IOT Based System Design For Smart City Using Raspberry Pi

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Abstract- *Commercial organizations and housing societies in cities needs energy saving system with security alert. As population is increasing day by day, the environment should be clean and hygienic. In most of the cities the overflowed garbage bin are creating an unhygienic environment. This will further lead to arise different type of diseases. To overcome these situations an efficient smart garbage management method has to be developed by using IR sensor. The garbage alert will be updated on to server.*

Keywords- Raspberry-pi, IOT, sensors.

I. INTRODUCTION

Cities with heavy populations escalate burden on energy, water, buildings, public places, transportation and many other things. Therefore, we need to find out solutions that are "smart" which means they are efficient and feasible for economic growth of the city and society as well. The smartness of a city describes its ability to bring together all its resources, to effectively and seamlessly achieve the goals and fulfill the purposes it has set for itself. The perfect solution for this is mobility of all resources and adapting to new technologies as and when they come .The smartness of the city is incorporating the technologies that can be infused into commercial applications implied on intelligent products and services. Smart homes, smart buildings, airports, hospitals, universities or communities equipped with mobile terminals and embedded devices with sensors or actuators which can be inter-connected.

Internet of things and cloud computing are two important folds of pervasive connectivity. Public data is another fold which lies on the top, and is the basis for enabling real time decisions by the stakeholders. Application for information is also created that provide access to datasets and open public data. The whole control device of the system it's a small Raspberry PI. This computing system is used due to the fact to prove that the whole industrial system can be automated just with a card size computing system or a microchip and the industrial environment data can be viewed or monitored from IoT.

The Raspberry Pi is a series of credit card-sized single-board computers developed by the Raspberry Pi Foundation. It features a Broadcom system on a chip, which includes an ARM compatible CPU and an on chip graphics processing unit. Secure Digital cards are used to store the operating system and program memory in either the SDHC or Micro SDHC sizes. Most boards have between one or four USB slots, HDMI, composite video output and a 3.5 mm phone jack for audio. Lower level output is provided by a number of GPIO pins which support common protocols like I^2C.

The Raspberry Pi may be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and virtually any other device/component with USB capabilities. Other peripherals can be attached through the various pins and connectors on the surface of the Raspberry Pi.Wireless Sensor Networks (WSNs) will play a key role in the extension of the smart grid towards residential premises and enable various demand and energy management applications.TheWSNs are increasingly being used in the home for energy controlling services. Regular household appliances are monitored and controlled by WSNs installed in the home.

II. LITERATURE REVIEW

The method is proposed by Nagender Kumar Suryadevara, IEEE,WSN-Based Smart Sensors and Actuator for Power Management in Intelligent Buildings The design and development of a smart monitoring and controlling system for household electrical appliances in real time has been reported in this paper. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The prototype has been extensively tested in real-life situations and experimental results are very encouraging**.** Thus, the real-time monitoring of the electrical appliances can be viewed through a website. The system can be extended for monitoring the whole intelligent building. The aim is to determine the areas of daily peak hours of electricity usage levels and come with a solution by which we can lower the

consumption and enhance better utilization of already limited resources during peak hour.

The paper mentioned by Melike Erol-Kantarci and Hussein Mouftah, Wireless Sensor Networks for Cost-Efficient Residential Energy Management in the Smart Grid. The main differences in the performance of in-home energy management (iHEM) is compared with an optimization-based residential energy management (OREM) scheme whose objective is to minimize the energy expenses of the consumers. As a future work, the planning to include learning techniques from the artificial intelligence (AI) field to increase consumer comfort and pervasiveness of our application. Furthermore, our schemes can be extended for a new class of appliances that allow sub cycle scheduling. The availability of such appliances will enrich the opportunities of residential demand management applications.

The method suggested by Mr.Vishal P.Patil Assistant Professor. Etl on Design and Implementing a Secured Wireless Communication System for Industrial Automation by using Raspberry pi. Control and monitor over industrial processes and sensor monitoring with wireless network using raspberry pi. The method proposes to manage the cities aspect by building smart homes, smart parking centers, smart water monitoring systems, smart environment monitoring system, smart waste management system. This paper focuses on creating a structure for the realization of smart cities through the Internet of Things (IoT).

III. PROPOSED SYSTEM

Raspberry pi acts as a main processor. A wireless sensor network containing Raspberry- pi as master controller along with various sensors. There are various slots to raspberry pi for connecting the various external devices such as mouse, keyboard etc. A memory card can be inserted into one of the available slot. All the sensors sences the respective data in plant and send this data towards the controlling unit such as Raspberry pi.Thus computer and a smart phone will continuously monitoring all data from remote processing unit and compare with the value preloaded process structure.Also we control or moniter the different devices via wifi technology.

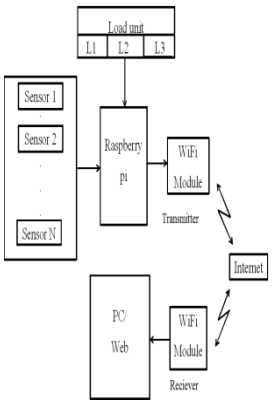

Figure 1. Block Diagram of Propossed System

The main components of the proposed work are Raspberry-pi ,wifi ,sensor unit and IoT.

