Automatic Ambulance Detection and Intimation Using RSSI

K.Rubini

UG Student, Department of Electronics and Communication Engineering, Easwari Engineering College, Ramapuram, Chennai-600089, India.

M.Vidya

UG Student, Department of Electronics and Communication Engineering, Easwari Engineering College, Ramapuram, Chennai-600089, India.

S.R.Yeshaswini

UG Student, Department of Electronics and Communication Engineering, Easwari Engineering College, Ramapuram, Chennai-600089, India.

A.Gowthami

Assistant professor, Department of Electronics and Communication Engineering, Easwari Engineering College, Ramapuram, Chennai-600089, India.

Abstract: The biggest problem in many metro-Politian cities is traffic congestion. This project focuses on controlling the speed of the surrounding vehicles near ambulance, and hence the ambulance can reach the hospital on time. It can be done by using RSSI (Received Signal strength Indication) which works based on Message Queuing Telemetry Transport algorithm. Node MCU acts as transmitter and server acts as receiver. Node MCU has the inbuilt Wi-Fi module (EP8266). It receives the signal from server and identifies that signals strength which is used to reduce the speed of other vehicles within the particular limit. An APR voice module is used to provide intimation to the surrounding vehicles about the arrival of ambulance. Also the traffic signals are made automated for ambulance so that the signals will go green thus providing a clear path for the ambulance to reach without time lag. The original signal is again restored once the ambulance moves over a particular distance from the signal that has been fixed earlier.

Keywords: RSSI ranging, MQTT, Ambulance, Node MCU, APR voice

1. INTRODUCTION

As the traffic road density is being increased, several problems occur due to delay in reaching the hospital with the patients in an ambulance. The ambulances are the most important means of transport as it carry patients to the hospital. But ambulance can stuck in traffic for long duration due to heavy traffic thus causing danger to the life of patients. To overcome this issue RSSI technique is used. It is the measure of RF power input to the transceiver. Its value is based on the goal setting in the receiver chain and the measured signal level in the channel. It works based on

Message Queuing Telemetry Transport algorithm (MQTT). It uses public communication pattern used for machine to machine communication. Node MCU has inbuilt Wi-Fi (ESP-8266) module. An APR voice module is used to give an alert signal to the nearby vehicles that the ambulance is arriving. Further the traffic signals are made automated to help ambulance reach the hospital without any delay.

2. LITERATURE SURVEY

In [3], the critical parameters of traffic road analysis are speed, flow and density. Real time estimation of traffic requires these parameters for attaining high performance road traffic management. Position and speed of the vehicles are required for adaptive traffic control system and they are utilized to optimize the traffic signal. Received Signal Strength Indicator (RSSI) based smart tollgate automation is used to achieve an improved form of tollgate billing system [7]. Few existing projects are based on RFID tag, which consume more power because reader and tags required power. Active tags are more expensive because of complexity [9]. The rescue system is implemented using a method called Automatic Ambulance Rescue System [11]. The aim of this method is to help the ambulance reach hospital in time. It controls the traffic signal along the way of ambulance and controls the traffic light according to its location and helps to reach the hospital safely. The RFID transmitter is present in the ambulance unit and receiver in the traffic signals are used for wireless communication and the signal is controlled with respect to the ambulance unit. Internet of Things allows remote access of devices through the network, anytime and at

any location [8]. Internet of Things enabled objects can communicate with each other, it can access information through Internet, and can interact with users creating a smart and pervasive communication which allows the machines being controlled by the environment.

