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Traffic load minimization in software-defined wireless sensor networks

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ABSTRACT

In this paper, we have discussed the problem of traffic and how to solve it using WSN and IoT. As we know IOT is the latest technology and is being used in many sectors nowadays at it very effective. As we know the problem of traffic management is increasing nowadays is big cities which causes many problems like traffic, accidents, and pollution. Management of traffic is very important and a tedious job. There have been many methods used to solve these Problems. Also, the issues like car theft have also increased nowadays, also due to high traffic ambulance also have problems in reaching the hospitals fast. In this paper, we have discussed the technique of solving this problem using IOT. There will be a sensor node and a base node the sensor node will be used to count the traffic in each lane and will send the information to the base node and the base node will take the decision of allocation of them. Also, the base node will have an RFID reader connected which will be continuously Reading for the RFID cards that will be present at the cars and compare it with the database and search for the stolen cars and ambulance and will notify after the stolen car is detected. This will help to solve the traffic management problem the theft problem and the emergency situations for the ambulance.

Keywords— *IoT, WSN, RFID*

1. INTRODUCTION

The traffic signaling system is a vast field where WSN and IoT can help solve the problem using Sensors to detect the traffic load. Wireless sensors network can be used in the detection of the traffic load. These sensors require very few power as they run on the sensor. These sensors are connected to a battery which is charged using sun at day times so that it can be used for the latter half day. Consider an area with high traffic where there is vehicles like car, motorcycle, trucks, ambulance and VIP cars. Traffic signal present now has hardcoded timings which cannot be changed. This can lead to wastage of time that can be precious in terms of an emergency vehicle. In order to handle such situations the proposed system has two parts the base node and the sensor node. The proposed system uses the Wireless sensor method for the same. The Base node will be having the sensors that will detect the traffic density. After measuring the traffic density at the 4 lanes it will send the data to base node about the same. The sensor nodes will be connected to the base node wirelessly using Wi-Fi. After getting the traffic density the base node will take the decision about the timing and allow the priorities and timing accordingly.

The base node will also have RFID readers connected to which will detect the RFID cards that are present on the car. After reading the RFID cards it will compare that to the database and search for lost vehicles an emergency vehicles and perform the appropriate operation

2. LITERATURE SURVEY

There have been many systems implemented for traffic management systems. All the systems have their own drawbacks Traffic conjunction is a serious issue nowadays because of it there are many problems caused like getting late and a design was developed with the use of PIC microcontroller, Infra-red Sensors, and ZigBee. IR sensor was used to decide the traffic density and the ZigBee was used for emergency situations, moreover, the system only operated in automatic mode and it didn't have any manual control overit [1].

To pass a number of vehicles an Algorithm was also designed. There was a priority number that was given to the different type of vehicle. A vehicle like Ambulance, Fire Brigade are given First Priority. Next Priority will be given to VIP vehicles. The priority will be given also on the basis of traffic density. The road that has traffic density high will have high priorities [2].

RFID stands for Radio Frequency Identifications, it is generally used in malls to detect stolen material it was used on signals to detect stolen vehicle and that will contain the RFID tags. Long range RFID can be used in this that will help improper implementation of the system [3].

The green path for emergency vehicle allowed all the vehicle to move forward whenever an ambulance is detected [4]. But the disadvantage of the system is that all side can create traffic jams for Emergency Vehicle.

3. PROPOSED METHODOLOGY

Our proposed wireless sensor network architecture is shown in Fig1. It has no centralized station that coordinates the traffic controllers' behavior, but rather, each traffic signal controls the intersection locally without the help of an external entity. In this Project the concept of intelligent traffic routing using wireless sensor networks. The primary elements of this system are the sensor nodes or motes consisting of sensors and a transmitter. The sensors interact with the physical environment while the transmitter pages the sensors data to the central controller. This system involves the 4 x 4 array of sensor nodes in each road. This signifies 4 levels of traffic and 4 lanes in each road. The sensors are IR based optical sensors which transmit status based on the presence of vehicle near it. The sensor nodes transmit at specified time intervals via ZigBee protocol to the central controller placed at every intersection. The controller receives the signal and computes which road and which lane has to be given a green signal based on the density of traffic. The controller makes use of the discussed algorithm to perform intelligent traffic routing. There is also an RFID added to the base controller which will read the RFID cards and identify the stolen cars.

