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AUTOMATED STREET LIGHTING AND SMART WASTE MANAGEMENT

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ABSTRACT : The aim of the paper is the automation in street light and ease of mechanism of waste management and plant watering. This project includes three systems which includes Automatic Street Light system, Smart Waste Management system and Automatic Plant Watering system. Smart Street light is to reduce the power utilization by controlling the light intensity by motion detection. The Smart Waste Management Sytsem which is proposed here is to implement a smarter way of conventional waste management using sensors to collect dustbin fill-level data. The information from bins sent to the Waste management centers using communicating modules. In daily operations related to watering is the most important practice and the most labor-intensive task. Modern watering systems could be effectively used to water plants when they need it. Soil moisture sensor is used for measuring the amount of water present in the soil and according to that the plant watering system will be operated. The entire operation is controlled using Atmega328P microcontroller.

1. INTRODUCTION

A smart city uses a framework of information and communication technologies to create, deploy and promote development practices to address urban challenges and create a joined-up technologically-enabled and sustainable infrastructure. Needs no manual operation for switching on and off. When there is a need of light it automatically switches ON. When darkness rises to a certain level then sensor circuit gets activated and switches ON and when there is other source of light i.E. Daytime, the street light gets OFF. The sensitiveness of the street light can also be adjusted.

It is project which supports Swach Bharat Abhiyan.This concept helps to maintain our environment clean and pollution free. We have also implemented Sensor Based Waste Collection Bins is used to identify status of waste bins if it is empty or filled so as to customize the waste collection schedule accordingly and also save the cost. Real time waste mangement system by using smart dustbins to check the fill level of dustbins whether the dustbins are full or not, through this system the information of all smart dustbins can be accessed from anywhere and anytime by the concern person. It will inform the status of each and every dustbin in real time so that concerned authority can send the garbage collection vehicle only when the dustbin is full. By implementing this system resource optimization, cost reduction, effective usage of smart dustbins can be done.

In daily operation related to watering the plants are the most important cultural practice and the most labor-intensive task. No matter whichever weather it is, either too hot and cold or too dry and wet it is very crucial to control the amount of water reaches to the plants. So, It will be effective to use an idea of automatic plant watering system which waters plants when they need it.In this system or project, the soil moisture sensors sense the moisture level in the soil and automatically switch on the water pump accordingly to supply water to the plants.
The Smart City Water System is another interesting way to help manage water better. Rather than focusing on improving efficiency, it uses a network of sensors to monitor urban sewer systems. Naturally, it can find efficiency solutions, but it also pays attention to illegal discharges or unusual contaminants.

2. LITERATURE REVIEW

- Tang, Hengyu [1] proposed a control core framework based on AT89S52 which controls street lights. This framework combines the various technologies of LCD, digital clock and a timer, photosensitive induction etc. when vehicles crossed by to conserve electricity the lights will turn on and vice versa. With this technology a large amount of power can be saved. In order to get the details of spoiled light and its information an auto-alarm function is used in this framework.

- Priyasree and Radhi [2] nominated control arrangement for a LED road lighting framework. The proposed control organization empowers disconnection of the road lighting framework from the mains amid pinnacle load time, lessening its effect in the distributed power framework natural utilization, decline the administration cost and screen the status data of every road lighting unit.

- Rajput and katav [3] propounded an intelligent street lighting system to lessen the large amounts of power wasted in street lightening system. This system makes use of different kind of sensors like CO2 sensor, noise sensor, light intensity sensor etc. To receive and send data between concentrator and system GSMmodules are utilized.

- Andrei Borozdukhin, Olga Dolinina and Vitaly Pechenkin [4] this proposed system consists of two parts: software and special signalling equipment. The equipment is placed on the side walls of the bin which consists of two parts: one is the receiver-transmitter and sensor. Sensor is used to indicate the level of the bin which is connected to the transmitter that transmits a signal of fullness of the bin to the receiver at the server host. A manager is appointed at the server side whose job is to find the shortest route and intimate it to the truck driver to collect it in a short interval of time.

- Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla [5] proposed a microcontroller based automatic irrigation system which is a combination of hardware and software that provides irrigation control. The system should be easy to rectify any fault in the event and it is user friendly as it requires only eight keys for operation.

From the above literature survey, the methods each one has implemented is simple and easy to understand. The above reports also shows that there is no street lighting system which focus on controlling intensity of lights on motion detection and there is no centralized system for collection, transport and management of waste. These papers and journals has given many ideas to further implement a much efficient system and make things automated.

