a software based design model for fingerprint spoofing detection where the texture features is extracted in wavelet domain. The fingerprint images are partitioned into $n \times n$ patches and are then transformed to wavelet domain using the Haar wavelet transforms. The binary pattern generated by comparison of the approximation sub band coefficients is then transformed into histograms. The concatenation of the histograms results in the corresponding feature vector that represents the textural characteristics. And finally based on these histogram features the test fingerprints are classified to be either spoofed or real using Support vector machine.

Index Terms—Fingerprint Spoofing Detection, Haar Wavelet Transform, Least Square Mean, Spoofing Detection, Support Vector Machine.

I. INTRODUCTION

Biometrics is basically a measure to analyze the identity of a person by means of the person's bodily characteristics. Its prime aim is to authenticate the identity of a specific person. Biometrics involves the elements such as face, fingerprints, geometry of hand the iris etc. It can be used to either identify a person devoid of the persons knowledge from a crowd of people or can be employed to verify the person's identity. Nowadays even multiple such elements are being considered collectively in order to authenticate the person to be genuine and this is called the multimodal biometric system [1], [2].

Among the diverse forms of biometrics, fingerprint tends to be the most extensively accepted means, and it is likely to have numerous gains compared to the conventional means like passwords and tokens. Fingerprint authentication is a means to verify the fingerprint matching based on a pre collected sample. The ridge patterns within the finger prints can be grouped as loops, arches, whorls etc. Arches are more like open curves, the loops can be either slanting toward the right or left or even both which is called a double loop. And whorls are a ridge pattern that makes a complete circle. The next set of features is the eye, delta, bifurcation, core, ridge endings, and islands etc shown in Fig. 1. where delta is a point where the different orientations converge. Bifurcation is the division of ridge into two branches and the ridge endings are where the ridges terminate. And finally comes to the high level features such as pores, scars, creases etc.

Finger prints are usually captured using finger print scanners such as the optical scanners. The captivity scanners use tiny capacitor circuits to gather the biometric data and the most commonly used ones are the ultrasonic scanners. The ultrasonic scanner finds a very wide application in the smart phone authentications. The fingerprints are also captured using the fingerprint cards. Such fingerprint cards serve the purpose of verifying the person at immigration centers. It is a printed piece of paper that keeps track of a person's fingerprints. But these recognition systems like the fingerprint scanners can easily be fooled using an accurate imitation of a real fingerprint.

The extensive use of such biometrics has been motivating the imposter to fabricate fingerprints. Fingerprint ridges can be easily manipulated artificially using materials such as gum, silicone, latex, gelatin etc to maliciously get unauthorized access to the biometric protected systems. The imposters simply use these fake fingers to claim the identity of some other person to which the actual ridge pattern belongs thus putting forth a direct security threat to these authentication systems. So to address this issue it is important to have a fingerprint liveness detection system that can efficiently distinguish between the fake and real fingerprints that are being captured [3]. Efficiency of the fingerprint spoofing detection is the measure of the systems capability to distinguish between the real and spoofed fingerprints.

Susan Shaju is with the Computer Science Engineering Department, Jyothi Engineering College, Cheruthuruthy, A P J Abdul Kalam Technological University, Kerala, India. (e-mail: suzishaju@gmail.com).

Diana Davis is with the Computer Science Engineering Department, Jyothi Engineering College, Cheruthuruthy, Kerala, India. (e-mail: diana@jecc.ac.in).

Adopting Ant Colony Optimization for Supervised Text Classification

Mohammed Abdul Wajeed

Professor, Computer Science & Engineering Dept.
Jyothi Engineering College
Cheruthuruthy, Thrissur, India
drwajeedphd@gmail.com

T Adilakshmi

Professor & Head, CSE Dept.
Vasavi College of Engineering
Hyderabad

Abstract—Different electronic gadgets have become indispensable part of human life in the era of information technology, as a result abundant data is generated which is growing in exponential order. The data generated is generally stored in dumped repositories, with the sole purpose of verification as a proof. If the data is stored in classified repository, accessing the required data at a later time or navigation can be done easily. Treating the classified repository as a resource efficient decision making can be made easily. Ant Colony Optimization belongs to meta-heuristic class of optimization algorithms. An individual ant plays no role, but as a colony they are very powerful in solving optimization problems based on the probabilistic techniques. The paper attempts in classifying the textual documents using Ant Colony Optimization in supervised learning paradigm. The results obtained are encouraging.

Keywords—*Ant Colony Optimization, Supervised learning, Text Classification.*

I. INTRODUCTION

Text classification has been the core research area in the field of data mining. Although in the recent past considerable research is addressed in classifying the unstructured data, still it is relatively upcoming area from the perspective of research when compared with structured data classification. In text classification bags-of-words (BOW) approach and parts-of-speech (POS) approach is employed as in [9] [10]. In BOW approach the presence of the word alone is taken into consideration rather than the context in which it appears in the document. In POS the context is taken into consideration, in addition the problems of synonyms (words having different spelling and pronunciation but similar meaning based on the context, for example bread, food), homonyms (words that have same spelling and pronunciation but different meaning based on the context, for example bank can be river bank or financial bank) is also addressed. The present paper employs BOW approach.

In any ACO based algorithm, the behavior and nature of the collective ant colony is used in solving the meta-heuristic Optimization problems as in [1], which is based on the probabilistic technique. The first algorithm in ACO family is proposed by Marco Dorigo in 1992 in his PhD thesis, which was aiming to search for an optimal path in a graph, based on the behavior of ants as in [2]. Since then ACO is applied in diversified wider areas. Ants in their path leave a secretion called pheromone.

In the process of finding shortest path between the food source and ants nest, ants wander initially randomly in search of food, upon finding food returns to their colony while excreting pheromone trails. If another ant sense pheromone instead of moving randomly follows the trail which has pheromone eventually discovers the path between the food source and their nest. The pheromone over time gets evaporate, which reduces the chance of other ants to choose the same path. But short paths in comparison are attracted by many ants as more pheromone is deposited than the longer paths, also evaporation is less due to the shorter distance, and another ant can trace the path and deposit pheromone over it in less span of time due to its more pheromone concentration.

The paper aims in exploring the text classification using the supervised learning paradigm by adopting the Ant Colony Optimization technique by a novel idea which is provided in section IV of the paper.

II. BACKGROUND WORK

Definitions: - We are provided with the training document set T_s whose class label is given along with the document. We are also given a set of document set T_t termed as test data set whose class label is to be determined by the classifier. Lexicon set \mathcal{L} is a set which contains all words, that have appeared in the training document set T_s as in [5].

