International Journal of Engineering & Technology, 7 (4.6) (2018) 563-566

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Incorporation of Eye Movement in Vehicle Dynamics and Auto Notification System

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ABSTRACT*:*

Here vision based gradient derivative model is proposed to detect eye blink for fully automated vehicle control system. In addition, the proposed model also integrates tiny encrypted IR based codebook model for sending notifications to other vehicles in order to remotely forward their status. This system comprised of a simple pre-processing and feature extraction methods and requires no human intervention to reduce the false rate. It allows for prompt accessibility, efficient usage of vision input characteristics and provides user convenience. The aim of the work presented in this thesis is to make automatic vehicle control system and IR based signal reception codec to combat environmental differences

Keywords

1. Introduction

Today many organizations in the world are interested in the development of vehicles which could enable disabled people to enjoy a higher quality of life, and possibly function. There are many people in this world kind of physical disability. The problems that a deaf, blind or disabled person encounters at work are, at times, insurmountable difficulties. Unfortunately the production of accessible facilities for disabled people in the workplace is often either very difficult or very expensive. Because of recent technological advances, the disabled could occupy many positions and could have their professional capacity reconsidered. Any contribution made by electronic systems to encourage the autonomy of the disabled at any stage should be thought of not as a luxury, but as a necessity. The vehicle described in this paper is directed at meeting the needs of those motion disabled persons who cannot drive vehicle manually nor with a steering but they are having healthy legs Therefore, an electronic system is proposed in an existing vehicle to enable it to be driven by the handicapped persons been developed to compensate for this. The vehicle that is suggested here is a electric series hybrid vehicle to which additional units are added.

Recently, the on-road vehicle detection has been a topic of great interest and development related to environment recognition has increased exponentially in the current automotive industry. For this, alarm and protection system related to driving support system has been applied to commercial vehicles. Starting with Auto Emergency Breaking system in Europe and the US, the technologies like Driver Assistance Systems (DAS) are included in New Car Assessment Program. A variety of sensors including radar, LIDAR and camera have become available to allow the vehicles to keep track of their position even when conditions change or when they enter uncharted environments. Especially the camera sensor occupies the largest share in the market. Cameras are widely used for Lane Departure Avoidance (LDWS) and Traffic Sign Recognition (TSR) in road environment. Moreover, camera is getting affordable, smaller and has more quality than ever before. Numerous vision-based object recognition approaches have been proposed in recent years[1-7].

With these changes, autonomous vehicle research started from Grand Challenge held in 2004 by Defense Advanced Research Projects Agency (DARPA) having purpose to drive in the desert terrain. In 2007, the place changed to the actual urban environment and environment recognition parts related to detect traffic sign, front car and intersection was added. Algorithms from the research institutes participated in the challenge for auto-driving in urban environment play a big role in the automotive industry of the world. More recently, at the beginning of Goggles driverless car, Audi, Toyota, BMW and Baidu has also announced plans about autonomous vehicle[8-14].

Although the autonomous vehicles from this company are almost operating fully autonomously, there are needs to advanced sensors to gather information about the environments. That means, recognition system of them is composed of complex hardware with expensive sensors. For the commercialization in the near future, we think that there is need for low-cost recognition system configurations. Thus, in this paper, we focused on monocular vision as opposed to stereo vision because it simplifies the hardware. We think, this is a good way to reduce the cost and size of the recognition system. In this paper, we present the test results of low-level vision based recognition algorithms for autonomous vehicle and implementation in a real-time data processing framework.

2. Objective

In real driving condition many uncertainties such as over speed in restricted regions, collision in heavy traffic drive cases leads accidents. To propose most reliable vision based system for physically disabled person to adjust the vehicle dynamics in fully automated way. In this paper, a vision-based system for detection of voluntary eye-blinks is presented, together with its implementation as a Human–Computer Interface for people with disabilities. The system, capable of processing a sequence of face

images with high resolution (1280 × 740 pixels) with the speed of approximately 30 fps, is built from off-the-shelf components: a consumer-grade PC or a laptop and a medium quality webcam. The proposed algorithm allows for eye-blink detection, estimation of the eye-blink duration and interpretation of a sequence of blinks in real time to control a non-intrusive human–computer interface. The detected eye-blinks are classified as short blinks (shorter than 200 ms) or long blink (longer than 200 ms). Separate short eye-blinks are assumed to be spontaneous and are not included in the designed eye-blink code[15-21].

3. Existing system

As the physically challenged peoples are facing lot of issues in driving and they are dependent on others for there daily activities in order to be independent we have found a way for them to overcome their problems. In the currently available project, they used the voice comments for driving vehicle but that was not so accurate for the physically challenged peoples .They found difficulties in that system. There where mismatching of voice commanded. And this existing system has more complex to use. Human detection is a basic computational block in systems related to vision-based human action recognition, and major issues related to human detection is appropriate discrimination over background objects. Detecting humans in video frames is a challenging task owing to their variable scale changes and appearance and the range of illuminations that they can adopt. However, most the existing works neglect dynamic changes in the background and cluttered backgrounds under difficult outdoor illumination conditions; and the scale variations in detected regions is also affecting the quality of the final detection rate. The major contributions of this work are: the implications of the histogram of gradient approach in the realm of sports video sequences; the design of a cell size; and orientation directions to explore the edge components of different spatial regions and carried out symmetric and asymmetric vector matching for human detection obtained from various unstable environments.