3. METHODOLOGY

3.1 System Block Diagram

The main component of this project is Atmega 328p microcontroller which will operate all the functions. The system also includes IR sensor, PIR sensor and Soil moisture sensor as a major component. LDR is used to detect the darkness of surrounding. PIR sensor is used for motion detection and by using LDR and PIR sensor the intensity of street light will be controlled. For the waste management system IR sensor is used for checking dustbin level. LCD is used for displaying the status of dustbin. The soil moisture sensor is used to detect amount of waterpresent in soil and according to that plant watering system will be operated.

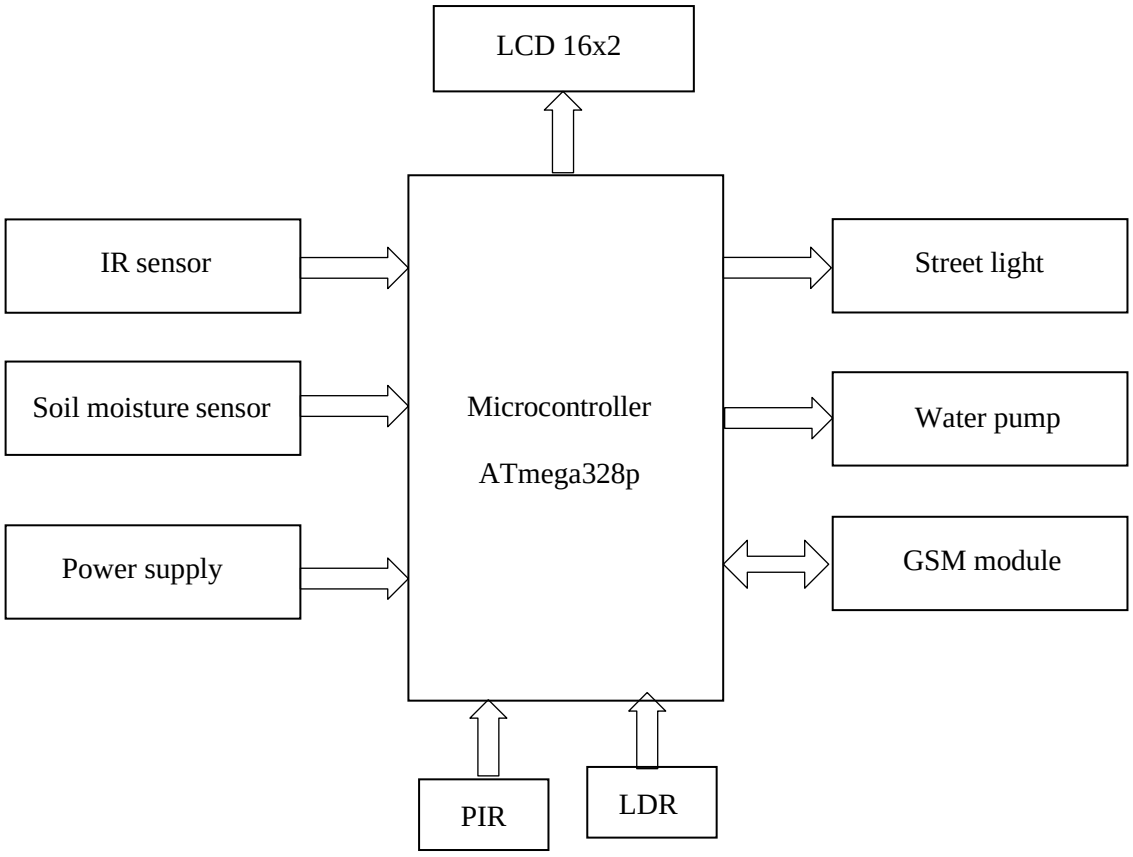

Fig 1: Basic Block Diagram

3.2 Hardware Used

1] ATMega 328p : The AT-mega 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general- purpose working registers, 3 flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and 5 software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts. The device achieves throughput approaching 1 MIPS/MHz.

2] Passive infrared sensor : A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

3] Soil moisture sensor : Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

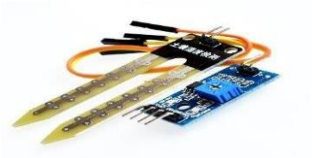

Fig 2 : Soil moisture sensor

4] IR sensor : The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion. In many electronic devices, the IR sensor circuit is a very essential module. This kind of sensor is similar to human's visionary senses to detect obstacles.