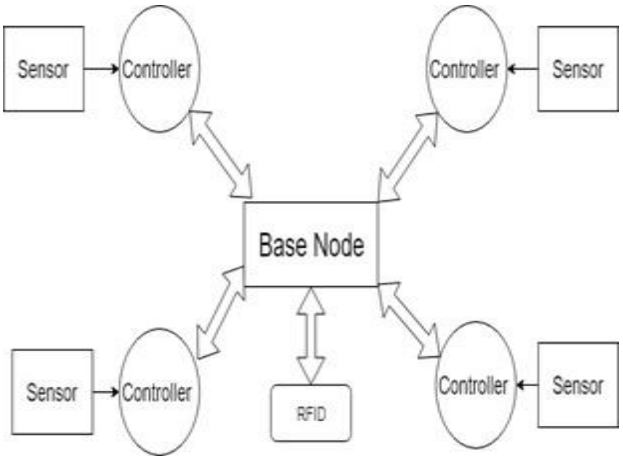

Fig. 1: Architecture

Architecture can be divided into two part:

3.1 The Sensor Node

It will have the sensors connected to the microcontroller which will measure the traffic density, mainly IR sensors will be used for the same. The Microcontroller will gather the data and send it wirelessly through a wireless device to the central node.

3.2 The central node

The central node will have all the sensor node wirelessly connected to it, it will gather the data from the sensor node and allow the timing according to the density. The central node will also have the database stored and will read the RFID tags on the car top to detect the stolen.

(a) Raspberry PI: At the base node there is RPI. The Latest Raspberry Pi 3 Model B Original quad-core 1.2GHz 64Bit SoC and onboard Wi-Fi and Bluetooth is the latest product in Robu.in among raspberry pi family. The Latest generation product which maintains the same popular board format as other raspberry pi modules, but it has faster 1.2GHz 64Bit SoC, and onboard Wi-Fi and Bluetooth. The RPi will be used as the Base Node in or Project.

(b) Arduino UNO: Arduino Uno is microcontroller based board which has an atmega328p on it, some of its features are that it has 14 digital IO pins, 6 analog inputs, 1 UART port, 1 I2C, and 1 SPI Port. Arduino Uno is easy to use and easy to program board. It is widely used in IoT projects all over the world. In our project, it will be used at the Sensor node to take the input from the sensors and give it to send it to the Base Node.

(c) RFID: RFID stands for Radio Frequency Identification and refers to a certain technology where data encoded by smart cards is read by RFID readers Using Electromagnetic waves. RFID is somewhat similar to Bar codes but RFID has advantages over the bar code. It does not have to be in the line of the sign of the reader. The long-range RFID reader can detect the Card from a long range. In our system, the RFID reader will be connected to the Base Node which will read the tags that will be connected on the cars and the ambulance to check for stolen cars or to check for an ambulance.

(d) Network device: As all the device needs to be connected in a network so as they can communicate in IOT. In our system, The Sensor nodes should be connected to the Based node so as to communication to happen. To achieve this communication first we need to wirelessly connect the sensor node to the base node. For that we will need a Network device like WIFI, the network device will be used to connect the sensor node and the base node.

(e) IR Sensor: It is an electronic device that emits in order to sense the aspects of the Surrounding. An IR sensor can detect the motion of an object and can also detect the heat of an object. There are normally two parts to it an IR transmitter and an IR receiver the IR transmitter transmits the wave and the receiver receives the wave. Whenever the Ir wave reflects back from the surface to is received by the receiver. We can vary the range of the IR sensor by changing the resistance. The Ir sensor will detect

whichever any object will enter its range of Sight. In our system we will be using multiple IR sensors for detecting the traffic density all the sensors will be connected to the microcontroller.

