

Intelligent Automatic Traffic Control on Time Basis

K. DHARMENDRA¹, K. VENKATA SAI THARUN², K. SAGAR KIRAN³, M. SAI CHENNA KESAVA RAO⁴

^{1, 2, 3, 4} Department of Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Nambur, Guntur, Andhra Pradesh, India

Abstract- *In the world today, urban mobility is one of the unprecedented challenges to be tackled in a big city's administration. This paper analyzes the ever-urban population around the world and discusses the traffic systems in densely populated towns. In addition, it proposes an advanced traffic management system, implemented using the Internet of Things (IoT). The system is supported by a circuit built into the vehicle, which operates with clustered systems using RFID. The system's functionalities include efficient control of traffic light, identification of stolen vehicle and anti-theft security mechanism. Presentation of the proposed architecture and work with Hadoop involving Big Data Analytics. Moreover, supervised learning techniques are proposed that would help determine road standard, estimate overall traffic flow, calculate average speed on a road of distinct types of vehicles, and analyze travel path of a vehicle.*

Indexed Terms- *Internet of Things (IoT), IR (infrared) sensor, Quadriplegia, Raspberry pi, RFID (radio frequency identification).*

I. INTRODUCTION

A population explosion has occurred across the globe with the turn of the century. As of October 14, 2017, Population Division of the world was 1.3 billion, according to the Department of Economic and Social Affairs of the United Nation. This has led directly to more people living in towns. Day by day more and more people are residing in cities and towns in this 21st century. This has led to traffic outbursts in towns. Nevertheless, little attention has been paid to reducing traffic congestion.

Therefore we have developed a proposed model that can minimize the traffic congestion for normal traffic flow. Bearing in mind the modern Indian road, our proposed model could solve the traffic congestion

problem at the junction much more efficiently than conventional traffic systems. The entire system is both cost-effective and efficient, and can be easily installed in Indian roadways. The method is pretty simple; it senses the vehicle on the road at predefined distance for a certain minute and automatically takes the best fitted decision by the vehicle on the road.

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

A prototype of the idea was drawn up using raspbain. Hardware that has 802.11n Wi-Fi, Bluetooth 4.0 and a quad-core 64-bit ARM Cortex A53 running at 1.2 GHz, IR Sensor, SD card, bread wide, and LED's (Light Emitting Diode) has demonstrated the prototype.

II. IOT

The Internet of Things is defined as Things that have identities and virtual personalities that work in smart spaces using smart interfaces to connect and communicate within social, environmental and user context. It could be considered the Internet Future, where all objects are connected to other objects. Every object inside the network is given a unique identity. This enables devices to be accessed remotely through the network, at anytime and anywhere.

IOT-enabled objects communicate with each other, access information over the Internet, and interact with users who create smart, omnipresent and always connected environments. IoT also allows machine

communication which allows Internet and other machines to be controlled by machines.

2.1 IOT CHARACTERISTICS

- Intelligence

Together algorithms and computing (i.e. software and hardware) provide the smart spark that makes a product experience intelligent. Consider Misfit Shine, a fitness tracker, when compared with Nest's smart thermostat. The Shine experience distributes the tasks of calculating between a smartphone and the cloud. For the AI, the Nest thermostat has more calculated horsepower which makes them smart.

- Connectivity

IOT connectivity is more than just slapping on a Wi-Fi module and calling it on a day. Connectivity offers accessibility and compatibility to the network. Accessibility becomes accessible on a network while compatibility provides the common ability to consume and generate data. If that sounds familiar, it's because it's the law of Metcalfe and it's true of IOT.

- Sensing

Our senses and ability to understand the physical world and the people around us tend to be taken for granted. Sensing technologies provide the means to create experiences that reflect a true consciousness of the physical world and its people. This is just the physical world's analog input but it can provide a rich understanding of our complex world.

- Expression

Expressing allows interactivity with the physical world and the people. Whether it's a smart home or a farm with smart farming technology, expressing gives us a means to create products that intelligently interact with the real world. This means more than simply rendering a screen with beautiful UIs. Expressing enables us to exit into the real world and to interact directly with people and the environment.