Fig 3 : IR sensor

5] SIM800L GSM/GPRS Module : SIM800L GSM/GPRS module is a miniature cellular GSM modem from Simcom, which can easily interface with any microcontroller to give the microcontroller GSM functionality, andallows for GPRS transmission. This module connects the microcontroller to the mobile network to make or receive phone calls, send or receive SMS (text messages), and connect to the internet using GPRS, TCP, or IP. Another advantage is It supports quad-band GSM/GPRS network, which means it can work anywhere in the world. These important functionalities as well as the low cost and small footprint make this module more perfectfor any project where long-range connectivity is required and also it can be integrated into a great number of IoTprojects.

Fig 4 : GSM module

6] LCD 16x2 : 16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment light-emitting diodes.

Fig 5 : LCD

7] LM2596 DC-DC BUCK CONVERTER STEP DOWN MODULE :

Input: AC 100-240V, 50-60Hz

Output: DC 12V 5APower: 60W

Connecter size: 5.5mm x 2.5mm

Features: All Sanyo solid capacitors, the 36u thickening circuit boards, high-Q inductance with output value ofhigh-power LED indicator

Dimensions: 45 (L) x 20 (W) x 14 (H) mm (with potentiometer)weight: 20 gms

Fig 6 : DC-DC buck converter

8] Power Supply Adapter :

Input: AC 100-240V, 50-60Hz
Output: DC 12V 5APower: 60W
Connecter size: 5.5mm x 2.5mm

Fig 7: Power supply adapter

9] DHT11 : DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously.

