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ACCIDENT PREVENTION AND EMERGENCY AWARENESS USING AUGMENTED REALITY

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Abstract - *While autonomous vehicles are almost assuredly the future of personal transportation, we are likely many years from seeing self-driving cars become as ubiquitous as manually-driven ones, as the auto industry has a myriad of government regulations and other constraints to contend with. With cars, there's no cumbersome, head worn display to act as a hurdle to adoption, as content is projected onto windshields or dashboard-mounted displays. Miniaturization of computing hardware is also not as big a concern with AR in cars when compared to the challenges of embedding the same technology in a pair of smart glasses. In addition to car-based solutions, automakers have also begun to apply augmented reality to the world of automobiles via mobile applications like GSM, IR Sensor and Wireless Communications (Zigbee Transceiver). The GSM has enabled to cut the call or to forward the message to AR and it used to detect the person from PIR sensor with the help of Zigbee Transceiver and Arduino UNO micro controller.*

Keywords: GSM, Zigbee and Arduino UNO, Augmented reality (AR)

1. INTRODUCTION

Cars are currently one of the most commonly used mode of transportation worldwide. Despite the advances in the automotive industry, the safety of car transportation is still an issue. Number of traffic deaths in the US in 2013 was over 34 thousands [1]. Despite numerous electronic safety mechanisms, the driver of the vehicle remains the key factor.

Recently, advances in sensors, computer vision and machine learning have enabled development of sophisticated driver assistance systems which provide a number of useful information in real-time. Pedestrian accidents can be limited with the use of pedestrian detection systems that can detect sudden crossings [2]. Efficient recognition of pedestrians is possible also during the night-time by employing infrared sensors [3].Lane detection systems can alert the driver to unintentional lane departure [4]. Recent methods are able to deal with both straight and curved lanes, under different weather conditions and in the presence of shadows and obstacles [5]. Robust traffic sign detection and recognition has been proposed with the use of Convolutional Neural Networks [6]. Detection of other vehicles on the road is also important in terms of safety.

2. EXISTING SYSTEM

Currently image processing systems are being implemented which may provide various kinds of distractions to the driver. Augmented reality plays a major role in avoiding those distraction by providing real world view.

3. PROPOSED SYSTEM

Proposed system employs two devices - an AR-glass mounted on the windscreen. For the AR we employ Epson Mover BT-300 device, which includes glasses with semi-transparent display and built-in camera, as well as Android-based processing unit. The GSM provides information for the AR-headset wirelessly. The smartphone's camera is used to analyse the environment in front of the car.

Although the AR-headset could be used for environment analysis, it has limited view and limited computing power, therefore it is employed only for providing feedback. In general, multiple sensors and various analysis algorithms could be used to provide information for the driver via the AR-headset. The AR-headset has an additional benefit of having a built-in inertial measurement unit. Employed AR-headset enables overlaying virtual information over the real-world view, although it does not provide built-in mechanisms for matching these views. In order to create the desired mixed view, we need to handle two issues. Firstly, the AR-headset needs to detect the smartphone in order to know the position of the camera used for environment analysis. Secondly, we need to apply coordinate mapping so that objects seen by the smartphone camera would be proper displayed by the AR-headset.

3.1 Block Diagram

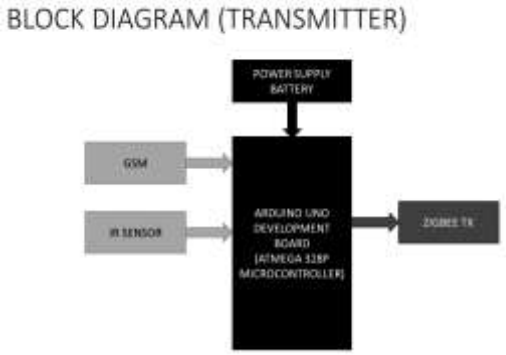

Fig-1 Transmitter

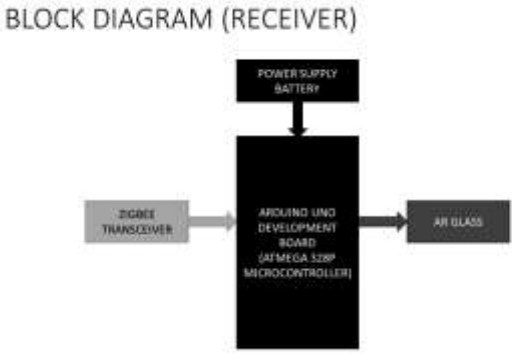

Fig-2 Receiver

3.2 Hardware requirements

- Arduino Uno
- ZigBee transceiver
- battery power supply
- GSM
- IR sensor

3.3 Software requirements

- Arduino IDE
- Embedded C

4. HARDWARE DETAILS

4.1 Arduino UNO

Arduino is a single-board microcontroller make the application more accessible which are interactive objects and its surroundings. The hardware features with a hardware board designed for an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards.