3. BLOCK DIAGRAM
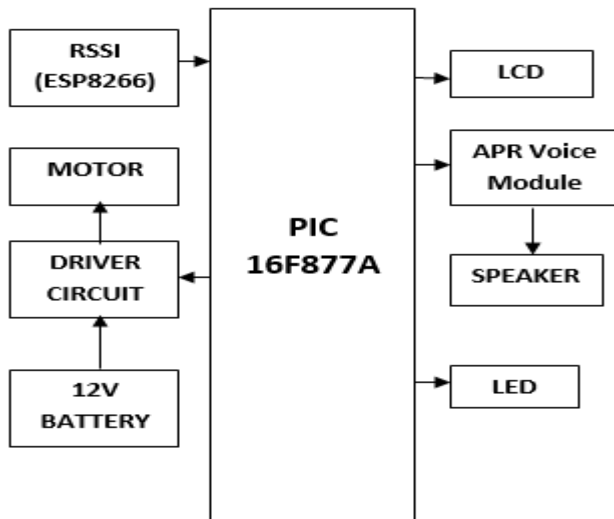
Components:

(i) PIC Microcontroller

A PIC microcontroller is a suitable microcontroller for programming. The main advantage is that the flash memory technology is used to write and erase any number of times. It consists of 40 pins out of which 33 is used as input pins and the remaining is used as output pins. PIC 16F877A has applications like remote sensors, security devices, safety devices, home automation and in many industrial instruments. The cost is very low and handling is simple.

(ii) APR Voice IC

APR9600 is a low cost, high performance sound record IC using analogue flash storage technique. Recorded sound message can be stored and played anytime with the help of module. The replayed sound is of high quality and the noise level is very low. Sampling rate is about 4.2 kHz for 60 second record message with a bandwidth range of about 20Hz to 2.1 kHz. Sampling rate can be increased up to 8.0 kHz by changing the values of an oscillation resistor. The length of the recorded message can be up to 32 seconds.

(iii) DC Motor

A DC motor runs with the help of DC electric power. The types of DC motor are the brushed DC motor and brushless DC motor. AC current is created by internal and external commutation from DC source. DC motor is a type of rotary electrical machines which converts electrical power into mechanical power. The common types of DC motor rely on the forces produced by the magnetic field. Almost all types of DC motors have electromechanical or electronic internal mechanism which periodically changes the direction of flow of current in the motor.

(iv) LCD

Liquid Crystal Display is an electronic device which has a wide range of applications. The commonly used and the basic module is the 16x2 LCD. It is used in clocks, DVD players and so on as display device. 16x2 LCD is preferred over LEDs. The reason is LCDs are more economical, it can be easily programmable, it has no limitation for displaying special characters and custom characters whereas it cannot be done in seven segments or animations. Sixteen characters per line can be displayed in 16x2 LCD and two such lines can be there. Each character in LCD is displayed in 5x7 matrixes. Command and Data are the two registers present in LCD. In this, the command register is used to store the command instructions and data register is used to store the data that is to be displayed. A command is a kind of instruction given for initializing the predefined task, for clearing the screen and setting the position of the cursor and the display is also controlled.

(v)LED

A Light Emitting Diode is a semiconductor light source that emits light when current flows through it. In the semiconductor, the electrons get recombine with the holes. Thus releasing large amount of energy in the form of photons. LEDs have many advantages like lower energy consumption, increased life time, smaller size and faster switching. Modern LED's are available across the visible, ultraviolet and infrared wavelengths with high output.

(vi) Speaker

Speaker is one of the common output devices. It is a transducer that converts the electromagnetic wave into sound wave. The input given can be either analog or digital form. Since the sound waves are in analog form, analog speakers are used to produce sound waves. For generating sound waves the input must be converted into analog signal.

(vii)Driver circuit

The input to the motor driver IC or motor driver circuit is a low current signal. The function of the circuit is to convert the low current signal to a high current signal. This high current signal is then given to the motor. The motor can be a brushless DC motor, brushed DC motor, stepper motor, other DC motors etc.

4. METHODOLOGY

The peripherals are connected with PIC microcontroller. A 12V battery is connected to the driver circuit which is used to

give the PWM (Pulse Width Modulation) signal to the dc motor. The PWM signal given is used to control the speed of the surrounding vehicles, if an ambulance is detected. RSSI module is used to pair the vehicles within a particular range with the ambulance whose speed is to be reduced. An APR voice module is used to intimate the surrounding vehicles that ambulance is arriving with a recorded voice message. The LED is used to represent the traffic light signals.

5. PROPOSED SYSTEM

The ambulance has the hotspot generator which generates the signal for pairing up with the surrounding vehicles which consists of an inbuilt node MCU using RSSI technology. When an ambulance is detected, all the vehicles in a specified range will get paired up with the hotspot generated by the ambulance. Consequently, an alert voice message "LEAVE WAY FOR THE AMBULANCE "by APR VOICE MODULE is sent to the paired up vehicles. The speed will be reduced to an average speed limit. Simultaneously, the traffic signal is controlled and set to green for that particular lane, hence a clear path is provided for the ambulance to reach the destination on time.