- Energy

We cannot bring our creations to life without energy. The problem is we can't make billions of things all running on batteries. Energy harvesting, power efficiency, and charging infrastructure are part of a power-ecosystem that we need to design. It is hugely

inadequate today and lacks the focus of many product teams.

- Safety

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

2.2 IOT – ADVANTAGES

- Improved customer engagement—Current analytics are suffering from blind spots and significant accuracy deficiencies; and, as noted, commitment remains passive. IOT transforms this completely so as to achieve a richer and more effective engagement with the public

- Technology Optimization—Similar technologies and data that enhance customer experience also enhance device usage and contribute to more powerful technological improvements. IoT unlocks a critical world of functional and field data.

- Reduced Waste-IoT clarifies areas for improvement. Current analytics provide us with superficial insight but IoT provides real-world information leading to more effective resource management.

- Enhanced Data Collection –Modern data collection suffers from its limitations and its design for passive use. IoT breaks it out of these spaces and puts it right where people really want to go to analyze our world. It gives you a precise picture of everything

III. RASPBERRY PY OS

3.1 Tools bundled with Raspbian:

3.1.1 Raspbian

Raspbian is a free, hardware-optimized Debian-based OS for Raspberry Pi. Raspbian has all of the basic programs and utilities like other general-purpose operating systems. Raspbian foundation officially

supports it, and its highlighting feature is its more than 35000 packages and fast performance. You can install its latest version Jessie on an 8 GB SD card.

3.1.2 Ubuntu 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.

3.1.3 Linutop

On Raspberry Pi, which uses Raspbian base with lightweight, classic XFCE graphical environment, Linutop can be set up quickly. It boots as fast as in 30 seconds, and can be quickly configured for all purposes. Its security features include a single-read mode to save from viruses and attempted hacking. All changes are not saved unless you enter the password.

3.2 Programming tools bundled with Raspbian:

- Node-RED for IoT applications

Node-RED is an open source and free tool for interesting ways of cabling hardware devices, online services, APIs together. It is developed by IBM Emerging Technologies and runs on all major operating systems. It offers flow editor based on browser. It's built on Node.js which makes running on low-cost hardware like Raspberry Pi at the edge of the network ideal. An online flow library also allows you to share the best of your flows with others.

- Python – a modern language for RPi

IDLE (Integrated Development and Learning Environment) is a Python IDE which is bundled with the default language implementation. Python for RPi is cross-platform, avoiding the clutter of features. Its highlighting features are multi-window text editor with syntax highlighting, auto completion, persistent breakpoints, syntax highlighting Python shell and visibility of call stacks. Raspbian comes with installed versions of both Python 3 and 4.

IV. EXISTING METHOD

We have to face many problems in modern life one of which is that traffic congestion becomes more serious day after day. It is said that the high tome of vehicles, the scanty infrastructure and irrational development distribution are the main reasons for increased traffic jams. The main cause that leads to traffic jam is the high number of vehicles that were caused by population and economic development. The government should encourage people to use public transport or vehicles in small size such as bicycles or make taxation on personal vehicles to unravel this problem. In particular, in some Asian countries, such as Viet Nam, the local authorities have passed legislation limiting the number

The above methods are in fact really efficient. It is also a decisive reason that the inadequate infrastructure cannot tackle the traffic issue. Public transport is available, and its quality is very poor, mostly in the countries established. In addition, the highways and roads are unable to meet the demands of increasing vehicle numbers.

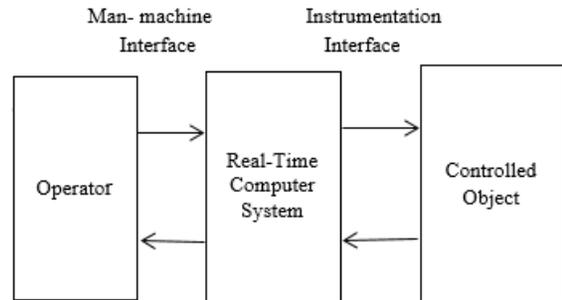


Figure-1 Real-Time System

- Manual Controlling:

Manual control of the instance name which requires man power to control the traffic. Traffic policies are allocated to control traffic for the required area or city, depending on the countries and states. Traffic policies will carry sign board, sign light and whistle for traffic control. They will be instructed to wear specific uniforms to control the traffic. Timers and electrical sensors control automatic traffic light.

