3rd National Conference on Innovative Research Trends in Computer Science and Technology (NCIRCST 2018) ISSN: 2454-4248
Volume: 4 Issue: 3 121 – 125

Smart Traffic System for Ambulance Using RFID and Internet of Things

M. Agila, P. Karthikeyan, M.Arun Kumar
agilacse005@gmail.com
pkmcse24@gmail.com
imarunmsd@gmail.com

Abstract: In the contemporary world, urban mobility is one of the unprecedented challenges to be tackled in the administration of a big city. This paper analyses the ever growing urban population around the globe and discusses about the traffic systems in densely populated cities. Further, an advanced traffic management system is proposed, implemented using Internet of Things (IoT).

The system is supported by a circuit embedded in the vehicle, which operates using RFID with clustered systems. The functionalities of the system include efficient traffic light control, parking space identification and anti-theft security mechanism. The proposed architecture and working with big data analytics involving Hadoop is presented. Moreover, supervised learning methodologies are proposed that would help in determining the standard of roads, estimating overall traffic flow, calculating average speed of distinct vehicle types on a road and analyzing the travel path of a vehicle.

*****

1. INTRODUCTION

With the turn of the century, there occurred an explosion of population across the globe. According to the United Nation's Department of Economic and Social Affairs, Population Division of the world was 1.3 billion as of October 14, 2017. This directly led to more number of peoples living in cities. In this 21st century day by day more and more people are dwelling in cities and towns. This has resulted in outburst of traffic in cities. However, not much attention has been paid towards reduction of the traffic congestion.

Hence we came up with a proposed model which can minimize the traffic congestion for normal traffic flow. Keeping in mind the modern Indian road, our proposed model would be able to solve the problem of traffic congestion on the junction much more efficiently than conventional traffic system. The whole system is efficient as well as cost effective, and can easily be installed in Indian roadways. The method is quite simple; it senses the vehicle on the road for certain minute at predefined distance and takes the best fitted decision automatically by the vehicle on the road.

The next step of the implementation is that a system to handle and changing the traffic signal to green when the emergency vehicle reach the signal. Different hardware components were used, such as RFID in each emergency vehicle like ambulance. When emergency vehicle wasbeing at the traffic junction the RFID tag transmitter module in vehicle sends a signal to the RFID receiver in traffic to change the traffic light to green.

A prototype of the idea has been designed using raspbain. The prototype has been demonstrated by Hardware which has802.11n Wi-Fi, Bluetooth 4.0, and a quad-core 64-bit ARM Cortex A53 running at 1.2 GHz, IR Sensor,SD card, bread broad, and LED's(Light Emitting Diode).

2. IOT

Internet of things is defined as Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts. It can be considered the Future of Internet, where every object is connected to other objects. Every object is given a unique identity in the network. This allows remote access of devices through the network, anytime and at any location.

IoT enabled objects communicate with each other, access information over the Internet, and interact with users creating smart, pervasive and always connected environments. IoT also enables machine to machine communication which allows machines being controlled by the Internet and by other machines.

2.1.1 IoT CHARACTERISTICS

1. Intelligence

Together algorithms and compute (i.e. software & hardware) provide the "intelligent spark" that makes a product experience smart. Consider Misfit Shine, a fitness tracker, compared to Nest's intelligent thermostat. The Shine experience distributes compute tasks between a Smartphone and the cloud. The Nest thermostat has more compute horsepower for the AI that makes them smart.

2. Connectivity

Connectivity in the IoT is more than slapping on a Wi-Fi module and calling it a day. Connectivity enables network accessibility and compatibility. Accessibility is getting on a network while compatibility provides the common ability to consume and produce data. If this sounds familiar, that's because it is Metcalfe's Law and it rings true for IoT.

3. Sensing

We tend to take for granted our senses and ability to understand the physical world and people around us. Sensing technologies provide us with the means to create experiences that reflect a true awareness of the physical world and the people in it. This is simply the analog input from the physical world, but it can provide rich understanding of our complex world.