Using the training data from the text corpus from [6], which has 5485 number of documents that are spread across 8 numbers of classes a classifier, is built. In addition to the training data the corpus has 2189 number of documents which is considered as test data. As it is assumed that the training data and test data are from the same distribution, so the number of classes in the training and test documents is same, which is 8 in the present experiment. Lexicon set is a set which contains all the terms (words) that occurred in the training data documents. In the process of construction of the lexicon set only training documents are considered, since we assume that the training data and test data are in the same distribution, so lexicon set would almost be the same for the training data and test data. More ever test data in general will be dynamic in nature in real scenarios and will not be available at the time of lexicon construction phase. Hence test data cannot be used in the process of lexicon set construction. So Lexicon set constructed, using the training data alone would suffice. In order to reduce the cardinality of the lexicon

Braille Code Conversion to Voice in Malayalam

Bindhu K Rajan and Anjitha V

Abstract—Braille Coding System is a method that is widely used by visually impaired people to read and write. Braille Code generally consists of cells of raised dots arranged in a grid to inscribe characters on paper. Blind People can sense the presence and absence of dots using their fingertips, giving them the code for symbol. Here a method is proposed for converting Braille codes to Malayalam voice message implemented using MATLAB which can be read out to many through the computer. In this paper Braille code is extracted from input image and it is mapped to the Malayalam database and spoken out.

Index Terms—Braille Character Recognition, extraction, filtering, segmentation, text enhancement, translation

I. INTRODUCTION

IN our daily life, we are seeing a lot of blind people in our society. These people face difficulties with their normal activities such as reading, walking, driving, socializing and writing. A French educator named Louis Braille developed a system for blind people to read and write which was known as Braille system. In this system patterns of raised dots were used to inscribe the characters on paper. It therefore helps visually-impaired people to read and write using single touch instead of vision. It is a way for blind people to actively participate in social activities and literature. Braille system was first developed in the nineteenth century. Its characters are six-dot cells, with two columns and 3 rows. Any of the dots may be raised above the paper plain thus giving 64 possible characters. Although Braille cells are used world-wide, the meaning of each of the 64 cells depends on the language that they are being used to depict. The concept of Braille was universally adapted.

With the help of scanners printed documents can be transformed to soft copies. The text in these soft copies can be translated to Braille code using any of the image processing algorithms. These Braille codes can be directed to Braille output devices such as Braille Printers. Certain Braille input devices has been designed with which Braille code can be directly entered by the Braille users with the help of standard QWERTY keyboard. Usually Braille code is stored on computers as North American Computer Braille code, which is a mapping of six dot Braille code to ASCII English character.

Bindhu K Rajan is with Jyothi Engineering College, Jyothi Hills, Cheruthuruthy, Thrissur, Kerala 67953(phone: 9995010047,e-mail: bindhukrajan09@gmail.com).

Anjitha V is with Jyothi Engineering College, Jyothi Hills, Cheruthuruthy, Thrissur,Kerala,67953,(phone:8086750488,email:anjitha.gkrishnan@gmail.com).

These Braille codes are printed on a thick sheet of paper using special symbols representing an alphabet. A Braille cell is composed of six dots arranged in three rows and two columns. In early days Braille use 8 dots to represent a character which creates discomfort for the blind people to read and so it was reduced to six dots which can be comfortably recognized in single touch Fig. 1 shows a Braille cell with 6 dots and Fig. 2 represents the Braille character for alphabet b.



Fig. 1. Braille cell



Fig. 2. Braille Character Corresponding to Alphabet 'b'

This paper describes an algorithm for translating Braille code for Malayalam characters to voice. The idea is implemented on an existing translation system combined with a finite state machine with certain context matching and translation rules. The paper set is mentioned as below. Section II describes the pre-existing method.

II. PRE-EXISTING METHOD

In the paper titled "Braille Translation", by Farhan Bodale, Uddhav Bhide, Dilip Gore [1], Braille Character is extracted from the given text message. These codes are compared with inputs and the system return the related patterns. If it is matched then Braille will be printed. But visually impaired people could not be able to make use of the proposed system as it is. There is requirement for Braille code to be converted to any local language so that without taking

TEXT RECOGNITION AND FACE DETECTION AID FOR VISUALLY IMPAIRED PERSON USING RASPBERRY PI

Mr. Rajesh M.
Scientist/Engineer 'C'
NIELIT, NIT campus
Calicut, Kerala, India
rajeshm@nielit.gov.in

Ms. Bindhu K. Rajan
Electronics and Communication Engineering
Jyothi Engineering College Cheruthuruthy,
Thrissur, Kerala, India
bindhukrajan09@gmail.com

Ajay Roy, Almaria Thomas K,
Ancy Thomas, Bincy Tharakan T, Dinesh C
Electronics and Communication Engineering
Jyothi Engineering College Cheruthuruthy,
Thrissur, Kerala, India
ajayroypl995@gmail.com, almariakt@gmail.com,
ancytpjec2015@gmail.com, bincytharakan96@gmail.com,
dineshrajagiri@gmail.com

Abstract— Speech and text is the main medium for human communication. A person needs vision to access the information in a text. However those who have poor vision can gather information from voice. This paper proposes a camera based assistive text reading to help visually impaired person in reading the text present on the captured image. The faces can also be detected when a person enter into the frame by the mode control. The proposed idea involves text extraction from scanned image using Tesseract Optical Character Recognition (OCR) and converting the text to speech by e-Speak tool, a process which makes visually impaired persons to read the text. This is a prototype for blind people to recognize the products in real world by extracting the text on image and converting it into speech. Proposed method is carried out by using Raspberry pi and portability is achieved by using a battery backup. Thus the user can carry the device anywhere and able to use at any time. Upon entering the camera view previously stored faces are identified and informed which can be implemented as a future technology. This technology helps millions of people in the world who experience a significant loss of vision.

Index Terms—Stroke Width Transform (SWT), gaussian filter, adaptive gaussian thresholding, OCR engine, e-Speak

I. INTRODUCTION

Due to eye diseases, age related causes, uncontrolled diabetes, accidents and other reasons the number of visually impaired persons increased every year. One of the most significant difficulty for a visually impaired person is to read. Recent developments in mobile phones, computers, and

availability of digital cameras make it feasible to assist the blind person by developing camera based applications that combine computer vision tools with other existing beneficial products such as Optical Character Recognition (OCR) system.