1. Raspberry pi

One of the powerful part of Raspberry pi is the GPIO (General Purpose Input/Output) pins.These pins are a physical interface between the pi and the outside world.As switches can turn on or off as input or output. Out of the 40 pins,26 are GPIO pins and the other are power or ground pins.

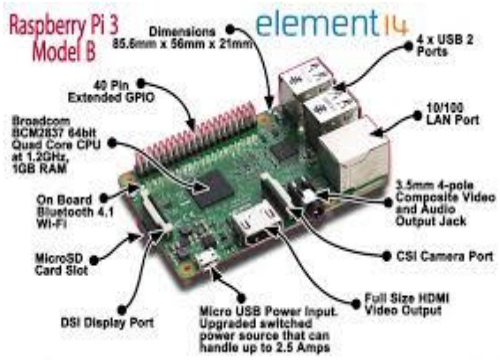

Figure 2. Raspberry pi Model

The Raspberry pi is manufactured in two board configurations. The Raspberry pi has a Broadcom BCM2835 system on a chip(Soc),which includes an ARM1176JZFS 700 MHz processor, Video Core IV GPU and was originally shipped with 256megabytes of RAM, later upgraded to 512 MB.

2. Wifi module

It is bascillay used to transfer data in between Raspberry pi an windows applications**.**Wifi 8266 communicates with each other through TCP/IP protocol and its IEEE no is 802.11B.

Figure 3.WiFi Module

The memory required for wifi 8266 is 64kB for instruction and 96kB for data. The input pins are 16 GPIO pins. The power required for wifi 8266 module is 3.3vDC.It is a small allows microcontroller to connect to wifi network and make simple TCP/IP connections using commands. The wifi8266 has 8 pins,4 pins in the raw of 2.The first pin on top left is GND.The second pins right from GND are 2 and 0.The pins on top right side is RXpin and pin on lower left is TX.This pins are used for communication. The middle pins are on bottom are CH_PD(chip power down) and RST (reset).The signal from wifi8266 from Tx pin is 3.3v which is enough for the communication.

3. Sensor Unit

The sensor are deployed in cities which sense the current status value of the city. The sensed data in analog form so it is given to ADC.ADC will convert analog signal to digital form and transmit the data to microcontroller. The overall system is controlled by microcontroller of Raspberry pi.Different types of sensors are attaches to sensor nodes. Their are serial communication between sensor unit and Raspberry pi.The data id displayed on computer. Their are different types of sensors are used in this proposed system are temperature sensor,IR sensor,LDR sensor, motion sensor.

3.1 Temperature sensor

Figure 4. Temperature Sensor

The LM35 series are precision integrated circuit temperature device with an output voltage linearly proportional to centigrade's temperature. The LM35 device has an advantages over linear temperature sensors calibrated in Kelvin as user is not required to subtract a large constant voltages from the output to obtain convenient centigrade scaling. The LM35 device does not required any external calibration or trimming to provide typical accuracies of 1/4C at room temperature and 3/4C over a full -55C to 150C range.

3.2 IR Sensor

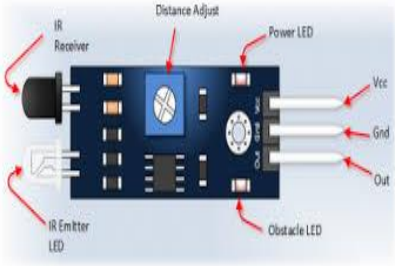

Figure 5. IR Sensor

IR sensor detectes IR radiation falling on it. Depending on application there are many types of IR sensors which can be built.IR sensor uses a specific light sensor to detect a particular light wavelength in Infra-Red (IR) spectrum. Here we can install a LED which produce light of some wavelength as per sensors specifications. The light from LED reflect back from object and into light sensor when that object is close to sensor. Because of this intensity of received light suddenly increases and this can be detected by using threshold.

3.3 LDR sensor

Figure 6. LDR sensor

Light Dependent Resister (LDR) or photoresister are aften used to detect light and change the opration of circuit depebdent upon the light levels.LDR sensors can be described by variety of names from light dependent resister,photoresister or even photo cell,photoconductor.LDR is a component that is sensitive to light.When light falls upon it then the resistance

changes.LDR are made from semiconductor material to enables them to have their light sensitive properties.Many materials can be used,but one popular material for these LDR is cadmium,sulphide.

3.4 Motion Sensor

Figure7. Motion sensor

Motion sensor is a device that detects moving object, particularly people. Such a device is often integrated as a component of system that automatically performs a task or alerts a user of motion in an area. They form a vital component of security ,automated lighting control, home control, energy efficiency and other useful system. Most low cost motion detector can detects up to destination of at least 15 feet (4.6m).Motion detector have found wide use in domestic and commercial application one common application is activating automatic door opens in businesses and public buildings.

IV. CONCLUSION

The proposed system provide high end energy monitoring, saving included security alerts. The proposed system works with Raspberry-pi board which has many advanced feature to control and monitor different parameters. The parameters which are included in system are real time. The use of reconfigurable analog-digital system from Raspberry-pi can reduce cost and design time in data acquisition system for monitoring physical variables. This device replaces the traditional components of MCU based system by a low cost single chip with programmable components. Raspberry-pi can be the future for smart application and client-server communication. This proposed system is a stepping stone to introduce the various features and possibilities available in Raspberry pi and opens up a new embedded invention.

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