4. FLOW CHART

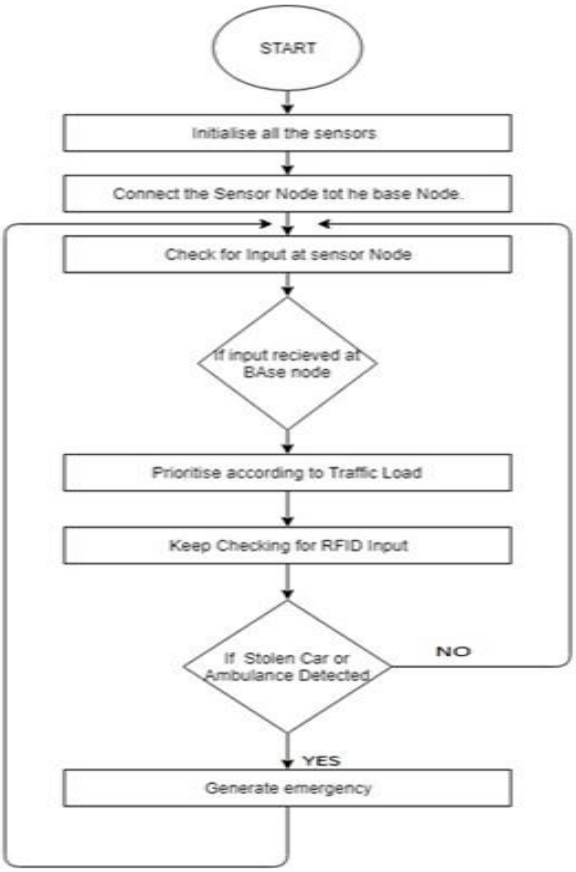

Fig. 2: Flow chart

5. RESULT AND DISCUSSION

A comparison is done between our system and previous systems that have been implemented. The result consists the Timings that was required by the previous system and the timings that will be required by our system.

Table 1: Comparison of regular and proposed model

S. No.	Type	Proposed Model	Regular Model
1	Traffic Timer	60secs	80secs
2	Waiting Time	30secs	70secs
3	Unnecessary Wait	10secs	30secs