4. Proposed system

In earlier system the manual type of car driving is used and now we proposed a fully automated vehicles by using a eye blink. The following block diagram shows about the system we proposed

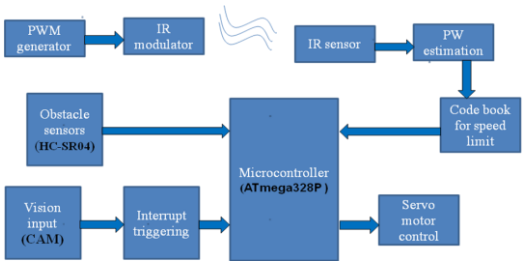


Fig1: Block diagram

In our proposed model (fig 1)we had been using sensors such as Obstacle sensor which is used as a typical IR sensing circuit. It consists of an IR LED, a photodiode, a potentiometer, an IC Operational amplifier and an LED. IR LED emits infrared light. The Photodiode detects the infrared light. Servo motor control which is used for by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. Interrupt triggering which is used for edge-triggered interrupt is an interrupt signalled by a level transition on the interrupt line, either a falling edge (high to low) or a rising edge (low to high). A device, wishing to signal an interrupt, drives a pulse onto the line and then releases the line to its inactive state. The aurdino AT mega 328P is used as microcontroller. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. When a signal is sent to the receiver from a remote control (RC), it travels across the wire and then turned back into infrared light by the transmitter at the other end. Radio frequency (RF) IR extenders perform these same functions without the help of any physical wires. An infrared receiver is a hardware device that sends information signal from an IR remote control to another device by receiving and decoding the signals effectively. The receiver outputs a code to uniquely identify the IR signal that it receives to other vehicle.

Interrupt will be activated to send notifications. Notifications activation will be prohibited if keys are not matched to ensure reliability. In Eye movement detection to enable the detection of the eyes better shape features and orientations parameters were used. Motion tracking- frame differencing and HOG model is used to monitor eyes. Interrupt will be activated by monitor distance metric between vehicles in IR based signal assertion model PWM generator will generate pulse which is modulated using IR radiation. IR sensor will estimate the width of PWM and it will be used to send unique encrypted code sequence moving conditions to send assertion to speed controller. In Parameter set evaluation, the Selected HOG features must give resistant to illumination changes at the background and invariant with scale changes of detected objects in the incoming frames**.** In Maximum dynamic changes check(for illumination changes) after frame conversion , spatial information's are divided into non overlapping macro blocks and HOG feature are extracted with user defined bin selection. Greater the variation in intensity level – lesser will be the bin levels scale changes check (for various appearance level) Frames are resized and re sampled and then HOG feature are extracted with constant bin selection. High speed detection number of frames) Cell size is reduced for accurate representation of gradients and dimensionality is reduced shown in fig 2.

Fig2: Block diagram for Normalization/ macro block size changes

Here to enable the detection of the eyes better shape features and orientations parameters were used. Motion tracking-> frame differencing and HOG model is used to monitor eyes. Interrupt will be activated by monitor distance metric between vehicle in both traffic and moving conditions to send auto notification thorough GSM.USB serial port interface with appropriate baud-rate is enabled to synchronize vision model with microcontroller unit. Same protocol is used to import vision input in NTSC format (30fps)

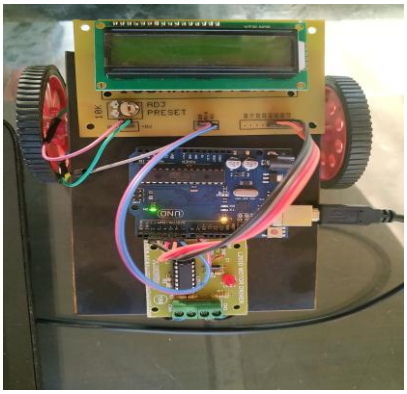


Fig3: Transmitter section (Main car)

4.1 fatigue induced effects on steering behavior

In general, steering behaviour is influenced by characteristics of the driving task, driver traits, and driver states Drivers are constantly judging the situation ahead and applying smooth, steering adjustments to correct for small road bumps, crosswinds by turning the steering wheel in small increments. This steering behaviour can be connected when drivers are becoming fatigue. A wide variety of steering wheel metrics have been suggested to measure steering behaviour, from standard deviation of steering wheel angle , steering wheel velocity , steering wheel action rate , to more advanced metrics such as high frequency component of steering wheel angle and steering entropy . Fatigue-induced effects on steering behaviour could be summarized follows: less small, smooth steering adjustments, more zigzag and slow oscillation, greater steering entropy, larger erratic steering movements, lateral drift outside the driver's comfort zon