4. Expressing

Expressing enables interactivity with people and the physical world. Whether it is a smart home or a farm with smart agriculture technology, expressing provides us with a means to create products that interact intelligently with the real world. This means more than just rendering beautiful UIs to a screen. Expressing allows us to output into the real world and directly interact with people and the environment.

5. Energy

Without energy we can't bring our creations to life. The problem is we can't create billions of things that all run on batteries. Energy harvesting, power efficiency, and charging infrastructures are necessary part a power intelligent ecosystem that we must design. Today, it is woefully inadequate and lacks the focus of many product teams.

6. Safety

As we gain efficiencies, novel experiences, and other benefits from the IoT, we must not forget about safety. As both the creators and recipients of the IoT, we must design for safety. This includes the safety of our personal data and the safety of our physical well-being. Securing the endpoints, the networks, and the data moving across all of it means creating a security paradigm that will scale.

2.1.2 IOT − ADVANTAGES

- Improved Customer Engagement – Current analytics suffer from blind-spots and significant flaws in accuracy; and as noted, engagement remains passive. IoT completely transforms this to achieve richer and more effective engagement with audiences.
- Technology Optimization – The same technologies and data which improve the customer experience also improve device use, and aid in more potent improvements to technology. IoT unlocks a world of critical functional and field data.
- Reduced Waste – IoT makes areas of improvement clear. Current analytics give us superficial insight, but IoT provides real-world information leading to more effective management of resources.
- Enhanced Data Collection – Modern data collection suffers from its limitations and its design for passive use. IoT breaks it out of those spaces, and places it exactly where humans really want to go to analyse our world. It allows an accurate picture of everything.

3. Raspberry Pi OS

3.1.1Raspbian

Raspbian is a free Debian-based OS optimized for Raspberry Pi hardware. Raspbian has all basic programs and utilities like that of other general-purpose OS. It is officially supported by Raspbian foundation and its highlighting feature is its more than 35000 packages and fast performance. Its latest version Jessie can be installed on a 8 GB SD card.

3.1.2Ubuntu MATE

Ubuntu MATE is a stable and simple OS, which is good for devices with less hardware specs. This makes it perfect for Raspberry Pi devices. Ubuntu MATE is an original Ubuntu with an APT package manager and Ubuntu's Software Center. For loading its latest version, Ubuntu MATE 15.10 (Wily Werewolf) for Raspberry Pi, 4GB or more high-speed SD card is required.

3.1.3Linutop

Linutop can be quickly set up on Raspberry Pi, which uses Raspbian base with lightweight and classic XFCE graphical environment. It boots as quickly as in 30 seconds and can be configured quickly for all purposes. Its security features include a 'read-only mode' to save from viruses and hack attempts. All the alterations will not be saved unless you input the password.

3.1Programming tools bundled with Raspbian:

Node-RED for IoT applications

Node-RED is an open source and free tool for wiring hardware devices, online services, APIs together in an interesting manner. It is developed by IBM Emerging Technologies and runs on every major OS. It provides browser-based flow editor. It is built on Node.js which makes it ideal to run at the edge of the network on low-cost hardware like Raspberry Pi. Also, an online flow library allows you to share your best flows with others.

Python – a modern language for RPi

IDLE (Integrated Development and Learning Environment) is an IDE for Python bundled with the default implementation of the language. Python for RPi is cross-platform, it avoids feature clutter. Its highlighting features are multi-window text editor with syntax highlighting, auto completion, persistent breakpoints, Python shell with syntax highlighting and call stack visibility. Raspbian comes with both Python version 3 and 4 Installed.

4. EXISTING METHOD

In modern life we have to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high tome of vehicles, the scanty infrastructure and the irrational distribution of the development are main reasons for augmented traffic jam. The major cause leading to traffic jam is the high number of vehicle which was caused by the population and the development of economy. To unravel this problem, the government should encourage people to use public transport or vehicles with small size such as bicycles or make tax on personal vehicles. Particularly, in some Asian countries such as Viet Nam, the local authorities passed law limiting to the number of vehicles for each family.

