

Smart Urbanization using IOT Technology

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Abstract— IOT offers systems that combine more than one disparate additive towards their synergistic use. Most of the world's population today lives in cities. By 2030, the population of the cities around the arena is predicted to grow from three. Three billion to five billion people. Due to aid constraints, there may be a hassle inside the destiny to provide all the offerings to the residents. To serve and improve the standard of dwelling of the developing population, it's essential to expand clever towns. The Smart City ambitions to make the most fulfilling and sustainable use of all sources, even as retaining the correct stability among social, environmental and financial expenses. The wireless sensors are connected to road lamps, water tanks, parking areas, dustbins and site visitors lights. Sensors are then connected to an arduino microcontroller board in which every and each essential parameters for the city are monitored and updated to cloud by way of a PC. The cloud is connected with the app server in turn that's connected to the integrated Blynk software of the consumer's Android cellphone. Here we are developing a project based on IOT. IOT is generally a sensor to sensor communication which communicates with the help of the internet. The sensors are connected together to a microcontroller over the internet to focus on five parameters of the city. Emphasis is given on how sensing and communication technologies of IOT can effectively be utilized in clever metropolis monitoring. The project aims at developing a device which facilitates the gathering of information with the assistance of interconnected modules inclusive of a couple of sensors beneficial to the city.

Index Terms— Arduino microcontroller, Blynk application, Sensors, Modules, Cloud

I. INTRODUCTION

The important idea of IOT is a system to gadget verbal exchange. Internet-based totally sensor networks have recently been gaining interest. Sensors are connected to the Internet and the records from the sensors are collected at a server through the Internet. Security and manageability of sensor statistics transmission and deployability of sensors connecting to the Internet wirelessly are the primary problems lighting fixtures could be monitored. Another set of IR sensors are interfaced with the controller which can be used by the government for quick actions. Co2 sensors are interfaced with the controller and are constant inside the metropolis' centers for tracking the pollutants within the city and if the pollution stage seems to be extended then necessary actions can be taken. LDR[9] light sensors are interfaced with the controller that allows you to come across the depth of mild falling and for this reason the street lighting fixtures can be controlled. Relays are interfaced with the controller for turning on and turning off the water valves according to comfort by using a cellular app.

IoT (Internet of Things) is a good advanced automation plus analytics system which usually exploits networking, realizing, big data, plus artificial intelligence technologies to provide comprehensive systems for the item or service. These types of systems allow better transparency, control, plus performance when used in any sector or system.

IoT systems have [7] apps across industries by means of their unique general flexibility and capability to be ideal in any atmosphere. They enhance information collection,

automation, functions, and even more through sensible devices and effective enabling technology. IoT systems allow customers to obtain deeper software, analysis, and incorporation in just a system. They will raise the reach associated with the other fields without precision.

II. LITERATURE SURVEY

“Internet of things(IOT): A vision,architectural elements and future directions,” describes systems that are industrially connected and communicate data.This paper shows implementation of IOT in worldwide centric vision.

In future the key technologies and application that's based on iot are likely to help increase research on iot.Using Aneka a cloud implementation ,based on private and public clouds are presented[1]

“An IOT application of safe building in ipv6 network environment” the mesh network which is wireless used to send and receive data to the backend are also used to connect the backend server for control. The IPV6 which is a wireless technology iot platform is called slowpan.,the first standard group all devices have radio which is wireless so they talk to each other, one or more have wifi ,3g,ethernet,initiate the wireless information .It's called root node.[2]

“smart cities concept and challenges bases for the assessment of ASCIMER (assessing Smart Cities in the mediterranean Region)” is a project which was developed by the universidad politécnica de madrid (UPM)for call on “Smart City Development: Applying European and International Experience to the Mediterranean Region”, Recent times, conception process, outcomes and deployment

methods was aimed by many initiatives referred as development of smart cities in multiple areas. The smart city projects are developed, evolved by execution of specific projects by implementing on global level strategies to tackle big city problems and challenges.

