

DESIGN OF IoT NODE FOR SMART CITIES

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ABSTRACT: Smart city is an emanation concept and includes five various dimensions namely smart economy, smart mobility, smart environment, smart living and smart governance. Smart city technology promotes the life of people and their surroundings and plays a vital role in IoT based services and cloud computing. Internet as a service, cloud computing represent the results of both hardware and software. On a part sensors are connected to the internet mainly to provide various services to enrich the smart concept. Internet of Things, are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support additional services for both the cities and citizens. The paper addresses various sources for application development. An IoT based smart bin, smart lightning, smart parking and pollution free surrounding is proposed in the paper.

Index Terms- Smart cities, Internet of Things, cloud computing, sensors.

1. INTRODUCTION

To create smart outcomes for citizens and also to improve the quality of life of people by enabling local development, smart city mission is a laudable initiative by the Government of India (GoI). Currently, 31% of India's population lives in cities, these cities also generate 63% of the nation's economic activity. These numbers are rapidly increasing, with almost half of India's population projected to live in its cities by 2030^[14]. Smart Cities focus on the most pressing needs and on the greatest opportunities to improve the quality of life for residents today and in the future. In the approach to the Smart Cities Mission, the objective is to

promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions. The focus is on sustainable and inclusive development, and the idea is to 'Smart' surroundings.

IoT plays a vital role in today's technology and provides connectivity for anytime, anyplace and anywhere. When focusing towards smart city IoT create safer, more efficient cities by transforming infrastructures, buildings and services with Internet of Things (IoT) solutions^[13]. IoT companies are leading the way in smart city development by developing smart and communicating technical solutions for

revolutionizing the services and infrastructure of cities all over the world. Integrating all electrical or electronic devices through internet of things for transforming much smarter development. To combine city's physical infrastructure and services with the latest technological offerings, IoT has become ever more prominent in everyday life hence the concept of the smart city has began to grow^[15].

The urban centre of the future is the vision of the smart city. The systems and structure will monitor their own conditions and carry out self-repair. The smart materials and structures are also known as the intelligent or adaptive materials. The flowing work focuses on four main specific sectors namely smart parking, smart lightning, smart bin and pollution free environment. Every device is part of a smart city must work to manage the resources of megacity populations^[15]. To execute the work 3 main sensors are involved and they are Infrared sensors, MQ 6 sensor and LDR sensor. Those three sensors are connected through the internet and results are updated in webpage. This paper is ordered as follow: Section 2 describes proposed system model. System design is explained in Section 3. The result and discussions are analyzed in Section 4 and Section 5 contains summary of the conclusions.

2. SYSTEM MODEL

Due to the unique context of each city shapes namely technological, organizational and policy aspects of that city, smart city is considered a contextualized interplay among technological innovation. Smart city includes wide range coverage and hence included four main various concepts, the following model is designed.

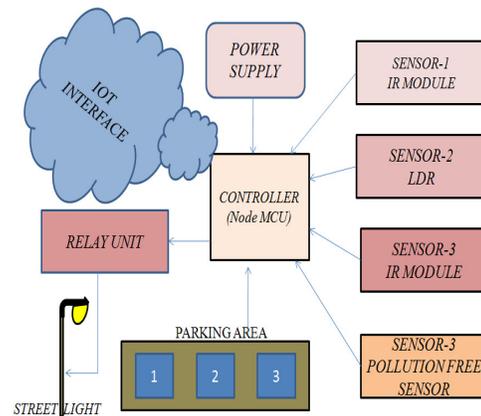


Fig.1, Block Diagram of Proposed Work

The Node MCU is an open-source firmware and development kit, inbuilt with wifi module. The ESP8266 itself is a self-contained Wifi networking solution offering as a bridge from existing micro controller to Wifi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. Without any troublesome MCU kit is made connected with laptops.

3. SYSTEM DESIGN

Smart city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening and how the city is evolving. Smart city includes data collected from citizens, devices and assets. Smart city includes data collected from citizens, devices and assets that is processed and analyzed to monitor and manage various services.

Smart lightning:

The system is programmed in such a way, when the sunlight intensity drops below a threshold value then it is set, it will facilitate the switching ON/ OFF of the street light. The data collected will be then sent to the cloud where it can be stored, analyzed and interpreted for better

understanding of the power consumed. Hence energy management is involved to save lot of electricity.

The threshold value is set upto 650. Below the luminous value the light is made ON based upon the principle of LDR(Light Dependent Resistor), ‘The resistance of photoresistor decreases with increasing incident light intensity’ in other words it exhibits photoconductivity. As like resistor, it too doesn’t have any polarity. By means of relay the light is made ON.

