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SMART SYSTEM FOR ROAD SAFETY ON VEHICLES

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***Abstract*— Pedestrian's safety refers to methods and measures for reducing the risk of a person using the road network for being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, and passengers of on-road public transport, mainly buses. Best-practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicle speeds will be within the human tolerances for serious injury and death wherever conflict point exist.**

The basic strategy of a safe system approach in today's present day scenario is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or serious injury. However in this paper we present a system in on detection pedestrians, the speed of the vehicle is reduced to a speed, such that the vehicle owner can steer their vehicle to safety thereby protecting the pedestrians. Along with this, we also propose a sign board voice alert system so that the driver of the vehicle need not take their eyes of the road.

Keyword—LCD, ADX

I. INTRODUCTION

Accidents occur frequently in highways, which will create a heavy loss for the victim's families as well as for the society. This project is developed in the vision of preventing accidents in the roads. A prior to the driver about the obstacles present in the highways such as steep curve, bends, bridges, temporary work on progress etc. to avoid mishaps.

II. PROPOSED SYSTEM

Many embedded systems have substantially different designs according to their functions and utilities. In this project design, structured modular design concept is adopted and the system is mainly composed of a single Microcontroller, Accelerometer, PIR sensor, Bluetooth module, RF transmitter and receiver, DIP switch, and D.C motor.

The microcontroller located at the centre of the block diagram forms the control unit of the entire project. Embedded within the microcontroller is a program that helps the microcontroller to take any actions based on the inputs provided by the output of the sensors. PIR sensor generates an output voltage whenever there is presence of any movement by human being or animal. This output voltage is fed to an input pin of the microcontroller. Based on the program within the microcontroller, the speed of vehicle (i.e D.C motor) is reduced to nil. At this particular time instant, even if the accelerator of the vehicle is increased the engine will remain neutral. Once there is no output voltage from PIR sensor, the vehicle starts to move.

When an RF signal is received by the RF receiver within the vehicle, from RF transmitter used by the digital signboards, the microcontroller, based on the program embedded within it, slows down the speed of the vehicle while it simultaneously passes the message to Bluetooth module which further transmits the message to the Android Smartphone of the driver, about the particular signboard.

Through the use of Android application, developed for this particular project demonstration, the driver of the vehicle is informed via voice about the presence of particular signboard along the road taken. In the block diagram LCD is utilized to demonstrate the working of entire unit.

III. BUILDING BLOCKS

A. BLOCK DIAGRAM

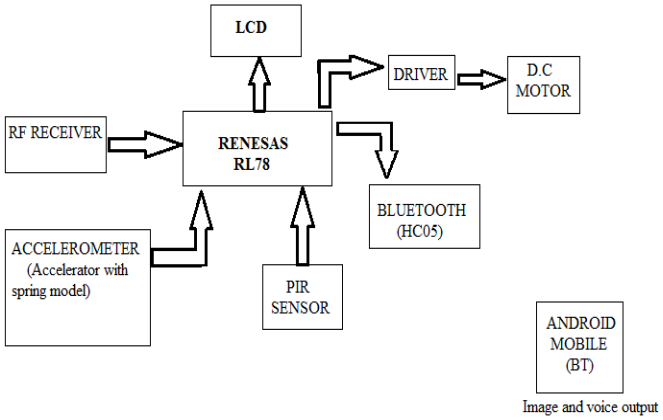

Fig 1: Unit within the vehicle

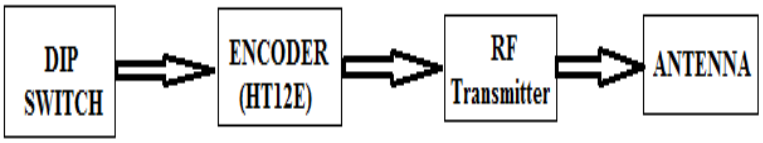

Fig 2: Digital Signboard

B. BUILDING BLOCKS

a) RL 78 MICROCONTROLLERS

RL78 is Renesas Electronics new generation microcontroller family combining advanced features from both the 78K and R8C Families to deliver low power consumption and high performance. RL78 is based upon a 16 bit CISC architecture with analogue rich functionality .The platform line up will include general purpose ,LCD and ASSPs including lighting and automotive microcontrollers. RL78 is designed specifically for ultralow power applications enabling customers to build compact and energy efficient systems at lower cost.

b) LCD

A liquid crystal display (LCD) is a flat panel display, electronic visual display, based on Liquid Crystal Technology. A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information. Liquid crystals do not emit light directly instead they use light modulating techniques.

c) BLUETOOTH MODULE

HC serial Bluetooth products consist of Bluetooth serial interface and Bluetooth adapter. There are two types of Bluetooth serial interface module: Industrial level and civil level. HC-05 belongs to civil level Bluetooth serial interface module. Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slave. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work in either mode (master or slave) of the device by AT commands.

d) PIR SENSOR

HC-SR501 is based on infrared technology, automatic control module, using Germany imported LHI778 probe design, high sensitivity, high reliability, ultra-low-voltage operating mode, widely used in various auto-sensing electrical equipment, especially for battery-powered automatic controlled products.

e) DRIVER IC (L293D)

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays, solenoids, DC and Stepper motor) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enabled input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

f) ACCELEROMETER (ADXL335)

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

g) DC MOTOR

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. We have used this driver circuit too drive the motors of the robot. Each L293D is used to drive two motors. Two L293D's are used to drive four motors.

h) RF MODULE

The TX is an ASK transmitter module. The TX is designed specifically for remote control, wireless mouse and car alarm system operating at 315/433.92 MHz the RX is a miniature receiver module that receives On-off keyed modulation signal and demodulated to digital signal for the next decoder stage. The result is excellent performance in a simple-to-21 use, with a low external component count.