In this proposed system text recognition is done by Open Computer Vision (Open CV), a library of functions used for implementing image processing techniques. Image processing is a technique of using mathematical operations in image, any form of inputs such as image, a series of images, or a video can be used for processing. An image or a set of characteristics or parameters related to image is the output of image processing. Image processing has various applications like computer graphics, scanning, facial recognition, text recognition etc. Various features of text like its font, font size, alignment, background etc influences in its recognition. Number plate recognition is a fair example for text extraction.

Text extraction from an image is carried out by OCR. It is a method of conversion of images of writings on a label, printed books, sign boards etc. to text only. OCR helps to create reading devices for visually impaired persons and technologies involving telegraphy. The binary image is converted to text by Tesseract library in OCR engine that detects the outline, slope, pitches, white spaces and joint letters. It also checks the quality of the recognized text. In this system the conversion of text to voice output is by e-Speak algorithm. The e-Speak is a Text-To-Speech (TTS) system which converts text into speech. The artificial production of human speech is known as speech synthesis. The speech synthesizer can be implemented in a software or a hardware product. The platform used for this

WSN Based Industrial Parameter Monitoring Using Smartwatch

Ms. Sandra P.S.,
Mr. Sandeep C.M.,
Mr. Vivek Nair,
Ms. Vindhujha M.V.,
Ms. Shruti S. Nair
Jyothi Engineering College, Thrissur,
India.

Mr. Ponmani Raja M.
Asst. Prof.
Dept. of Electronics and
Communication Engg.
Jyothi Engineering College, Thrissur,
India.

Abstract— In any industry, the monitoring and controlling of various system parameters like temperature, pressure etc. is cardinal since the production factor and overall safety relies on them. Wireless Sensor Network (WSN) in this paper has been employed to collect data about various physical parameters and their effective monitoring. In multi system industrial environment, the monitoring of various physical parameters in real time has always been a cumbersome task since these parameters were made available only in a single controlling location. The proposed system consists of a sensor interface device and an Radio Frequency Identification (RFID) enabled smart watch for industrial WSN. Since the smart watch is RFID enabled, it can be used as an authentication device and also to identify the exact work location of the user in the industry, there by sending only the sensor data of that specific area. The critical situations can be avoided and preventive measures are successfully taken.

Index Terms—Wireless Sensor Network (WSN), Radio Frequency Identification (RFID), Graphical User Interface (GUI), Smartwatch, ZigBee.

I. INTRODUCTION

In this day and age, where prior importance is given to the development and civilization, the safety and security of the employees is often overlooked and remains unheeded. This has led to a scenario of perilous working environment which increases the frequency of mishaps and adversities. This confines the production factor of any industry and it indirectly affects the build out of the industrial sector of the nation's economy as a whole. User safety is a vital factor of importance in industrial domain and hence unmanned action of operation is always preferred over manned action. Monitoring and controlling of each division demands umpteen number of task. Wireless Sensor Networks (WSNs) are appealing, attractive and agreeable in many intensive computing environments and plays a key role in technology for monitoring and control of predefined parameters. They are available at feasible and affordable price and are designed, fabricated in viable sizes and utilize extremely low power[6]. WSN's are cementing its stature as a propitious technique to improve healthcare, monitoring and controlling, electronics, etc. In past years, WSN has stepped out of the laboratories and now is an indispensable part of the real time world.

Because of its far reaching application, ease of establishment, convenience of maintenance and its working efficiency, it has found a place in every domain of life, relating humans to technology [5]. Graphical User Interface (GUI) based monitoring and network reprogramming has enormously contributed to the escalation of the WSNs. This invites new design of smart sensors incorporating digital communication standard interface and many options including self-diagnosis, auto-calibration, multi sensing, data storage in a electronic data sheet [4]. Stretching the application of WSN to industries and keeping in mind the safety and security of working staff, this paper proposes a concept to do the same. To accomplish this task wireless communication and sensor interfaces are put together on a single platform. On time values of parameters like temperature and gas are collected and displayed for easy transparency. During the times of shoot up of the values, the workers are alerted, hence the aim is attained.

The paper contains the following sections. In section II, we describe similar systems from previous literature. In section III, we have included the different technologies used in our system. The architecture of the proposed system is presented in section IV. In section V, the program design is described in detail. Section VI depicts the experimental setup required for this project to be accomplished. Section VII brings out the application and future scope of the system. Finally, the paper is concluded at section VIII.

II. LITERATURE SURVEY

Wireless Sensor Network has become a popular technology in various areas such as industrial infrastructure, automation, health, traffic, and many consumer areas. The development of WSN was mainly inspired by military applications. So it holds an important role in today's world. WSN has also application over health care and remote monitoring. Remote monitoring covers a large range of applications where wired systems can be replaced by wireless systems; thereby reducing wiring cost and also allows new types of measurement applications. Monitoring of environmental parameters like air, water, and soil, and structural monitoring for buildings and bridges, industrial machine monitoring, process monitoring and asset tracking are included within this remote monitoring[10],[11].

Wireless Health Monitoring System for ECG, EMG and EEG Detecting

Ms. Nyni K.A, Linson K Vincent, Lisiya Varghese
Electronics and Communication Engineering
Jyothi Engineering College Cheruthuruthy,
Thrissur, Kerala, India
nyni@jecc.ac.in, linsonkvincent12@gmail.com,
lisiyavarghese1995@gmail.com

Liya V.L, Neethu Johny A, Yesudas C.V
Electronics and Communication Engineering
Jyothi Engineering College Cheruthuruthy,
Thrissur, Kerala, India
liyavlazer@gmail.com, neethujohny95@gmail.com,
yesudasev333@gmail.com

Abstract— In the field of human health care, health monitoring system has a great significant role. The health monitoring contributes a wide variety of applications such as hospital, home care unit, sports training and emergency monitoring system. In this work, a wireless biosignal system is designed for health monitoring which integrates both the extracting and monitoring of the biosignal such as ECG, EEG and EMG. The developed integrating system is used for wireless monitoring of patient's biopotential changes of the heart, neuronal activity of the brain and muscles of the body. Dry electrodes, biosignal amplifier and filters are used for the development of this wireless system. The system also allows the continuous monitoring and graphical representation of the health condition of patient on a computer screen, even if the physician is away from the patient. The successful implementation of this wireless system is help to overcome the limitations of wired health monitoring system. Obviously it is a solution to bridging the gap between the doctor and the patients and best to be used on rural areas. Ultimate goal of this paper is to implement a low cost, high efficient wireless system for health monitoring.