In traffic light a constant number value loaded in the timer is loaded in each phase. The lights get ON and

OFF automatically, depending on the changes in the timer value. While using electrical sensors, it will capture vehicle availability and signals at each phase, automatically switch ON and OFF depending on the signal the lights give.

V. PROPOSED METHOD

5.1 Hardware

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

IR sensors (Infrared Sensor) are modules that detect objects in front of them. If the object is present it will give output of 3.3V and if it is not present it will give 0 volt. This is made possible by using a pair of IR pairs (transmitter and receiver), and the transmitter (IR LED) will emit an IR ray that is reflected if an object is present before it. The receiver (Photodiode) will receive this IR ray back, and the output will be high after being amplified using an op-amp link LM358.

IR sensor is a very popular sensor used in many electronics applications, such as remote control, motion detector, product counter, line follower robots, alarms, etc.

Radio-(RFID) uses electromagnetic fields to automatically detect and track tags affixed to objects. A small radio transponder consists of an RFID tag; a radio receiver and a transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID device, the tag transmits digital data, generally

an identifying inventory number, back to the reader. You can take advantage of that number to stock goods. The RC522 is a 13.56 MHz RFID module based on the NXP semiconductor MFRC522 controller. The module can support I2C, SPI, and UART and is normally shipped with a key fob and RFID card. It is commonly used in attendance systems and other application for identification of persons / objects

5.2 Processor

The system used in the first-generation Raspberry Pi on a chip (SoC) is quite equivalent to that used in older smartphones (such as apple, 3 G, 3GS). The Raspberry Pi is based on the Broadcom BCM2835 SoC[2] featuring a 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU),[12] and RAM. It has a 16 KB Level 1 cache, and a 128 KB Level 2 cache. The Level 2 cache is chiefly used by the GPU. The SoC is stacked under the RAM chip, therefore only its edge is visible.

5.3 Design

A smart, fully automatic system design that detects real-time traffic congestion and efficiently manages congestion to ensure smooth traffic flow using active optical detection technology. Our designed traffic system, acts on each side of the four way junction according to the traffic load.

.Radio frequency identification is a technique using the radio waves to uniquely identify the object. RFID is a technique widely used in the various fields of application such as medical science, trade, security, electronic toll collection, access control, etc. RFID has three major components: RFID tag, RF Reader, and Database. There are different types of tags available but we can divide them mainly into two categories: passive tags and active tags. The passive tags contain no source of internal power. The tag is composed of three parts: antenna, semiconductor chip and some form of encapsulation

The system acts on the basic priority to decide which side needs to be green depending on whether the side has more traffic with the help of IR sensors. Higher preference is given when an ambulance is in the lane and then it is detected using RFID Tag and Reader that lane is set to green and the way ambulance moves is also continuously cleared so that the ambulance

reaches the destination as soon as possible. This helps patients in getting to hospitals on time and saving more life.

