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Design and Implementation of Smart GIL System

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***Abstract*:**

The project is about building a smart GIL network for smart cities. Smart Cities face energy use, waste management and water conservation challenges. The role of garbage collection system, intelligent irrigation system, and smart street lighting system is incorporated into a single system, namely a smart GIL system, and operated by a single controller. This machine output can be controlled at a standard control room. In the cell phone the data can also be tracked using IoT. The program eliminates man power and behaves smart when it comes to holding smart cities. Garbage collection program shows the amount of dustbin available. Irrigation device is used to water the plants by calculating the soil moisture content. In a specific control room, the availability level of the dustbin, motor ON/OFF irrigation system, and light ON / OFF state with day / night indication will be displayed. These data are transmitted through serial communication to the cloud server, and can be accessed in a mobile application.

Keywords: *GIL, Garbage, Irrigation, IoT and Lighting.*

1. Introduction

People are facing a lot of waste, water, and energy management problems at present. As a result of an increase in India's population, it also contributes to increased waste. India faces significant environmental problems related to the insufficient management of waste. In the current scenario, more waste is produced in urban areas and this waste is not collected at the correct time, which results in garbage overflow in the road side. It has environmental and public health impacts. GIL system automatically senses the level of bin availability and is indicated in the control room. The GIL system also takes care of the automation of the social welfare irrigation system to provide sufficient irrigation and to save water if the plant is irrigated within the appropriate area.

Lighting can reflect 10-38 per cent of the total energy. The idea of developing new street light network that does not use huge quantities of energy became part of GIL program. Manual control can cause an error and lead to energy loss, and midnight manual dimming is impracticable, but this is made possible by the use of sensor. The project focuses on combining these three management systems with the help of IoT-interfaced embedded framework.

2. Literature Review

Shobana G, Sureshkumar R, published a paper in International Journal of Applied Mathematics, 2018, entitled "Automated Garbage Collection using GPS and GSM." This approach is advanced in which sensor-based automation system was developed to automate bin level detection. The garbage bin level can be calculated via sensor of ultrasonics. Microcontroller interface with garbage system. The processor processes the data to the cloud and displays the amount using website and device interface.

Isha Abdulazez Watson, published a paper in International Journal of Emerging Technology and Advanced Engineering, 2015, entitled "Construction and Implementation of an Automatic Street Light Control System." Two kinds of sensors which are light sensor as well as photoelectric sensor used in this article. Light sensor senses darkness for the ON / OFF switch to activate. To trigger street lights, the photoelectric sensor must detect the movement. Microcontroller tests these.

Abishek Kumar, Magesh. S, a paper in the International Journal of Pure and Applied Mathematics, 2017, entitled "Automatic Irrigation System dependent on Soil Moisture sensor using Arduino." Soil sensor is

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linked to Arduino board that senses the content of moisture present in the soil. Whenever the amount of moisture descends, the sensor detects the increase in humidity, giving the microcontroller a signal to activate the pump.

3. Proposed System

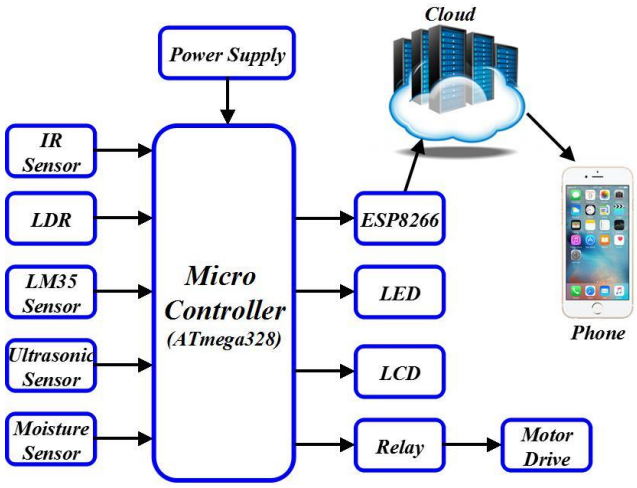

Fig.1 Block Diagram

Arduino ATmega328 is used for microcontroller operation. The controller is given analog signal got from the IR sensor based on the signal output from a sensor LED being switched ON / OFF. If the IR sensor detects an object then the LED will be turned Off for a certain time delay. LDR sensor will give the output as day or night based upon the amount of light falling on is surface. Ultrasonic sensor measure the distance in the dustbin. It will give the controller the availability value of bin as digital input. Moisture sensor can measure the soil's moisture content and give the controller a high signal when the moisture content is low, transmitting a high signal to the motor drive circuit to turn the motor on. When the moisture content is high, the engine is switched OFF. Temperature sensor is used for calculating ambient temperature. The LCD display shows the data concerning motor ON / OFF state, light ON / OFF state, bin availability level and temperature. Such data are displayed in the mobile application by sending those data via WiFi module to cloud server. These data is transmitted via serial communication to the cloud server.