Keywords—ECG, EEG, EMG, biosignal, biopotential

I. INTRODUCTION

Different signals are generated by human body. Such signals are called biosignals. Biosignals can be defined as any signal in living being that can be continually measured and monitored. It may be electric and non electric signal. This bioelectric signal can be formed in certain cells of the body due to differences in concentration of certain chemical ions such as sodium, chloride and potassium ions.

Biosignals can be measured using sensors such as electrodes that are skin surface transducers. The transducers are a device which converts the one form of physical signal into electric signal. The signal can be processed in electric

circuits, that are bio electrodes, which are commonly used for measuring biosignals. In this proposed method, electrodes made up of silver-silver chloride metal is used.

Among the biosignal measuring devices well known devices are electrocardiogram(ECG), electroencephalogram (EEG) and electromyogram (EMG). These signals are mainly used for application like disease diagnosis. ECG signals are bipolar low frequency signal. The normal range of ECG signal is 0.05-100Hz having its amplitude range from 10 microvolt to 5 millivolt. 1mv is typical value for ECG amplitude. For EEG signal at low frequency 0.5-100Hz, 1-100 microvolt peak to peak is voltage range at cranial surface. ECG signal voltage is 100 times greater than EEG signal. So EEG signal requires input preamplifier with high gain.

The information about frequency and voltage of signals from different measuring devices helps in diagnosis of the disease corresponding to the body part. Among them ECG is for diagnosing heart related diseases and disorders such as sudden cardiac arrest, cardiovascular diseases and so on. EEG measures biopotential generated by neuronal activity of brain. It is very complex than ECG.

EEG In the medical field, evolution of technology is extremely fast passed. Separate devices are present for measuring ECG, EEG and EMG. In this proposed methodology aim is to develop a low cost biosignal acquisition system which is affordable for the people of developing and under developed country. In previous papers, separate devices were used for ECG, EEG, and EMG. This paper presents a biosignal acquisition system, which is portable, battery powered and also includes wireless facility. Biosignal is transferred by Bluetooth serial communication

True Copy Attested

Dr. SUNNY JOSEPH KALAYATHANKAL
M.Tech, MCA, M.Sc, M.Phil, B.Ed
Ph.D (Computer Science), Ph.D (Mathematics)

POWER MANAGEMENT SYSTEM IN VESSEL

Abdul Hafis A Jaleel, Gloria Devassy, Melvin C Vincent, Neethu Rose, Rinto Raphel, Sreechithra C M,
 Department Of Applied Electronics And Instrumentation Engineering
 Jyothi Engineering College, Cheruthuruthy,
 Thrissur-679531, Kerala, India.
 rintorapheal2002@gmail.com, chithranair94@gmail.com.

Abstract. The power management system (PMS) is designed for full automation of any power plant. The power management system (PMS) plays a crucial part of the automation and power systems on marine vessels as well. The PMS controls the power system in such a way to maximize the blackout prevention and minimize the fuel consumption in marine vessels. It also serves to decrease the maintenance costs through protecting the equipment against failures and malfunctioning. Through the interaction between PMS and other control systems, the performance of the vessel can be maximized.

In a ship based power system each generator is equipped with its own independent and autonomous PMS system. It can ensure the high degree of reliability. A ship based power system mainly consists of three generators in turn run by diesel engine provided individually. The PMS input-output module is equipped with a controller which executes generator control functions and the input-output module communicates with the PMS operator panel.

The purpose of this paper is to develop power management system in a model ship using a simulating software codesys v 2.3 .

Keyword-Vessel, Power Management System (P.M.S), Codesys

I. INTRODUCTION

The primary objective of this work is to development of a control system, power management system (PMS) which is capable to improve the system robustness due to blackout and handle machinery components under minimal stress under all operational conditions.

Today the electric marine power system tends to have more system functionality implemented in integrated automation systems. The present state of the art type of tools and methods for analysing marine power systems do only to a limited extend utilize the increased knowledge available with each of the mechanical and electrical engineering disciplines. As the propulsion system in typically consisted of the largest consumers on the vessel, important interactions exists between the PMS and vessel propulsion system. These are interacted through dynamic positioning (DP) controller, thrust allocation algorithm, local thrust controllers, generator's local frequency and voltage controllers. The PMS interact with the propulsion system through the following main functions: available power static load control, load rate limiting control and blackout prevention control (i.e. fast load reduction). These functions serve to

prevent the blackout and to ensure that the vessel will always have enough power.

The PMS interacts with other control systems in order to prevent a blackout and to minimize operational cost. The possibilities to maximize the performance of the vessel, increase the robustness to faults and decrease a component wear-out rate are mainly addressed locally for individual control systems.

This project defines a way to develop the simulator using codesys v 2.3 for this ship based power management system which operates intelligently for controlling the generator when required and thereby achieving the power management.

II. BLOCK DIAGRAM DESCRIPTION

The proposed block diagram mainly consists of three blocks they are as follows

1. Independent D-G set connected to the bus bar.
2. PMS operator module connected to each D-G set.
3. PMS I/O module connected to each D-G set.

The mechanical energy required for the generator is supplied by the diesel engine. Generally, three diesel-generator sets are independently connected to the bus bar in marine power system for transmitting the energy developed in the generator by making use of the mechanical energy supplied by the diesel engine.

Generally, two generators will be connected to the bus bar for feeding the electrical needs in the ships.

In order to overcome disadvantages of the complex, bulky controller that we are using nowadays in marine power management we are designing this smart, intelligent power management system which can operate intelligently according to the electrical needs of the ships.

The fig1 shows the proposed block diagram of this intelligent system which can automatically observe and control the entire electrical parameters of the ship thereby operating the D-G set as per the requirement

The diesel engine and the generator are connected to its I/O PMS module for continuously observing the parameters of the D-G set.

The generator parameters such as active power (kW), voltage (v), current (A), frequency (Hz), reactive power (KVAR), and power factor (cosphi) will be displayed at operator station. These parameters are analyzed by the operator which is connected to the I/O module act as brain of the system.

A Novel Three Phase Three Level Step up Multilevel Inverter Topology for Aircraft Applications

Justin John, Jenson Jose and Paul Davis
Department of Electrical and Electronics Engineering
Jyothi Engineering College
Thrissur, India

justinjohnka@gmail.com, jensonjosep@gmail.com, pauldvs91@gmail.com

Abstract—Multilevel inverters give a near sinusoidal output, thus avoiding the need of a bulky filter in the inverter output. This paper proposes a novel three phase three level multilevel inverter using switched capacitors. The operating frequency is 400Hz, thus enabling its usage in aircraft and aerospace applications. The circuit is simulated using MATLAB Simulink and results are analyzed. A prototype is made and output is verified within limitations.