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, an ICSP header, 16 MHz ceramic resonator a USB connection, 6 analog inputs, a power jack and a reset button. This contains all the required support needed for microcontroller. In order to get started, they are simply connected to a computer with a USB cable or with a AC-to-DC adapter or battery. Arduino Uno Board varies from all other boards and they will not use the FTDI USB-to-serial driver chip in them. It is featured by the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.Its, sensors, actuators, and electronic components on a common silicon substrate through micro-fabrication technology. The electronic components are fabricated using integrated circuit process sequences (e.g. CMOS, Bipolar, or BICMOS processes). The micromechanical components are fabricated using compatible "micromachining" processes in which selected parts of the silicon wafer can be etched. Also, it can add new structural layers to form the mechanical and electromechanical

Fig-3 Arduino UNO

4.2 GSM

Global System for Mobile communication (GSM) is a used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc.) for computer. Also they have IMEI (International Mobile Equipment Identity) number for their identification. The MODEM needs AT commands, for interacting with processor or controller, and serial communication takes place. These commands are sent by the controller. The MODEM sends back a result after it receives a command. The MODEM can be sent by the controller to interact with the GSM.

GSM/GPRS MODEM can perform the following Operations:

1. Send, receive and delete SMS messages in a SIM.
2. Add, search and read the entries of the SIM.
3. Reject, receive and make a voice call.

Fig-4 GSM

4.3 IR (Infrared) sensor

Input Power: 3.3V or 5VDC.3 pin interface which are OUT, GND and VCC

OUT is digital output pin from sensor module, connect to any digital input on your microcontroller. Will output logic LOW when object is detected .GND is where you connect to 0V.VCC is the +ve supply, connect to either +3.3V or +5V.Two LED indicators, (Red) as power indicator, (green) object detection indicator. Detection range: 2cm to 10cm

Fig-5 IR sensor

RSSI stands for Received Signal Strength Indicator. It is the measured power of a received radio signal. It is widely used and implemented in 802.11 standards. Receiver .RSSI has a larger variation because it is subject to the deleterious effects of fading or shadowing. It is a non-linear with respect to distance.

Fig-6 IR sensor

4.4 Arduino IDE

Arduino is a micro-controller development board series - Uno, Nano mega etc. Now, any micro-controller (here it is the at mega 328 IC on the Arduino Uno or at mega 1280 on Arduino Mega) that needs to be programmed is fed with a hex code version of the code written in high level (English) language. So, Arduino development boards are fed with the code via Arduino IDE.

IDE (Integrated Development Environment) is a software that enables better and assisted code editing, compiling and debugging. The Arduino IDE works on the Java Platform. You can co-relate this to Eclipse, the language java has different IDEs that ease the usage of the language for a particular purpose .However, Eclipse doesn't support the functions and commands that work on Arduino board. So, this Arduino IDE has inbuilt functions and commands that though work on Java platform, are customised to run on the Arduino development.

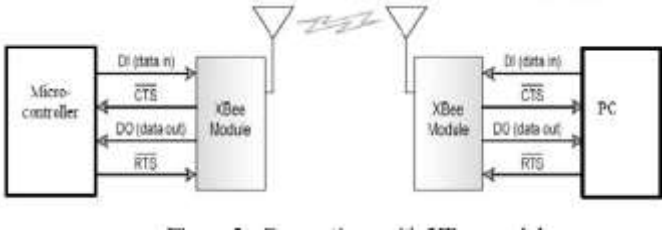

Fig-7 ZigBee Transceiver

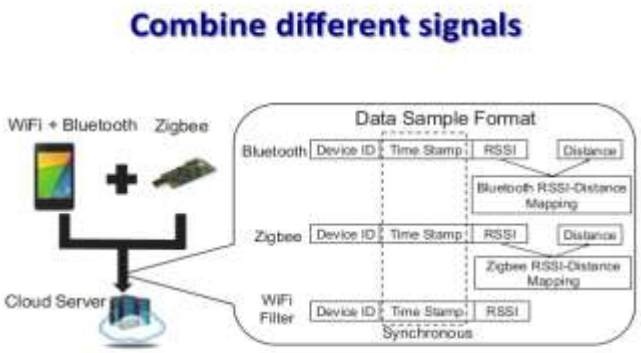

Fig-8 Signal format

Fig-9 Receiver module

5. CONCLUSION

In this work a system was proposed such that it employs AR glass which intimates driver with important information in a mixed view of real world and virtual generated data. More relevant information is delivered to driver by employing sensor and AR systems. To conclude it's believed that AR technology is future of driver assistance and plays vital role in automotive industries in upcoming years.

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