III. METHODOLOGY

Generally, this project contains a centralized microcontroller named ESP32 which is linked to the internet. It is connected with many sensors namely LDR, IR, Float Switch and Ultrasonic Sensors. This system works to bring advanced technology in five different aspects of the city. We are focussing on [9] some of the major problems of the city, especially major cities. The problems which we are covering in this system are street light automation, density based traffic monitoring, car parking monitoring, garbage monitoring system and water level monitoring system. The complete strategy is handled and monitored by a multi purpose web software which is linked to a server. For a traffic based monitoring system, the IR sensors are kept in two lanes of the road which detects and generates LED light and this information is sent to a server and which we can monitor in a smart phone in the Blynk application. A set of IR and Ultrasonic sensors is connected to a dustbin which detects the amount of garbage filled and this information is passed through a Microcontroller and information is displayed on a LCD screen. In the same [10] way a set of IR sensors is kept at the parking slot to know the arrival and departure of the vehicles. LDR sensor detects the light and turns off the street light automatically and if it won't detect the lights get turned on. Float switch sensor detects the amount of water filled in a tank. If the water level reaches a certain amount of level the flow of water will stop. All of this data is transferred to the cloud server called Blynk Later this data will be sent to the Blynk application in which we can track the data.

BLOCK DIAGRAM:

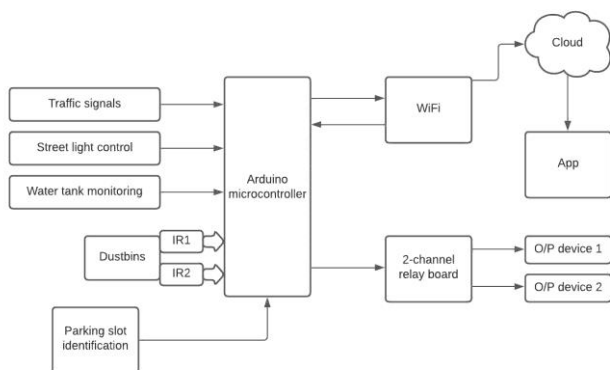


Fig1: Proposed Model

IV. WORKING PRINCIPLE

The mentioned method illustrates a new novel method regarding making smart urban centers. Here various sensors are used for overseeing various parameters like light availability, water availability, and many other parameters. Two IR sensors are used for [8] overseeing the waste stage present in the dustbin. Ultrasonic sensors for clever parking. These sensor values are presented for the Arduino. The values are sent to the cloud through Wi fi connection. An individual could access these principles through Blynk software. Along with overseeing the user could also control many of the variables like switching about the motor, switching about the LED. This is done from the Electrical relays attached to the Arduino. The instructions are sent from the Blynk app.

SOFTWARE IMPLEMENTATION:

The software implementation of our project mainly includes the Arduino IDE platform which connects with all types of operating systems like IOS and Android. It is used to compile the Arduino IDE and Raspberry PI sensors. Embedded C is an extension of the C programming language which is used to write the programs that are required for the project. In this project we wrote a code that runs all the sensors which are connected to the ESP32 microcontroller. Here we use an arduino IDE compiler which is an open source software available on the internet to download for free. Later all this data is hard coded to the cloud server called blynk which sends all the data to our smartphones.

V. COMPONENTS USED

HARDWARE REQUIRED

❖ **ESP 32:** It is generally a chip which has many features like Wi-Fi bluetooth and it has a dual high performance eXtensa and it is a 32 bit processor with LX6 cores with multiple peripherals it has a ultra reduced power of co-processor. It is type of platform which provides a robust technology and it has a power usage for the constant demands because it has a high security and small in size and it generally help the application developers and provides the basic need of hardware and software requirements this ESP32 generally used for developing the many hardware series and it is generally used for the internet of things projects which adds a more value to the project and easy control over the sensors and to send and receive the data. We generally need to use some of the hardware parts like bread board and USB cable.

The below figure shows the complete pin configuration of the ESP32 microcontroller that we are going to use in this project which in addition is connected to many other sensors like LDR,IR,Float switch.