Keywords—multilevel inverter; three level; step up; sine PWM

I. INTRODUCTION

The fast growing world paves way for depletion of natural non renewable resources in an alarming rate. This facilitates more research in the efficient use of renewable energy resources. Problems with the renewable energy sources are the low voltage output and its inconsistent nature. So the need for stepping up of the inverter voltage becomes necessary. The non conventional inverters gives a two level output which has got high level of harmonics. This causes the need for bulky filters, which create problems in the aircraft industries. Therefore, multilevel inverters are used to obtain a near sinusoidal waveform. This gives a reduced THD output.

On studying the literature, it can be seen that majority of the circuit contain multiple voltage sources and increased number of switches. Also, in aircraft applications, the permitted THD is below 3-5%. Many of the topologies have got a THD greater than 3%. Though the conventional multilevel topologies give a reduced THD output, it will not step up the output voltage. These problems are addressed in this paper thus giving a stepped up output with reduced THD.

A researcher named Yuanmao Ye [1], introduced a single phase topology which has reduced number of switches and a single voltage source. This circuit consists of a dc part and an ac part. This circuit is modified into a three phase topology and desired output is obtained. It is also proved that this topology cannot be extended to higher number of levels, which is stated otherwise in the base paper [1].

II. PROPOSED TOPOLOGY

The proposed circuit is shown in Fig. 1. It necessarily consists of three legs, which are the three phases, phase A,

phase B and phase C. For each leg, two diodes and one capacitor constitute one leg. Therefore, the whole circuit consists of twelve switches, six diodes and three capacitors. All the three legs are connected to a common point. The main advantage of the circuit is the usage of a single voltage source.

The three phase output is taken from the three legs of the converter. A star connected load is used for the analysis. Circuit explanation is given for one phase of the converter. Working of other two phases is the same as that of the explained one. One phase leg of the proposed topology is shown in Fig. 2.

A. Zero Level

For obtaining the zero level output, the switches Q_0 and Q_3 are kept ON. Q_1 and Q_2 are kept OFF. In this state, the capacitor charges through the switch Q_0 . The output remains zero. Fig. 3 explains the working of a phase leg to obtain zero level output.

B. $+V_{dc}$ Level

For obtaining $+V_{dc}$ level, the switches, Q_2 and Q_3 are inverted from that of zero level stage. This ensures that the capacitor C_1 is still in the charging mode. At the same time, the input voltage V_{dc} is taken out through the diode D_1 and switch Q_2 . Fig. 4 explains the working of a phase leg to obtain $+V_{dc}$ level output.

C. $+2V_{dc}$ Level

For obtaining $+2V_{dc}$ level, the switch Q_0 is turned OFF and switch Q_2 is turned ON. Switch Q_3 will remain in its ON state and Q_1 will remain in its OFF state. Here, the input voltage V_{dc} is added up with the capacitor voltage and is taken out through the switch Q_2 which gives $+2V_{dc}$ output. Fig. 5 explains the working of a phase leg to obtain $+2V_{dc}$ level output.

This comprises the working of one phase leg. The working of other two phases is same as explained above but with 120° apart. The pole voltage is taken between the switches Q_0 and Q_3 , and the common point. The pole voltage shows the three level output and this determines the output of the three phase multilevel inverter.

True Copy Attested

Dr. SUNNY JOSEPH KALAYATHANKAL
M.Tech, MCA, M.Sc., M.Phill, Ph.D.
Ph.D (Computer Science)
PRINCIPAL
Jyothi Engineering College
Cheruthuruthy P.O.

IMPROVED NONISOLATED BIDIRECTIONAL DC-DC CONVERTER WITH HIGH VOLTAGE GAIN FOR PV HYBRID POWER SYSTEMS

Jismi Vincent
PG Scholar
Jyothi Engineering College
jiscathrine@gmail.com

Ms.Aathira K.V
Asst. Prof, Dept of EEE
Jyothi Engineering College
aathira@jecc.ac.in

Mr. Kapil Das K.S
Asst. Prof, Dept of EEE
Jyothi Engineering College
kapil@jecc.ac.in

Abstract—This paper presents a nonisolated bidirectional DC-DC converter with four switches. The converter structure also consists of two inductors and capacitors. Because of this simple structure the control of the circuit is easy. This converter has larger gain than the conventional cascaded bidirectional buck/boost converter (CCBC) in step up mode, although the gain is reduced in step down mode. Moreover the use of synchronous rectifiers enhances the efficiency. A detailed analysis of the converter is presented in this paper. To validate the design procedure and performance of the proposed converter simulation is performed.

Keywords—nonisolated bidirectional, DC-DC converter, synchronous rectifier, efficiency

I. INTRODUCTION

In this current world scenario, demand for renewable energy sources has increased due to environmental issues and limited fossil fuels. Different types of converters have been utilized to provide grid connection to the renewable energy sources. Wind energy, solar energy and Fuel cells are widely used renewable sources [1]-[2]. The drawback of these energy sources are the discontinuity of extracted power due variations in climatic conditions. This necessitates the use of battery that replenishes the insufficient power and also uses the surplus power to charge the battery [3]. Bidirectional converters are those which transfer power in either direction between two DC sources [4]. The various applications of these converters are uninterruptible power supplies (UPS), PV hybrid power systems, electric vehicles and many other industrial applications [5].