Advantages:

- Easy to detect ambulance
- Automatic voice intimation

6. EXPERIMENTAL RESULTS

The received signal strength for the pairing between ambulance and vehicle is categorized by distance. When the ambulance is in distance less than 40dbm to the vehicles, an alert message is sent with reduction in vehicle speed and the traffic signal goes green.

(a)The image corresponds to condition when ambulance is less than 40dbm distance.
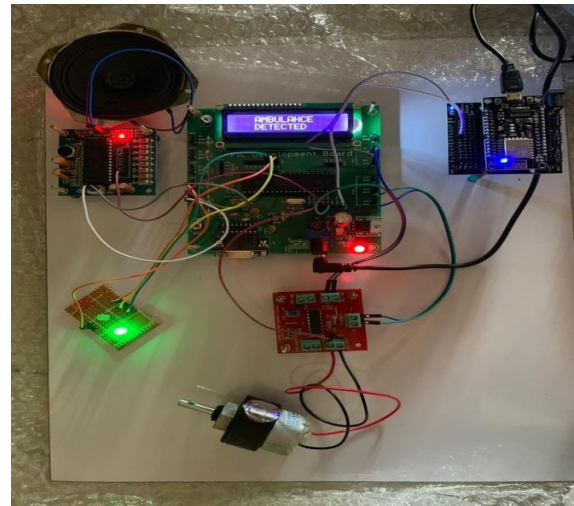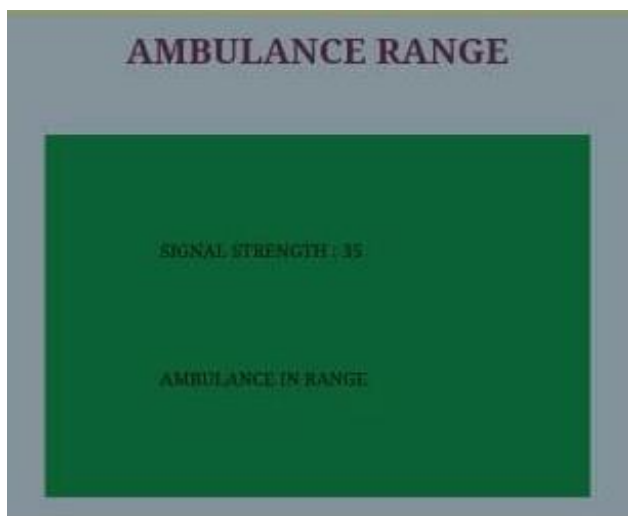
When the ambulance is greater than 40dbm distance, the vehicles are at full speed.

(b)The image corresponds when ambulance is not detected.
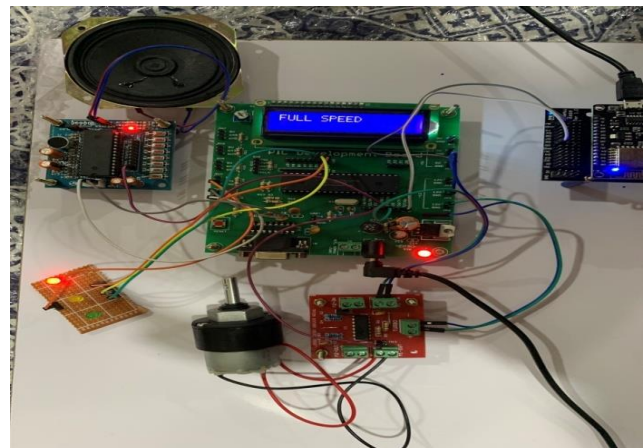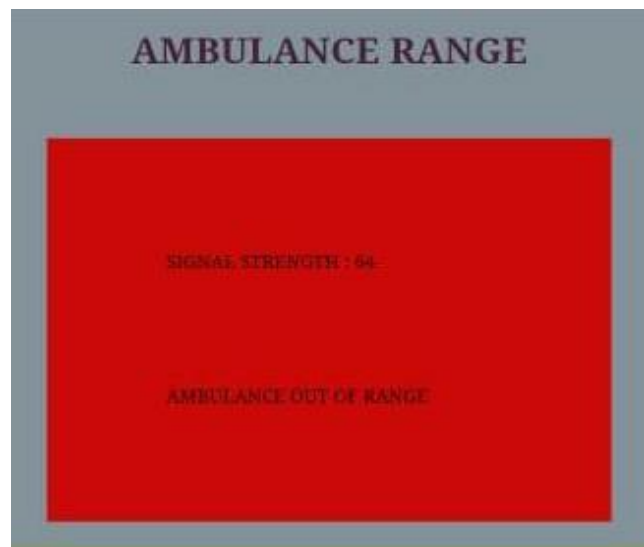
7. CONCLUSION