C. SOFTWARE PROFILE

a) RENESAS FLASH PROGRAMMER

Renesas Flash Programmer is a software package used to program the on-chip flash memory of Renesas microcontrollers. It provides usability and functionality optimized specifically for flash programming. Easy flash programming using a simple GUI designed specifically for development. PC-controlled programming via the E1 emulator, E20 emulator, E2 emulator, E2 emulator Lite, a serial USB connection. Programming a unique code to a designated area of flash memory. Easy selection of type names. No need to select detailed type names for products of the RL78 family.

b) CUBESUITE+

The CS+ integrated development environment provides simplicity, security, and ease of use in developing software through iterative cycles of editing, building, and debugging.

The basic software tools can be used for developing software for Renesas MCUs immediately after the initial installation. CS+ is also compatible with Renesas hardware tools including the E1 on-chip debugging emulator, which facilitate advanced debugging. Abundant extensions and functions for user support ensure a dependable environment for all users.

c) **ANDROID**

Android is an open source and Linux-based operating system for mobile devices such as smart phones and tablet computers. Android was developed by the open Handset Alliance, led by Google, and other companies.

Android offers a unified approach to application development for mobile devices which means developers need only develop for android, and their applications should be able to run on different devices powered by Android. The source code for Android is available under free and open source software licenses. Google publishes most of the code under the Apache License version 2.0 and the rest, Linux kernel changes, under the GNU General Public License version 2.

IV. WORKING

For obstacle detection

1. Start: Switch on the power supply.

2. Initialize all components: All the hardware components are initialized using appropriate commands.

3. Receive data from PIR sensor, go to step 4: PIR sensor used in this project to detect any kind of movement in front of the motor. The corresponding information is then given to the microcontroller.

4. Check whether PIR value> threshold, if yes go to step 5 otherwise go to step 3: The microcontroller checks whether the value obtained from PIR sensor is above or below the threshold value. Then microcontroller takes the necessary action.

5. Reduce acceleration and go to step 6: If the value is greater than threshold the controller will reduce the acceleration of the motor.

6. Show the message on LCD, go to step 7: Corresponding messages will be get as output on the LCD.

7. Provide delay, go to step 8: Here some delay is given by the controller to stop the motor from running further.

8. Stop: Finally as the destination is reached the motor will stops.

For sign board detection and alert

1. Start: The whole hardware and microcontroller is started here to detect the sign board and continue with necessary actions.

2. Receive data from RFID and go to next step: RFID receiver on the vehicle is continuously receives information from the transmitter and it is given to microcontroller.

3. Check received data with first code for the sign and if it is matched go to step 4, otherwise go to step 6: The microcontroller is written with some codes corresponding to different signs. Hence it checks the received code with first written code. If it get matched it goes to next step, otherwise to step 6.

4. Transfer the details of that sign board to mobile via blue tooth, then go to step 5: The information about sign board is given to the mobile through the blue tooth device. To display the details about sign board an application is used.

5. Provide some delay then go to step 2: Some delay is given to the microcontroller and again continue the detection after the delay.

6. Check the matching of data with other codes, if matched with any then go to step 4, otherwise to step 7: Here the received code is checked until it matches with any of the code written into the microcontroller and pass necessary information to the mobile. If it is not matched it will go to next step.

7. Stop: Here as the destination is reached the sign board detection is stopped.

V. RESULT

The developed hardware unit within the vehicle consists of RENESAS microcontroller, PIR sensor, DC motor, accelerometer, RF receiver, Bluetooth module and LCD display. A supply voltage is given to the controller via an adapter. All the components are connected to the microcontroller using wires. PIR sensor senses the motion in front of it. Then given the information to the microcontroller. The microcontroller will reduce the speed of motor even if the accelerator is applied. RF receiver is used to accept the signals from digital sign board and it also given to microcontroller. Where the speed reduction is done if necessary and the corresponding information is passed to android mobile using Bluetooth. This all system is worked smartly with high efficiency.

The digital sign board hardware consists of a battery, DIP switch and RF transmitter module. The battery is used to provide necessary voltage for the RF transmitter, and then only it gets worked. The various arrangements of DIP switch pins correspond to different sign boards. A reset button is used to reset the whole sign board system. This sign board is also worked efficient

VI. APPLICATIONS

The main application of this project is on vehicles. This may include cycles, bikes, cars, buses, jeeps, and Lorries. Digital signboard system can be applied on road sides to avoid mishaps.

VII. ADVANTAGES AND DISADVANTAGES

A. Advantages

This is economical to be used in all vehicles. Mishaps can be avoided. RF communication units cover meters max hence will be useful for school, college, and hospital areas. Speech of the vehicles can be controlled in such areas. Traffic violations can also be avoided.

B. Disadvantages

The RF transmitters placed at the estimated hazard points need to check for its working constantly. During heavy rain and storm conditions units have to be more robust.

VIII. FUTURE SCOPE

The vehicles can be made to communicate with highway command units for getting other useful information on the traffic density and weather conditions etc. A highway command unit – An interactive unit also can maintain a data base of vehicles which will help in vehicle tracking. It can also alert vehicles if it violates rules and regulations on highways.

IX. CONCLUSION

A user friendly and economical device to give the information to the driver about the spot and situation on the road to avoid mishaps has been developed. In this project a new system which informs the driver about the obstacles on the roads and the sign boards using a speech alert system. Hence the driver of the car does not have to take their eyes of the road. Thus a large amount of accidents can be reduced and thereby saving the life of other road users also.

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