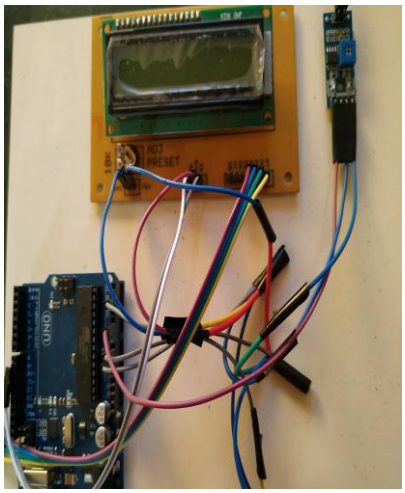


Fig4: Receiver section

Until recently, the analysis of steering wheel movement was based on finding single features correlating. The detection task was reduced to a simple thresholding of these features, but large inter individual and intra individual differences in fatigued driving patterns are an issue. Because of this overwhelming complexity, a sufficient and accurate classification of individual steering samples was not achieved. Thus, we propose a multivariate, and machine learning based approach including the computation of a large, highly redundant feature set modelling fine grained temporal steering behaviour structures. Shown in fig 3-5.

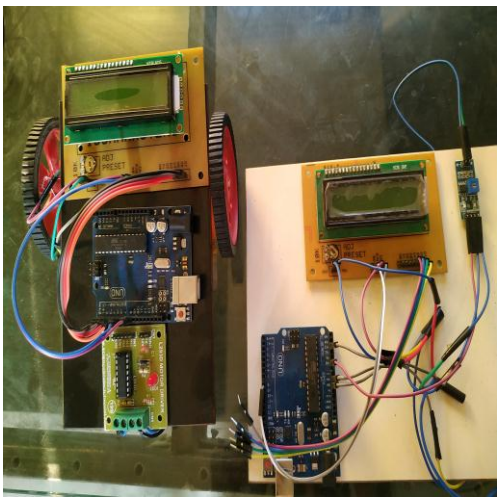


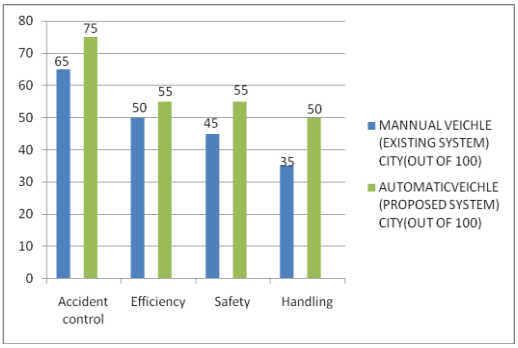
Fig5: Combination of both Transmitter and receiver section

5. Experimental results and analysis

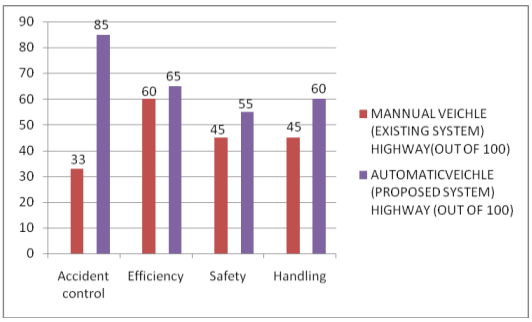
In our system we are using hardware components such as the Microcontroller, Vision input- webcam, GSM modem, Servo motor, Obstacle sensor, Ultrasonic sensor, and we had been using software tools such as the IDE and MATLAB for stimulation In this work vision based applications was adopted in many areas to overcome the physically disabled driver's difficulty by finding eyes blinks especially during vehicle drive. In this work, a research project which was developed to acquire eye movement information using integrated approach of image processing algorithms is presented. Motivation for developing this system came from the fact that minimum cost is involved along with some sensor-based techniques to send auto notifications. Security surveillance cameras which are readily available in most cars can be used to acquire these patterns to ensure the data forwarding regime. This solution is much cost effective than installing sensor alone models shown in fig 6&7..

	MANNUAL VEICHLE (EXISTING SYSTEM)		AUTOMATICVE ICHLE (PROPOSED SYSTEM)	
Description	CITY (OUT OF 100)	HIGHWAY(OUT OF 100)	CITY(OUT OF 100)	HIGHWAY (OUT OF 100)
Accident control	65	33	75	85
Efficiency	50	60	55	65
Safety	45	45	55	55
Handling	35	45	50	60

Fig 6: Comparison of Proposed system and Existing system



(i) In city



(ii) In highway

Fig 7: Graph of comparison

7. Conclusions

In this work vision based applications was adopted in many areas to overcome the physically disabled driver's difficulty by finding eyes blinks especially during vehicle drive. In this paper, a research project which was developed to acquire eye movement information using integrated approach of image processing algorithms is presented. Motivation for developing this system came from the fact that minimum cost is involved along with some sensor-based techniques to send auto notifications. Security surveillance cameras which are readily available in most cars can be used to acquire these patterns to ensure the data forwarding regime. This solution is much cost effective than installing sensor alone models.

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