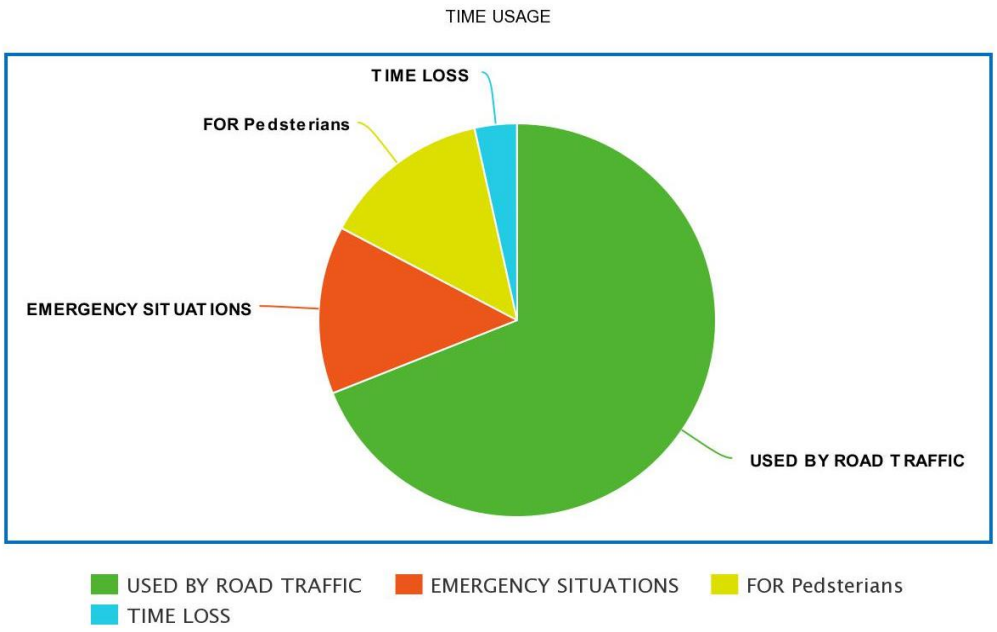

Fig. 3: Pie chart

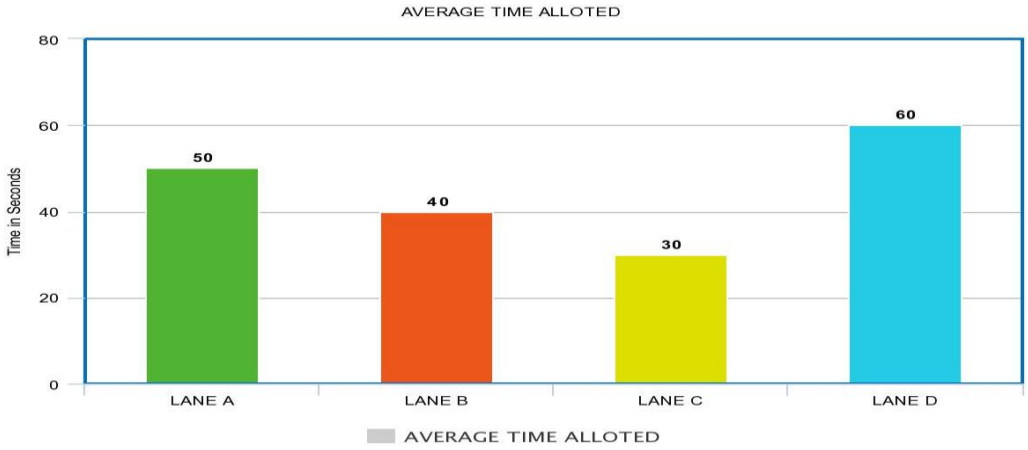

Fig. 4: Chart

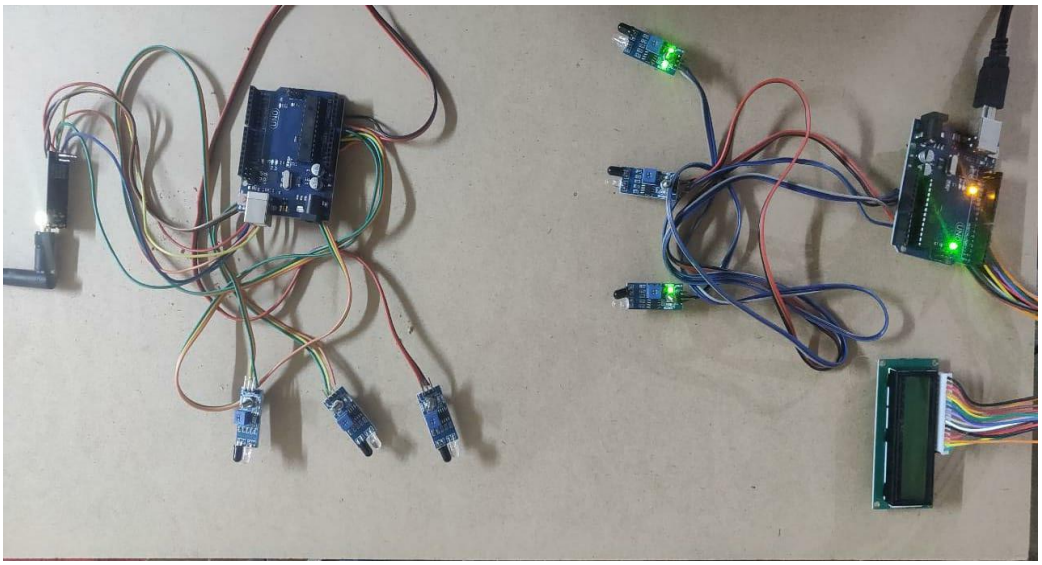

Fig. 5: Hardware

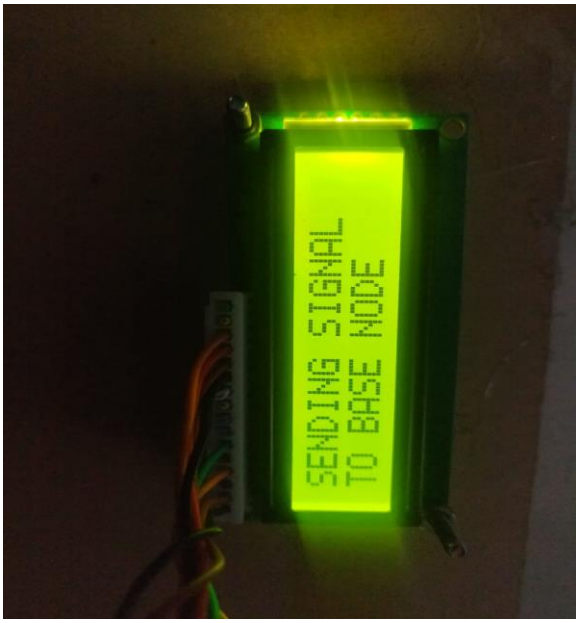

Fig. 6: Hardware result

6. CONCLUSION

This paper we have proposed an IoT based Traffic load minimization system, we have also seen the methodology, the hardware-software requirements and the software flow required for our project. As we know Traffic management is a very serious problem using the Concept of IOT for can help it solve the problem very easily.

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