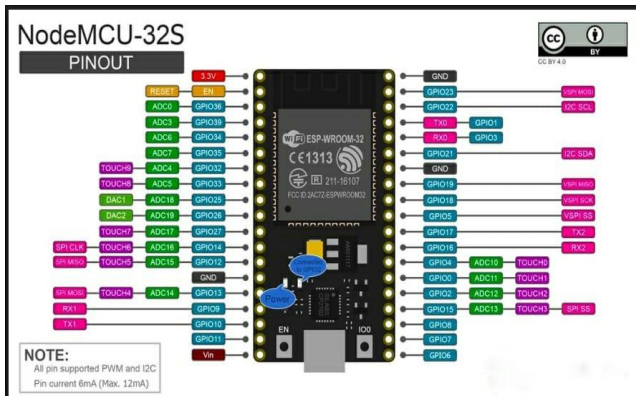


Fig2: ESP32 Pin configuration

- ❖ **LDR Sensor:** The light dependent sensor in short form we call it as LDR or even we can call it a photoresistor. This sensor functions as a particular incident electromagnetic radiation. They are commonly known as light sensitive devices These are the photocells which we can commonly call it as photoconductive or photoconductors, these are generally made up of semiconductors which attract the opposite forces. These sensors generally work with different symbols. These sensors work with a principle called photo-resistivity in which the arrow indicates the dependence of the light function. These sensors generally absorb the light using the photo-resistivity [12] principle. When there is a dark with no light it cannot absorb light so the photon cannot work in the sensor. In this way the sensor works and sends all the data to the main source like arduino or microcontrollers. It is used to detect the light radiation from nature or any other light generating sources. The energy from the light hits the photons of the semiconductor strongly and it will generate an output using the other source like lcd displays.. The effect of this procedure is more plus much more present starts flowing by means of the device as soon as the circuit can be closed and therefore it is mentioned that resistance associated with the device has decreased. This in particular really is the functioning principle of LDR
- ❖ **IR sensor:** This project and its particular circuit are a single of the easiest and most popular messfühler modules. Within electronics, this messfühler is analogous in order to humans' visionary feelings which can be utilized in order to discover a barrier which is a single of its typical applications. Infrared radiation is the particular part of the electromagnetic spectrum. The particular location from several μm to six μm is known as mid infrared plus the region more than 6 μm is definitely known as significantly infrared. Reflectance sensors: This type of sensor houses both an IR source and a good IR detector within a single casing in such a way that lighting is reflected between the two objects.

This principle can be used in intrusion recognition, object detection (measure the occurrence associated with an object within the sensor's FOV), barcode decoding, plus surface feature recognition (detecting features coated, taped, or or else marked onto the particular floor), wall monitoring (detecting distance through the wall), and so on. It can be used to check a defined region; the [11] transmitter gives off a beam associated with light into the particular scan zone, the particular reflected light can be used to discover the change within the particular reflected light therefore scanning the preferred zone.

- ❖ **UltraSonic sensor:** Ultrasonic sensors are gadgets that use electrical-mechanical energy transformation in order to measure distance through the sensor in order to reach the target item. Ultrasonic waves are usually longitudinal mechanical dunes which travel being a sequence of compressions and rarefactions throughout the direction associate with wave propagation via the medium. Aside from distance dimension, they are furthermore used in ultrasonic material testing (to discover cracks, atmosphere bubbles, and additional flaws in the particular products), Object recognition, position detection, ultrasonic mouse, and therefore forth These detectors are categorized within two types in accordance to their operating phenomenon – piezoelectric sensors and electrostatic sensors. Here all of us are discussing the particular ultrasonic sensor making use of the piezoelectric basic principle. Piezoelectric ultrasonic detectors utilize a piezoelectric material to create the particular ultrasonic waves
- ❖ **Water level sensor:** Have you ever acquired a water heater that exploded or actually attempted to create submersible electronics, after that you understand just how important it's miles to find whenever water is regarding..With this Drinking water Level Sensor, a person could do that specifically ! This could be utilized to measure the particular water degree, screen a sump hole, locate rainfall or even locate leakage.

SOFTWARE REQUIRED

- **Arduino IDE Compiler:** Arduino Compiler or Arduino Software (IDE) Includes a textual content editor, a message region, a textual content console, a toolbar with buttons for writing code, unusual location competencies and a few menus. Arduino compiler is used to create packages and to make the comfortable use of t hardware sensors. It is an open source software and a platform [13] where the electronic devices are primarily based totally and absolutely smoothly to use hardware and utility software programs. This compiler reads the input of the sensors and it activates the other sensors which are connected to the main sensor. The language that we used to write the programme is

Embedded C which is the version of C programming language.