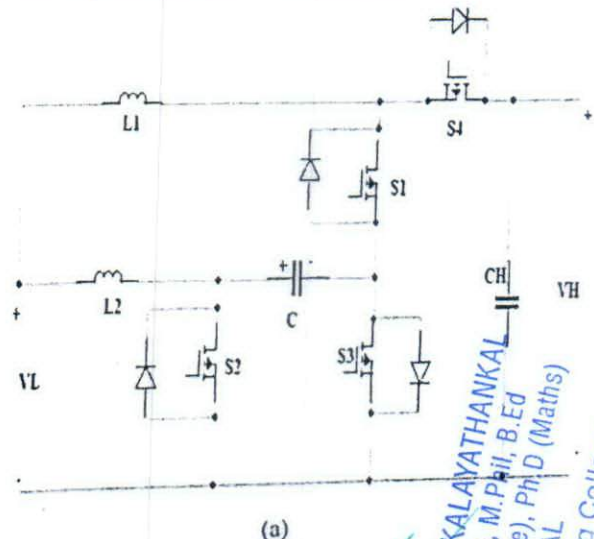
The bidirectional converters are of two types isolated and nonisolated. The isolated and nonisolated converters can be differentiated by the presence and absence of same electrical ground between source and load. Flyback converters [6], forward flyback converters [7], half bridge converters [8] and full bridge converters [9], are some of the isolated topologies. The main advantages of these converters are the large voltage gain in both step up and step down modes. Because of the simple structure and easy control flyback converters are widely used. But the switches of this converter suffer high voltage stress and also the leakage inductor energy cannot be recycled. In order to increase the efficiency and reduce the voltage stress voltage clamping techniques are used [10] The different non

isolated converters include conventional buck/boost converter [11], switched capacitor type [12], Sepic/ Zeta type [13], three level type [14] and coupled inductor types [15]. Though the losses are reduced and efficiency is improved most of these converters requires large number of switches which makes its driving circuitry complex. A converter with three power switches and mutual inductors is presented in [16]. The voltage gain of this converter is low.

A nonisolated bidirectional DC-DC converter with four switches is presented in this paper. Two switches act as power switches and remaining two as synchronous rectifiers. Simple structure and large voltage gain are the main features of this converter. It consists of two conventional boost converters.

II. OPERATING PRINCIPLE

Fig 1 shows the circuit configuration of the converter with four switches along with two capacitors and inductors. Two switches work as synchronous rectifiers while the other two as power switches. A detailed steady state analysis of the converter is performed with the following assumptions that the ON - STATE resistance R_{DS} of the switches and the equivalent series resistances of the inductors and capacitors are ignored and the voltages of the capacitors are constant.



(a)

Efficient Approach in Power Flow Based Transmission Cost Considering Maximum Line Loading

¹R.Ithaya, ²P.Jagatheeswari

¹Asst. Professor, Electrical and Electronics Engineering, Udaya school of engineering, India

²Professor, Electrical and Electronics Engineering, Ponjesly college of engineering, India

¹r.ithaya1@gmail.com, ²jagatheeswarissk@gmail.com

Abstract—This paper proposes the efficient approach in transmission with fixed cost allocation with pool based electricity market which takes into consideration the annual system operation. The optimal capacity in the transmission facilities are defined as the maximum power flow since the facility considered under a contingency for a certain system snapshot with equal values. In this efficient approach, for each and every interval, the largest optimal capacity with a transmission facility can be calculated for all N-1 conditions considering the security constrained optimal power flow and the available transfer capability. Charges for each facility with power flow are based on the facility level in the largest optimal capacity at all time intervals during all level of optimization. Allocation usage and capability is determined by generalized distribution factors with transmission efficiency and three variations of the MW method for pricing and calculating counter clock flows are calculated for the proposed cost allocation method. The proposed pricing method is applied to the IEEE 24-bus reliability test system in each and every unit and compared with other pricing methods and state.

Methods for Assimilating Non-Deterministic Features in PWM Tactics of Induction Motor Drives and FPGA Based Experimental Presentation

Reshma Raj.C¹,

Aathira K.V²,

Dr. Jarin T^{3*}

¹Asst.professor,Dept. of Electrical and Electronics Engg., Jyothi Engg. College,

²Asst.professor,Dept. of Electrical and Electronics Engg., Jyothi Engg. College,

³Assoc.Professor,Dept. of Electrical and Electronics Engg., Jyothi Engg. College,

reshma.mijesh@gmail.com;aathirakv@gmail.com;zarinaaf663@gmail.com

Abstract—The prime merits of non-deterministic Pulse Width Modulation (PWM) strategies are that the harmonic power in the output voltage is spread over the wide range in the frequency spectrum and does not get clustered at a specific frequency. This absence of distinct dominant harmonics results mainly in reduction of acoustic noise and torque ripples in drives. The effectiveness in acoustic noise reduction depends on how effectively the non-deterministic characteristics (randomness) are being amalgamated in the PWM strategy. This paper proposes two different methods to amalgamate the randomness in the PWM, suitable for induction motor drive. Firstly, a Pseudo Random Binary Sequence (PRBS) bit based random carrier PWM (RCPWM) is considered. Secondly, an investigation of the performance of random pulse position pulse width modulation (RPPPWM) has been conducted. A detailed simulation study on performance characteristics such as harmonic spectrum, Harmonic Spread Factor (HSF), Total Harmonic Distortion (THD), and power density spectrum, are presented for conventional sinusoidal PWM (SPWM), RCPWM and RPPPWM. The results are verified by implementing the prototype with VSI fed Induction motor. The implemented pulse width modulation using a SPARTAN-6 Field Programmable Gate Array (FPGA) (XC6SLX45), supports the simulation study.

Amrith
Dr. SUNNY JOSEPH
M.Tech, MCA, M.Sc, M.Phil, B.Ed
Ph.D (Computer Science), Ph.D (Maths)
1 PRINCIPAL
Jyothi Engineering College
Cheruthuruthy P.O.-679 531

CRASH PREDICTION MODELING OF RURAL HIGHWAY CURVES USING CONSISTENCY INDEX

Dr. Anitha Jacob^{a*}, Ms. Jisha Akkara^b, Ms. Asha Dominic^c and Ms. Henna Maria Paul^d

^{a*} Associate Professor, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India, 9447092923, anithajacob@jecc.ac.in

^b Assistant Professor, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

^{c,d} Final year UG students, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

Abstract

Design consistency assessment is a tool employed by the highway designers to improve road safety. It refers to the conformance of a highway's geometry with driver expectancy. Drivers make fewer errors in the vicinity of geometric features that conform with their expectations. The objective of this study is to investigate and quantify the relationship between design consistency and road safety for horizontal curves of two lane rural highways. The output of the work is the safety prediction model which incorporates consistency index and geometric variables as independent variables. Scope of the study is limited to horizontal curves of two-lane rural highways. For this, study stretches of length about 75 km, consisting of horizontal curves, was selected from various state highways of Thrissur and Palakkad districts.

The methodology adopted was data collection, analysis and modeling. The data collected for study comprised of geometric data of road, speed data and crash statistics. Geometric data includes radius, curve length, deflection angle, road width, degree of curvature, preceding tangent length and superelevation. Speed data collection was done separately for different vehicular classes like two wheeler, LMV (Light Motor Vehicle) and three wheeler both at tangent and midcurve locations. Operating speed was then estimated and certain indices were used to quantify the consistency of geometric design.