4. Hardware Description

1. Arduino Uno

Arduino Uno ATmega328P is used as a microcontroller of that project. It is programmed in language embedded in c. This Contains digital pins, analog pins, button reset, etc., It's typically used in most autonomous systems, since it is easy to use, with low power requirements.

2. IR Sensor

A passive infrared sensor which measures the radiation of infrared light from objects within its field of view. They are most widely used in motion detectors based on PIR. The word passive applies suits because PIR instruments will not radiate energy. They will work by detecting infrared radiation emitted by objects or reflect from them.

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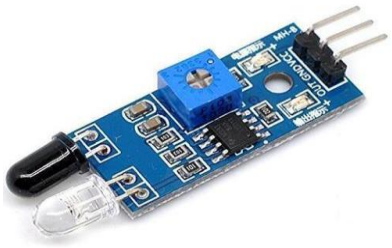

Fig.2 IR Sensor

3. Ultrasonic Sensor

An ultrasonic sensor will calculate the distance between the objects using the waves. The sound waves are transmitted at certain rate and are waiting to the wave to rebound, the system uses the rate taken to find the space. By noting down the rate of time taken between sending wave and the receiving wave, the distance between can be determined

For transforming duration to distance,

Space_measured (cm)= (Rate of time taken/2) / 29.1

*Space_measured (inches) = Distance (cm)*0.39370*

Fig.3 Ultrasonic Sensor

The waves of sound is transmitted at a specific frequency and await the sound wave to rebound, the system is used to measure the time taken the distance from each other. We find the condition of output by comparing the echo patterns with the sound wave patterns.

4. Temperature Sensor

The sensors calculate the condition i.e heat energy or even coldness produced by object, makes us to feel or find the physical changes to that condition by producing an analog or digital output either.

*Temp = Temp * 0.48828125*

5. Soil Moisture Sensor

Moisture sensors calculate the water content in soil. It works based on the measured resistance. The current pass through the probe present in the sensor, based on the conduction level the resistance is found out. The sensor output signal is based on the resistance level.

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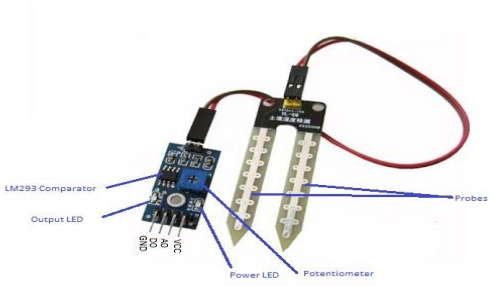

Fig.4 Soil Moisture Sensor

6. ESP8266 Module

The ESP8266 module is used as a Wi-Fi based module. A stand-alone SOC with inbuilt TCP / IP stack .This will offer any controller access to the Wi-Fi based network. The ESP8266 is either efficient of running application or downloading all Wi-Fi based networking features from processor of software. Each ESP8266 comes pre- programmed with the firmware for an AT command, simply hook. It is up to your Arduino computer to get as much Wi-Fi as you can. It's a cheap Wi-Fi microchip with a complete TCP / IP The power of the stack and microcontroller.

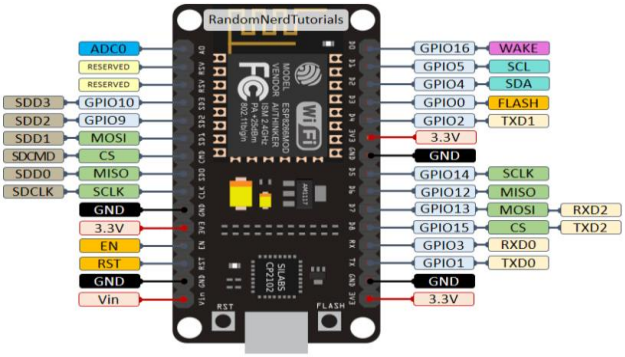

Fig.5 WiFi Module

7. LCD Display

Liquid Crystal Display is a display panel made with Liquid Crystal technology is commonly abbreviated to an LCD. Seven Segment Displaying is the most basic type of electronic display available. It's got its own limits. The 16×2 LCD module is the most strong Commonly used one which can display 32 ASCII characters in 2 rows.

8. Submersible Pump

A pump is a tool that pushes the water or any of the fluids. Carrying out certain mechanical acts that include a motor coupled to the body of the pump. This is used in the circuit of the motor driver for the purpose of irrigation. The whole setup is submerged in the water to pump. This functions by transforming rotary energy through the engine to cause a flow of increasing water pressure.

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Fig.6 Submersible Pump

5. Results & Discussions

Data on the condition of the light and engine, the extent of availability The dustbin and temperature are displayed on the LCD panel.

Fig.7 Hardware output

6. Conclusion

Smart GIL program that uses IoT for the smart cities is economical. Affordable, realistic, environmentally-sound and the best way to reduce pollution Waste of water, decreases environmental impacts established by the disposal of waste on the roadside and also reduces waste of electricity. Better resource planning and Advances in technology. The expense of the setup can be reduced through the use of well equipment, maintenance may take place. In terms of periodic tests, too, be reduced.

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