➤ **Blynk App:**

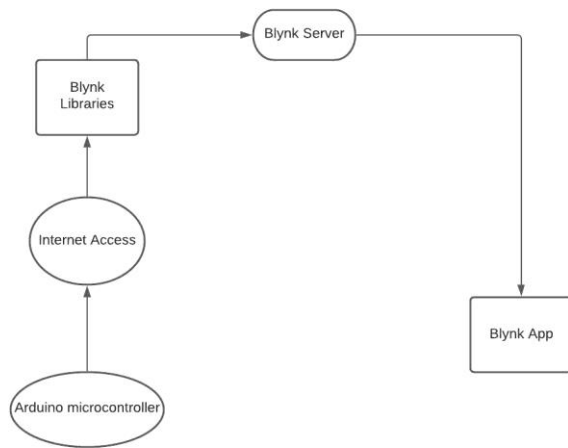


Fig3: Blynk Flow Chart

➤ Blynk is really the tool for most makers, badass creators, RaspberryPi plus similar ones. We have done all the particular effort of creating a web connection, constructing an iphone app plus writing hardware program code. With Blynk, a person simply snaps together an amazing user interface from various icons we offer, add the example program code to your equipment and enjoy viewing first results within under 5 minutes! It works properly for newbie manufacturers and saves loads of time intended for evil geniuses. when choosing tips on how to plug Blynk into the existing or new task. You will furthermore take pleasure in the convenience associated with Blynk Cloud. Which usually is, by the way, free of charge and open-source. Picture a prototyping panel on your mobile phone where you pull and drop control keys, sliders, displays, charts along with other functional icons. An issue of minutes, these types of widgets can manage Arduino and obtain data from this particular device. Blynk is not really a software that will work only along with a particular protection. Instead, it's already been made to assist the boards and shields you might be currently using. And it also functions on iOS plus Android. More Arduino compatible shields plus boards (this listing will be up-to-date as we check the compatibility) Is actually not that in the particular task in order to consider [14] Arduino away from your house network, so we have built a Blynk server. It grips all of the particular authentication and conversation, and also retains a watch on your own board as the particular smartphone is off-line. Blynk server operates on Javaplus; it is open-source. You will become able to function locally in case you actually need to. Messages between mobile programs, Blynk Server plus Arduino,

is dependent on an easy, lightweight and quick binary protocol more than TCP/IP sockets.

VI. RESULTS

Developed the prototype model of the smart city project and observed the results for 5 different problems that are commonly faced in the city using the IOT technology with the help of sensors.

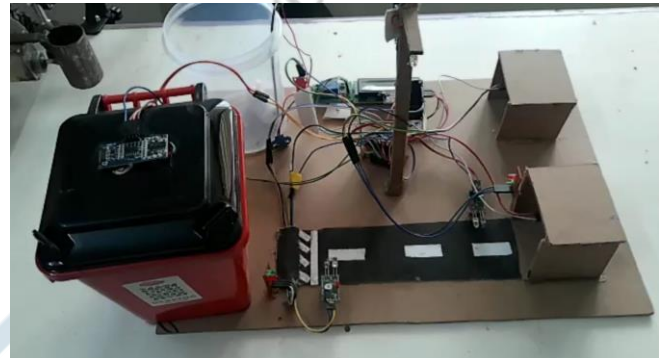


Fig4: Developed Prototype Version

We have developed the prototype model of the project, all the sensors are connected to the ESP32 microcontroller as shown in the above figure. Observed the outputs for the street light automation using the LDR sensor, dustbin and parking slot management using the IR Sensor, water level monitoring system using the float switch sensor and traffic monitoring system using the IR sensor. All the data is hard coded to the blynk server and observed the output on the blynk application.

VII. APPLICATIONS

1. Using these sensors cities are being monitored for twenty four hours and it keeps the people updated with the data.
2. Parking monitoring system keeps the people updated with the arrival and departure of the vehicles in the particular slot.
3. A particular sensor is used to monitor the flow of water in the tank. When we get notified about the status of the tank we can avoid the wastage of water.
4. By monitoring traffic light signals ambulance and VIP convoys can pass efficiently.
5. By using a garbage monitoring system we can avoid bad smells which pass through the air and cause pollution which leads to harmful diseases.

VIII. CONCLUSIONS

Nowadays IOT is having its own priority and it has its own range in the electronics field. How much we use the IOT but we feel that this technology is not used up to that mark that IOT has in the market. In the future there will be a lot of scope for IOT technology and the use of sensors which are

easily available in the market for low cost for various uses. The main aim of this paper is to motivate the people to use the current technology wisely for different problems that people are facing nowadays.

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