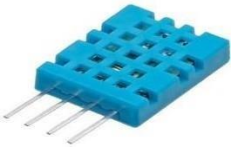

Fig 8 : DHT11

3.3 Circuit Diagram

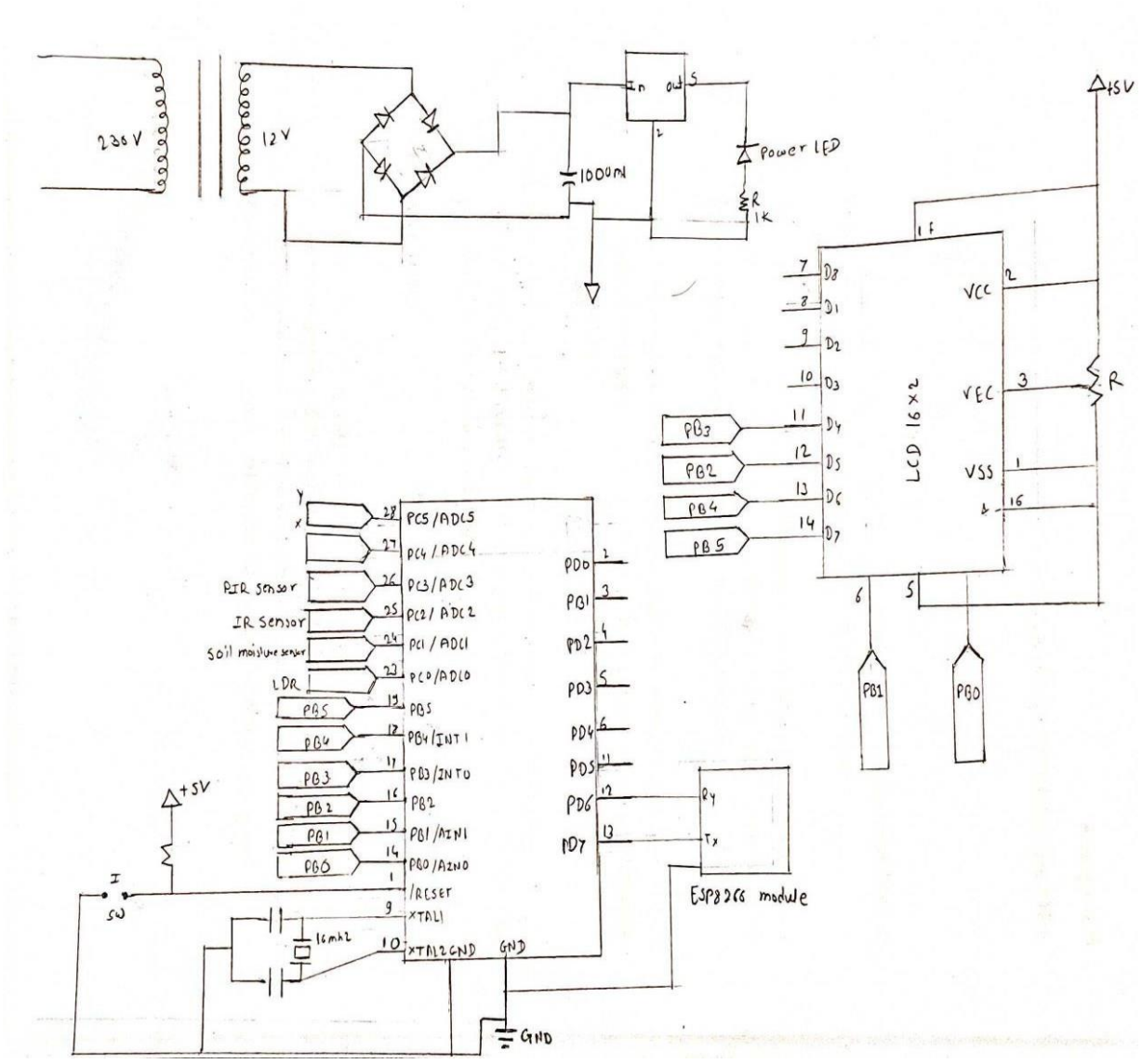

Fig 9: Circuit Diagram

In the above circuit diagram, we are using a 12v 5amp DC power adapter. A power adapter is connected to the buck converter 2596 module. Which converts the input to 5v. Because all components operating voltage is 5 volts. Using microcontroller AtMega 328 we operate all components and sensors. All components are connected to each other in a specific manne. 16x2 LED is used to display output. It is connected to the microcontroller and takes input from a microcontroller and displays output on the screen. SIM800L GSM module is used to send messages to mobile. It contains a micro sim port. It takes input from the IR sensor and sends the message. The water pump with the DC motor is connected to the soil moisture sensor. It takes input from the soil moisture sensor and usinga microcontroller motor will be turned ON/OFF.

3.4 Results

The main aim of the project is to reduce power consumption by street lights. The intensity of lights will be control automatically using motion detection by PIR sensor. The smart waste management system to manage waste collection using sensor based smart dustbins. The proposed automatic plant watering system is expected to manage watering of plants automatically based on amount of water present in the soil.

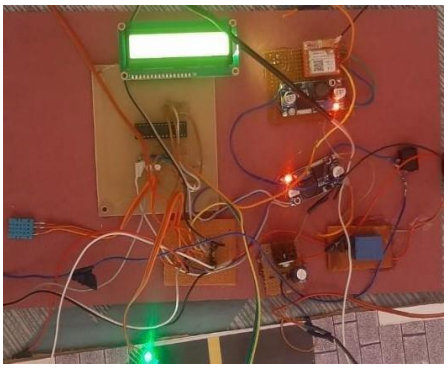

Fig 10 : Implementation view

4. CONCLUSION

This system combines safe lighting protocols with consumption of minimal amount of power. The system automatically control the intensity of street lights. The future scope of this project expands into speed detection and customizable area of illumination. This system can be easily implemented on our Indian streets The smart waste management of system will stop overflowing of dustbins. This system also aims at creating a clean as wellas green environment.

REFERENCES

[1] Hengyu Wu, Minli Tang and Guo Huang, "Design of multi-functional street light control system based on AT89S52 single-chip microcomputer," The 2nd International Conference on Industrial Mechatronics and Automation, Wuhan, 2010, pp. 134-137. DOI: 10.1109/ICINDMA.2010.5538068.

[2] Priyasree, Radhi & H Kauser, Rafiya & E, vinitha & Gangatharan, N. (2012). "Automatic Street Light Intensity Control and Road Safety Module Using Embedded System." International Conference on Computing and Control Engineering (ICCCE 2012), At Coimbatore Institute of Information Technology, 2012.

[3] K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav, "Intelligent Street Lighting System Using Gsm," International Journal of Engineering Science Invention, Volume 2, Issue 3, March, 2013, PP.60-69.

[4] Andrei Borozdukhin, Olga Dolinina and Vitaly Pechnkin, "Approach to the garbage collection in the Smart clean city Project", in Yuri Gagarin State Technical University of Saratov, Russia in 2016.

[5] Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla, "Microcontroller based Automatic Irrigation System with Moisture Sensors", International Conference on Science and Engineering, 2011, pp. 94-96