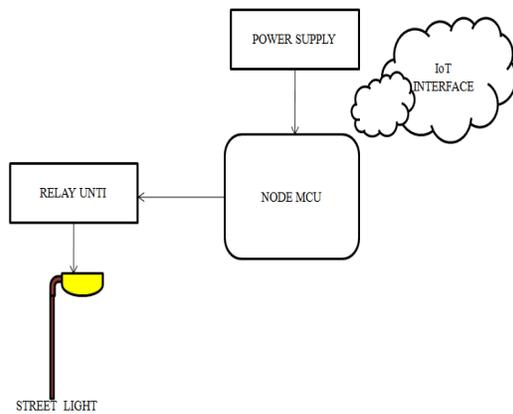


Fig.2, Block of Smart Lightning concept

Smart bin:

Bins placed near the public places are overloaded and entire area is spread with bad odor. A bin with heavy dumped wastes creates unhygienic conditions for people as well as ugliness to that place. Inorder to avoid all such hazardous scenario and maintain public cleanliness and health, the following work is mounted on a smart bin system. The main theme of the work is to develop a smart intelligent bin alert system for a proper garbage management. The following block is designed to implement smart bin concept. Once the dust reaches the marked area, data’s are stored in cloud via ESP8266 module.

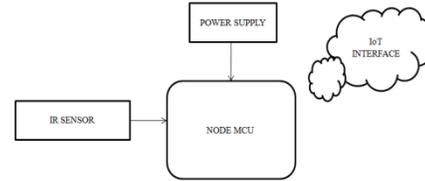


Fig.3, Block of Smart Bin concept

Smart parking:

Smart parking in around surroundings will free up space and the time in the city of tomorrow. Smart Parking provides a service that ensures the efficient and regulated use of car parks. One of the main problems in today’s cities is parking. People living in cities facing lack of sufficient parking space. Nowadays total number of motor vehicles exceeding the total number of heads per family. The parking scenario is woefully falling short of the current requirements in the country. Approximately 40% of the roads in urban India are taken up for just parking their cars. Inorder to overcome such problems the following block is worked out. IR sensor is made fit under the road marker lightning above the parking tracks and track out the area whether free or not.

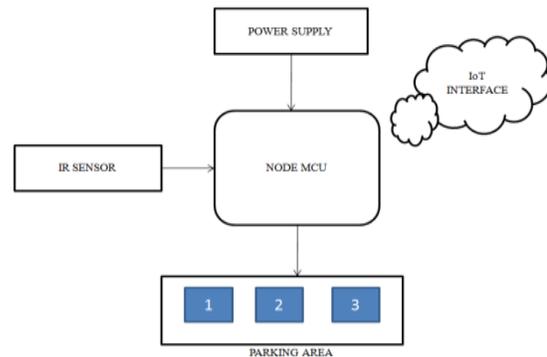


Fig.4, Block of Smart parking concept

Pollution free area:

Surrounding atmosphere by different forms of pollution may cause hazardous problems for the people. MQ6 sensor detects the presence of pollution in air and if polluted the current value is sent to webpage, now steps taken to make over it. Keeping concern the following block is designed.

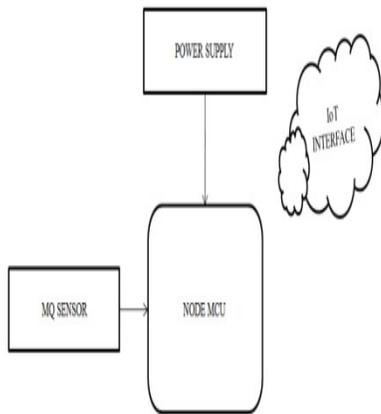


Fig.5, Block of pollution free concept

4. RESULT AND DISCUSSIONS



Fig.6, Set up to develop smart city

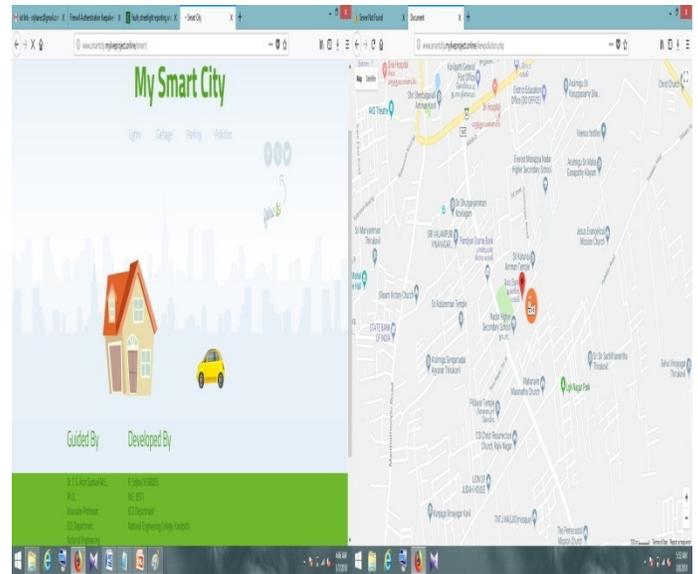


Fig.7, Webpage result

Once the problem is deduced from various sensors, the data is collected and viewed in webpage for further precaution to be taken. Power is supplied to node MCU through USB cable and connected with the four main sensors to perform smart work. The data out from LDR is connected to the ADC since the out from the LDR is analog. The remaining out from the sensors are digital and made connected to the data pins. The following happening around the area is viewed and indications are provided in webpage to make the citizens be alert.

5. CONCLUSION

The smart city concept has gained a lot of attention and will most likely to do so in future. Smart city is wide concept and here focused in four main factors to overcome the problematic issues all over the surroundings. The sensed data's are informed by cloud computing to enrich the day to days life much more 'smart'. The designed application is mainly used to manage urban flows and allows simple transactional relationship with citizens.

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