This paper brings out the idea of RSSI which is the advancement in wireless network technology. Based on the RSSI value which is been decoupled into three bands precisely the band A (ranging between 0-40dBm), the band B (ranging between 40-60dBm), and band C (ranging above 60dBm). When the ambulance enters into the band B which is moving towards band A, vehicles in that range will get paired up with the hotspot generated by the ambulance and the speed of the paired vehicles is reduced. Accordingly, the traffic signal is also controlled to prevent the ambulance from getting trapped in traffic. Implementation using RSSI is also suitable for all emergency and defense vehicles. The advantage of the application is the accuracy and advancement of technology that is helpful in saving precious human life.

REFERENCES

[1] Sadiq Basha.G ,Thiyagarajan.V "RSSI Based Implementation of Smart Tollgate Automation" International Journal of Innovative Research in Science, Engineering and Technology (A High Impact Factor, Monthly, Peer Reviewed Journal) Vol. 6, Issue 12, December 2017.

[2] Nathaniel Fairfield Chris Urmson"Traffic Light Mapping and Detection'' IEEE International Conference on Robotics and Automation, 2011.

[3] Linganagouda.R, Pyinti Raju, AnusuyaPatil, "Automatic ambulance traffic control system" IEEE International Journal of Electrical, Electronics and Instrumentational Engineering, July 2016

[4] Moises Diaz-Cabrera1 and Javier Sanchez-Medina'' Suspended Traffic Lights Detection and Distance Estimation Using Color Features'' 15th International IEEE Conference on Intelligent Transportation Systems, 2012.

[5] Legon-Okponglo, "Design and development of microcontroller based traffic system using image processing techniques". University of Ghana,published in ICAST, 2012 IEEE 4th International Conference.

[6] "Highway traffic model-based density estimation"-IEEE paper by Morarescu, Nancy Univ., France, published in American ControlConference(ACC), 2011.

[7] N. B. Soni, Jaideep Saraswat, "A review of IoT devices for traffic management system", the International Conference on Intelligent Sustainable Systems (ICISS 2017)

[8] Z. Ning, X. Wang and W. Hou, "A social-awaregroup formation framework for information diffusion in narrowbandInternet of things," IEEE Internet of Things Journal, Doi:10.1109/JIOT.2017.2777480, 2017.

[9] Anuran Chattaraj, Saumya Bansal, Anirudha Chandra, "An Intelligent Traffic Control System using RFID", IEEE Potentials 28(3):40, May 2009

[10] W. Zhang, Z. Zhang, and H.-C. Chao, "Cooperative fog computing for dealing with big data in the Internet of vehicles: Architecture and hierarchical resource management," IEEE Communications Magazine, vol. 55, no. 12, pp. 60–67, 2017.

[11] R.K.Moje, Amol Kumbhar, Ramesh Shinde, ShrishailyaKorke, "Automatic ambulance rescue system", International Journal of innovative research in Electrical, Electronics, Instrumentational and Control Engineering,Vol 4, Issue 4,April 2016

[12] E.L.Zhou,G.L.Wang "Research of indoor location based on RSSIranging", Journal of Chongqing University of Technology(NaturalScience), vol.28, issue 9, pp.98-101, 2014.

[13] Z. Cao, S. Jian and H. Guo, "A unified framework for vehicle rerouting and traffic light control to reduce traffic congestion," IEEE Transactions on Intelligent Transportation Systems, vol. 18, no. 7, pp. 1958–1973, 2017.