The methods mentioned above are really efficient in fact. That the inadequate infrastructure cannot handle the issue of traffic is also a Decisive reason. The public conveyance is available and its quality is very bad, mostly in the establishing countries. Besides, the highway and roads are incapable of meeting the requirement of increasing number of vehicle.

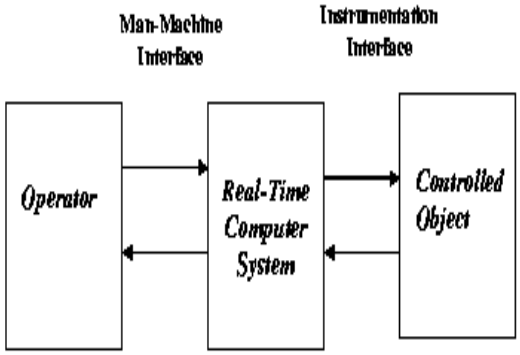

Figure 1: Real-Time System

Manual Controlling: Manual controlling the name instance it require man power to control the traffic. Depending on the countries and states the traffic polices are allotted for a
required area or city to control traffic .The traffic polices will carry sign board, sign light and whistle to control the traffic. They will be instructed to wear specific uniforms in order to control the traffic.Automatic Controlling Automatic traffic light is controlled by timers and electrical sensors.

In traffic light each phase a constant numerical value loaded in the timer. The lights are automatically getting ON and OFF depending on the timer value changes. While using electrical sensors it will capture the availability of the vehicle and signals on each phase, depending onthe signal the lights automatically switch ON and OFF.

5. PROPOSED METHOD

5.1Hardware

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram depicts models A, B, A+, and B+. Model A and A+ and Zero lack the Ethernet and USB hub components. The Ethernet adapter is connected to an additional USB port. In model A and A+ the USB port is connected directly to the SoC. On model B+ and later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while model B only provides two. On the model Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port.

IR sensors (Infrared sensor) are modules which detect the presence of objects before them. If the object is present it give 3.3V as output and if it is not present it gives 0 volt. This is made possible by using a pair of **IR pair** (transmitter and receiver), the **transmitter (IR LED)** will emit an IR ray which will get reflected if there is a object present before it. This IR ray will be received back by

the **receiver (Photodiode)** and the output will be made high after amplified using an op-amp link **LM358**.

IR sensor is very popular sensor, which is used in many applications in electronics, like it is used in Remote control system, motion detector, Product counter, Line follower Robots, Alarms etc.

5.2Processor

The system on a chip (SoC) used in the first generation Raspberry Pi is somewhat equivalent to the chip used in older smartphones (such as iPhone, 3G, 3GS). The Raspberry Pi is based on the Broadcom BCM2835 SoC,[2] which includes an 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU),[12] and RAM. It has a Level 1 cache of 16 KB and a Level 2 cache of 128 KB. The Level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible.