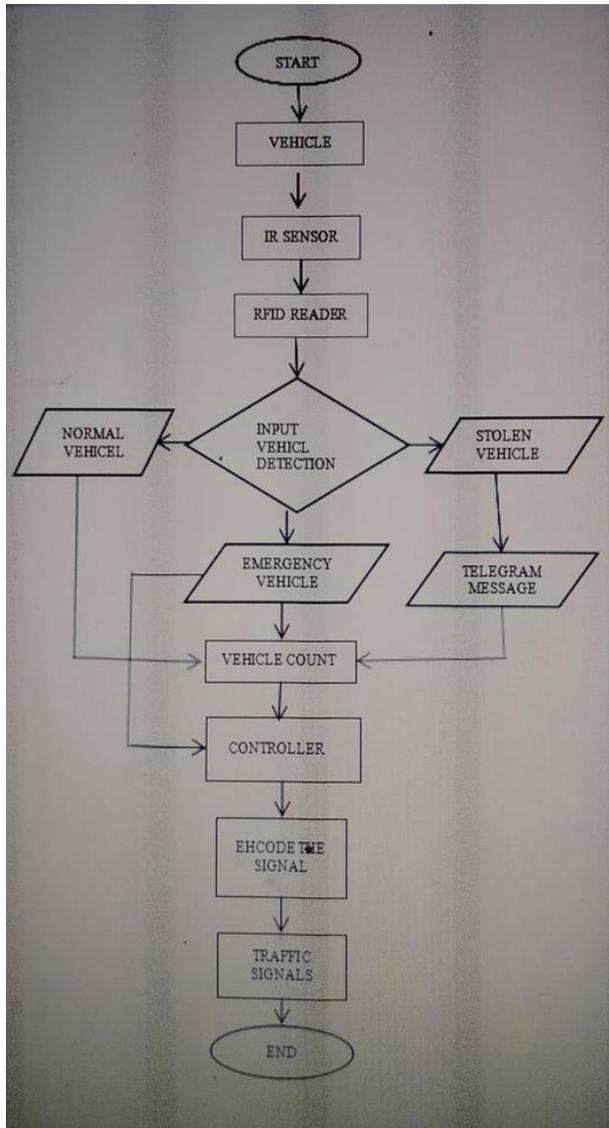


Figure-2 Flow chart

5.4 Description

From the block diagram it can be seen that the vehicle was detected by using IR sensors. The RFID reader reads the vehicle RFID tag when the vehicle was detected. By this we can easily identify the emergency vehicle, the vehicle and general vehicles that were stolen. The IR sensor sends information directly to the microcontroller and the microcontroller starts the counter and the counter output is again feedback to the

microcontroller to initiate the traffic signal that best fits our system's deployment mode.

Three lights are called interconnected lights which are placed on opposite sides of the road joining two intersections. The RFID reader stores the records of all the vehicles which have passed the road. The Traffic light controller follows the lights in some sequence. But if any traffic light detects an emergency vehicle then the controller leaves the road and generates the ambulance's green signal. Send telegram message to the control room if stolem vehicle occurred. The controller's other task is to calculate the time of the green signal, which is based on vehicle number. A time-is defined to solve the Starvation problem. If this limit exceeds then the light will get its own

CONCLUSION

Using raspberry pi 3B we implemented the system in hardware. To validate the model system performance, the hardware simulation was conducted in raspbian. The system was implemented to control the traffic congestion in Indian roadways in hardware with efficiency. In this project, the traffic signal works when an intimation is given by the IR sensor receiver that a vehicle is on the road then the traffic signal is on and off when no vehicle is on the road.

This system may however be further upgraded which would further minimize traffic congestion. Some of the possible ways are car data analysis that goes through that junction, use of wireless sensor network, identification of radio frequencies. This system is fully automated and wireless so that human intervention is avoided.

REFERENCES

- [1] M. Abdoos, N. Mozayani, and A. L. C. Bazzan, Traffic light control in non-stationary environments based on multi agent Q-learning, lin Proc. 14th Int. IEEE Conf. Intell. Transp. Syst., Oct. 2011, pp. 580–1585
- [2] Intelligent Ambulance with Traffic Control (Gargi Beri, Pankaj Ganjare, Amruta Gate, Ashwin Channawar, Vijay Gaikwad.
- [3] Automated Emergency System in Ambulance to

Control Traffic Signals using IoT (Dr.A. Balamurugan, G. Navin Siva Kumar, S. Raj Thilak, P. Selvakumar)

- [4] JS. 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] Amrita Rai and Govind Singh Patel Multiple Traffic Control Using Wireless Sensor and Density Measuring Camera. Sensors & Transducers Journal Vol. 94, Issue 7, July 2008, pp. 126-132.