The consistency indices used are operating speed difference from design speed and operating speed and difference between operating speeds at tangent and mid-curve. The crash statistics obtained was converted into EPDO (Equivalent property damage only crashes), a measure of crashes according its severity by giving proper weightages. The data exploration included the development of scatter plots and correlation matrices to identify the relationship between various variables and indices with EPDO. Variables which have linear relationship with EPDO and their significance levels were finally identified from the data exploration phase.

Regression technique was applied for modeling crashes. Three types of regression analysis namely, linear regression, Poisson regression and negative binomial regression approaches were used for the model development. For two wheeler and three wheeler, Poisson regression models were found the best whereas linear model form was obtained for LMV class. It was found that width of highway and operating speed difference between tangent and midcurve are the significant variables. An increase in width may be increasing the speed of vehicles and it can be read along with the operating speed consistency measure. More crashes are expected when the speed inconsistency increases.

The models developed are useful quantitative tool to evaluate the impact of design consistency on safety. The study concluded that the models, which explicitly consider design consistency indices, can more effectively identify the locations of crash risks in two-lane rural highway curves.

Keywords: Crash prediction; Consistency indices; Operating speed; Linear regression; Poisson regression; Negative Binomial regression; two-lane rural highway.

True Copy Attested


Dr. SUNNY JOSEPH KALAYATHANKAL
M.Tech, MCA, M.Sc, M.Phil, B.Ed
Ph.D (Computer Science), Ph.D (Maths)
PRINCIPAL

DESIGN CONSISTENCY EVALUATION FOR TWO - LANE RURAL ROADS: A CASE STUDY FROM KERALA

Jisha Akkara ^a, Dr. Anitha Jacob ^b, Anna Vincent ^c, Abhishek. T. S ^d & Deepika. P ^{e*}

^a Assistant Professor, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

^b Associate Professor, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India.

^{c, d, e} Final year UG students, Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala, India

Abstract

Road accidents are most frequent and cause damage to human life and property. One of the main reasons for the occurrence of road accidents is lack of geometric design consistency. Geometric design consistency is having an important role in highway design. Design consistency is defined as the relationship between the geometric characteristics of a highway which is comfortable for safe driving. When the design is consistent with the driver expectation, the highway is consistent. This reduces the possibility of driving errors and unsafe manoeuvring. This paper focuses specifically on the development of new operating speed model in which the geometric features of an alignment are considered and also to evaluate design consistency with operating speed.

After taking several considerations into account, three study stretches were selected in Thrissur and Palakkad districts of Kerala State that comes under SH 23, SH 39, SH 50 and SH 74. Accident data on the selected roads were collected from 10 police stations. Geometrical survey and spot speed survey was carried out on the identified 50 curves. Spot speed data collection was conducted mechanically using the equipment TIRTL (Transportable Infra-Red Traffic Logger) and as well as manually.

Vehicles are categorised as Two Wheeler (2W), Three Wheeler (3W), Light Motor Vehicle (LMV) which includes car and jeep, Light Commercial Vehicle (LCV) which includes mini bus and mini truck, and Medium Commercial Vehicle (MCV) which includes bus and truck. Operating speed of each vehicle category was computed. Database includes geometrical elements like radius of curvature, curve length, deflection angle, width of road, level difference, degree of curvature, and also tangent length and traffic volume. Scatter plot was plotted to find out the relationship between operating speed and various geometric parameters. Then a correlation matrix was formed and the significant variables were identified. Multiple Linear Regression Analysis was performed at 95% confidence level. Models having greater R² value for each vehicle category were identified, performed validation and selected the model with least Root Mean Square Error Value.

Consistency evaluation was done based on Lamm's criteria which measures geometric design consistency in three levels (good, fair and poor). Based on these criteria about 26 curves were identified as good, 15 curves as fair and 3 as poor. Consistency rating was done for all types of vehicles. The number of accidents was found to be more at curves whose difference in 85th percentile speeds between tangent and curve is greater than 20 km/h. Accidents were found to be less at curves whose difference in 85th percentile speeds is less than 10 km/h. This criterion helps a designer to evaluate highway design and make suitable modifications in the design from the safety point of view.

Keywords: Consistency Evaluation; horizontal alignment; two-lane rural highway; operating speed;

Road accidents may be due to many factors like highway designs, pavement conditions, weather conditions, driver behaviour and speed limits *etc.* As the number of accidents increasing day by day, the design consistency evaluation of roads are becoming more significant. Geometric design consistency is an important component in highway design and an important tool in evaluating road safety. Design consistency refers to the condition where in the roadway alignment does not violate driver expectations [3]. Identifying and treating any

* Deepika.P. Tel.: +91 944 666 2897
E-mail address: deepika.p924@gmail.com

Dr. SUNNY JOSEPH KALAYATHANKAL
M.Tech, MCA, M.Sc, M.Phil, B.Ed
Ph.D (Computer Science), Ph.D (Maths)



EFFECT OF CONSISTENCY ON SAFETY OF NON-URBAN HIGHWAY

Anitha Jacob¹, Jisha Akkara², Henna Maria Paul³ and Asha Dominic⁴

¹Associate Professor, anithajacob@jcecc.ac.in ²Assistant Professor, jishaakkara@jcecc.ac.in

³UG student, hennamariapaul95@gmail.com

⁴UG student, jyashadominic@gmail.com

Department of Civil Engineering, Jyothi Engineering College, Cheruthuruthy, Thrissur, Kerala.

Abstract - Design consistency refers to the conformance of a highway's geometry with driver expectancy. Drivers make fewer errors in the vicinity of geometric features that conform to their expectations. The objective of this study is to investigate the level of significance of design consistency in predicting the road safety for horizontal curves of two-lane rural highway. For this, study stretches of length about 75km, consisting of horizontal curves, was selected from various state highways of Thrissur and Palakkad districts. Selected curves were deprived of gradient and have sufficient preceding tangent length. The methodology adopted was data collection, analysis and exploration. The data collected for study comprises of geometric data of road, operating speed at tangent and midcurve, crash statistics from nearby police stations and crash spot identification.

The consistency indices used are operating speed difference from design speed and operating speed and difference between operating speeds at tangent and mid-curve. The crash statistics obtained was converted into EPDO (Equivalent property damage only crashes), a measure of crashes according its severity by giving proper weightages. The data exploration included the development of scatter plots and correlation matrices to identify the relationship between various variables and indices with EPDO. Variables which have linear relationship with EPDO and their significance levels were finally identified from the data exploration phase. The study showed that the consistency indices and geometric features contribute more to crashes and have higher level of significance in safety prediction.