5.3 DESIGN

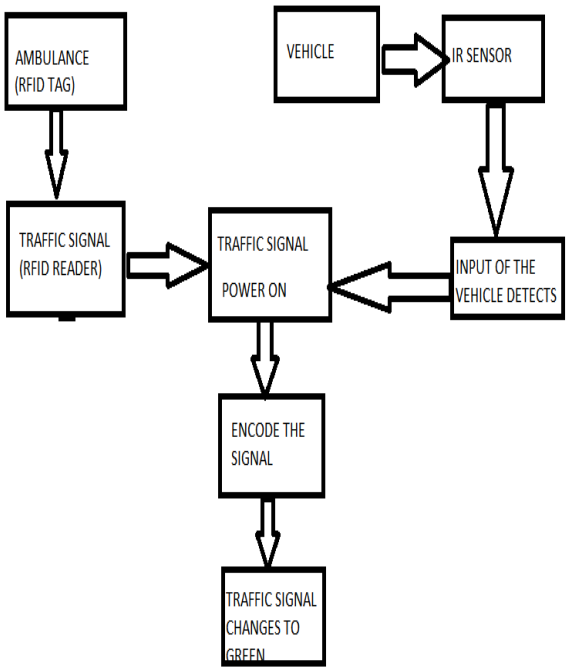

Figure 2:Working Architecture

A design of a smart and fully automatic system which detect traffic congestion in real time and Management of the congestion efficiently to ensure smooth traffic flow with the use of active optical detection technology. Our designed traffic system, acts according to the traffic load on each side of the four way junction. The system act on priority basic to decide which side need to be green depending on the side having more traffic with the help of IR sensors. When there is an ambulance in the lane it is given higher preference and it is detected using RFID Tag and Reader then, that lane is set to green and the way ambulance moves is also cleared continuously so that the ambulance reaches the destination as soon as possible. This help patient to reach hospitals on time and save more life.

5.1.1 DESCRIBITION

From the block diagram it can be seen that IR sensors send information directly to the microcontroller and microcontroller initiate the counter and the output of the counter is again feedback to microcontroller to initiate the traffic signal which is best fitted the deployment model of our system.We have placed a IR sensor at a certain distance say 100 m from the junction on both side of a road i.e. transmitter in one side and receiver in other side to all the road.

Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. RFID is a technique that is widely used in the various application areas like medical science, commerce, security, Electronic toll collection system, access control etc. There are three main components of RFID: RFID tag, RF Reader and Database. Various types of tags are available but we can mainly divide them into two categories: passive tags and active tags. The passive tags don't contain any internal power source. There are three parts of the tag: antenna, semiconductor chip and some form of encapsulation.

Two lights are called linked Lights that are placed on opposite sides of the road that join two intersections. The RFID reader stores the records of all the vehicles that passed through the road. The Traffic light controller follows the some sequence of the lights. But if an Emergency vehicle is detected at any traffic light then controller leave the road and generate the green signal for the ambulance. The other task of the controller is to calculate the time of green signal that is based on the number of vehicle. To solve the problem of Starvation a time limit is defined. If this limit exceeds then that light gets its turn.

6. Conclusion

We have implemented the system in hardware using raspberry pi 3. The hardware simulation has been carried out in raspbian to validate the performance of the model system. The system has been implemented in hardware with efficiency to control the traffic congestion in Indian roadways. In this project, the traffic signal work when the IR sensor receiver an intimation that a vehicle is on the road then the traffic signal is on and it is off when no vehicle on the road.

However there can be further more up-gradation in this system which would minimize the traffic congestion further. Some of the possible ways are data analysis of cars which pass through that junction, use of wireless sensor network, radio frequency identification. This system is completely automated and wireless which avoids human intervention.

REFERENCES

[1] VeeraVenkatesh, Nazneen Syed, ―Smart Traffic Control System for Emergency Vehicle Clearance‖ in International Journal of Innovative Research in Computer and Communication Engineering Vol. 3, Issue 8, August 2015

[2] M. Abdoos, N. Mozayani, and A. L. C. Bazzan, ―Traffic light control in non-stationary environments based on multi agent Q-learning ‚‖in Proc. 14th Int. IEEE Conf. Intell. Transp. Syst., Oct. 2011, pp. 580–1585

[3] Traffic Congestion in Bangalore—A Rising Concern. [Online].Available:http://www.commonfloor.com/guide/traffic-congestion-in-bangalore-arising-concern-27238.html, accessed 2013.

[4] S. Sharma, A. Pithora, G. Gupta, M. Goel, and M. Sinha, ―Traffic light priority control for emergency vehicle using RFID,‖Int. J. Innov. Eng. Technol., vol. 2, no. 2, pp. 363–366, 2013. http://www.iject.org/vol63/1/29-debanjan-sarkar.pdf

[5] http://www.arm.com/Images/doc2545.pdf