Keywords - Crash prediction, Consistency indices, Operating speed, Regression analysis

I. INTRODUCTION

Over the last few years road crashes has become one of the main causes of death and cause for large economic loss in the world. The economic losses due to property damage or fatalities has been estimated in the order of billions of rupees annually. Crash occurrence is mainly due to the involvement and interactions of multiple factors in a complicated manner. The global burden of disease study conducted by WHO reported that the number of disability adjusted life years caused by the road crashes would become the third largest in 2020 compared to the ninth position in 1990. In developed countries the fatality rates is decreased by 30% and is expected to increase by 80% in developing and under developed countries. Nearly 1.3million people die on every year on the world's roads and 20-50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury [1].

In India, the motor vehicle population is growing at a faster rate than the economic and population growth. The surge in motorization coupled with expansion of road network has crashes. According to the WHO, road traffic injuries are the sixth leading cause of death in India with a greater share of hospitalization, deaths, disabilities and socio-economic losses in the young and the middle aged population. In Kerala, road crashes have touched an all-time high during the last six years with 39,029 crashes being registered in 2015. As many as 4130 persons lost their lives in road crashes last year [2].

It is estimated that more than 50% of the total fatalities on rural highways can be attributed to the crashes that takes place on curved sections. Not all curves are crash prone, but that section that violates driver's expectancy becomes crash spot [3, 4, 5]. In other words, curve sections that lack consistency in the geometric design cause crashes. Design consistency refers to the highway geometry's conformance with the driver expectation. Generally drivers make fewer errors at geometric features that conform to their expectations. Therefore, improving highway design consistency is an important strategy that can aid rural highway safety. There are different ways in which consistency is measured [6]. They are based on operating speed, alignment indices, driver workload and vehicle stability.

Among the various measures, operating speed based consistency measure is the most common and widely adopted measure. There are two main ways in which operating speed is used. One is by finding the speed differential between design speed and operating speed and the other is by generating speed profiles for successive alignment features. Alignment indices are quantitative measures of the general character of a roadway segment's alignment. A large increase or a decrease in the values of alignment indices for successive roadway segments is an indication of geometric design inconsistency. Vehicle stability is an important issue in the safety consideration. It addresses the importance of design parameters such as superelevation and side friction on vehicle stability. Another measure is to evaluate the performance of the highway design by measuring the workload exerted by the highway on driver. Driver workload assumes that there is a relationship between the effort required to perform a task and the roadway geometrics presented during that performance.



OPERATING SPEED MODEL DEVELOPMENT FOR TWO-LANE RURAL HIGHWAYS

I Jisha Akkara¹, II Dr. Anitha Jacob², III Deepika P.³, IV Anna Vincent⁴ and V Abhishek T. S.⁵

¹ Assistant Professor, Department of Civil Engineering, Thrissur, Kerala, jishaakkara@jecc.ac.in

² Associate Professor, Department of Civil Engineering, Jyothi Engineering College Thrissur, Kerala, anithajacob@jecc.ac.in

^{3,4,5} Final year UG students, Department of Civil Engineering, Jyothi Engineering College, Thrissur, Kerala, deepika.p924@gmail.com, annanellissery@gmail.com, abhishek.4864@gmail.com,

Abstract - Road accidents are most frequent and cause damage to human life and property. One of the main reasons for the occurrence of road accidents is the unsafe operating speed of vehicles. The operating speed of a road is the speed at which motor vehicles generally operate on that road. Design speed is the selected speed used to determine the various geometric features of the roadway. This paper focuses specifically on the development of new operating speed model for two-lane rural highways in which the geometric features of an alignment are considered.

After taking several considerations into account, three study stretches were selected in Thrissur and Palakkad districts of Kerala State that comes under SH 23, SH 39, SH 50 and SH 74. Geometrical survey and spot speed survey was carried out on the identified 50 curves. Spot speed data collection was conducted mechanically using the equipment TIRTL (Transportable Infra-Red Traffic Logger) and as well as manually.

Vehicles are categorized as Two Wheeler (2W), Three Wheeler (3W), Light Motor Vehicle (LMV) which includes car and jeep, Light Commercial Vehicle (LCV) which includes mini bus and mini truck, and Medium Commercial Vehicle (MCV) which includes bus and truck. Operating speed of each vehicle category was computed. Database includes geometrical elements like radius of curvature, curve length, deflection angle, width of road, level difference, degree of curvature, and also tangent length and traffic volume. Scatter plot was plotted to find out the relationship between operating speed and various geometric parameters. Then a correlation matrix was formed and the significant variables were identified. Multiple Linear Regression Analysis was performed at 95% confidence level. Significant variables were found to be different for different category of vehicles. But traffic volume was found to be a common significant variable for all categories of vehicles. Models having greater R^2 value for each vehicle category were identified, performed validation and selected the model with least Root Mean Square Error Value.

Keywords - geometric survey, operating speed, regression analysis, spot speed survey, two-lane rural highway

I. INTRODUCTION

Road accidents may be due to many factors like highway designs, pavement conditions, weather conditions, driver behavior and speed limits etc. As the number of accidents increasing day by day, the operating speed of roads is becoming more significant. Operating speed is an important component in highway design and an important tool in evaluating road safety.

This paper focuses specifically on highway geometry, its effect on the speed of vehicles and its effect on safety. The operating speed of a highway is the speed at which motor vehicles generally operate on that highway. AASTHO defines the operating speed as "the highest overall speed at which a driver can travel on a given highway under favorable weather conditions and under prevailing traffic conditions without at any time exceeding the same speed as determined by the design speed on a section-by-section basis." The 85th percentile of a sample of observed speeds is the general statistic used to describe operating speeds on a geometric feature. Thus, operating speed, usually termed V_{85} , is defined as the 85-th percentile of the speed distribution under free flow conditions. It represents the speed scenario at a given section. Operating speeds on two-lane rural roads depend on many factors related to drivers, vehicles, roadway environment, radius of a horizontal curve, curvature change rate, grade, length of the horizontal curves, deflection angle, sight distance, super elevation rate, side friction factor and pavement conditions. Horizontal alignment in road design consists of straight sections of road, known as tangents, connected by circular horizontal curves. Circular curves are defined by radius and deflection angle. The design of a horizontal curve entails the determination of a minimum radius (based on speed limit), curve length, and objects obstructing the view