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Automated Waste Management System for Smart Cities Using IoT

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ABSTRACT

For a real-time solid waste garbage monitoring system that would help with the optimization of solid waste collection, this research suggests a revolutionary system and intelligent sensing algorithm. On decision algorithms for sensing solid waste data in a wireless sensor network, the monitoring application is built. A group of server-based applications display the most recent garbage status in real time. The proposed system has thus succeeded in providing the solid waste management operator with real-time garbage status information. This data can then be utilised to optimise the collection route, lowering collection costs and carbon emissions, helping to create a more environmentally friendly society.

Keywords: Arduino Uno, and Node MCU ESP8266 it is incorporated with ultrasonic sensor, tilt sensor, Relay, DC Motor, Wifi Module.

INTRODUCTION

Waste management or Waste disposal is all the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc. The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, commercial), agricultural, and social (health care, household hazardous waste, sewage sludge). Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. India is the largest population country, which delivers 0.1 Million tons of solid garbage per day Disposal of solid garbage is one of biggest headache in India In India open garbage system is followed to avoid the methane formation inside the garbage bin In the advancement of smart cities every bin should be in closed condition .So we are focusing on waste management project with automated garbage system Our project based on an Arduino Uno and Node MCU ESP8266 it is incorporated with ultrasonic sensor, tilt sensor, Relay, DC Motor, Wifi Module.

EXISTING METHOD

In existing project is an automatic garbage level detecting system informing the concerned authorities timely and also classification among the wastes aiding efficient waste management. Whenever the garbage is full information can be send to the concerned authority to clean the bin. Here we use a low maintenance recent communication development like GSM. GSM is used in the project as a communication back bone for the whole system for various reasons likes easy to implement and less signal deterioration. Hence these networks can work even with very low power.

- A system for automatically identifying garbage levels and alerting the appropriate authorities is already in place in the project.When the trash can is full, information can be sent to the appropriate authority to clean the trash can.
- Here, we make use of the low-maintenance GSM technology that has just been developed.GSM is employed in the project as the foundation of communication for the entire system for a number of reasons, including ease of implementation and little signal degradation. As a result, these networks can function at very low power levels.

PROPOSED METHOD

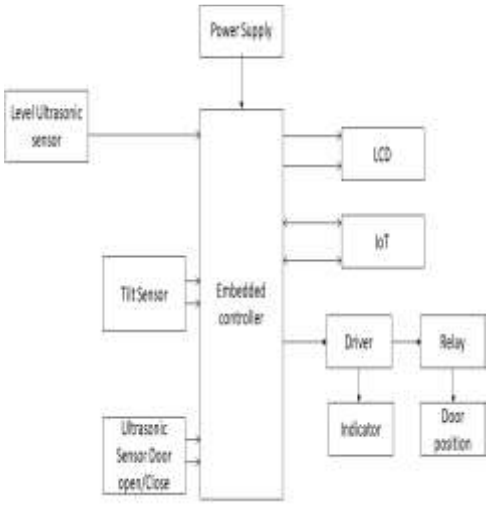
In the proposed system, the level , smoke, tilt, fire, wet, IR sensor of garbage in the dustbins is detected with the help of Sensor systems and communicated to the authorized control room through IOT. This system we implemented to automatic door open close in dustbin person detection.

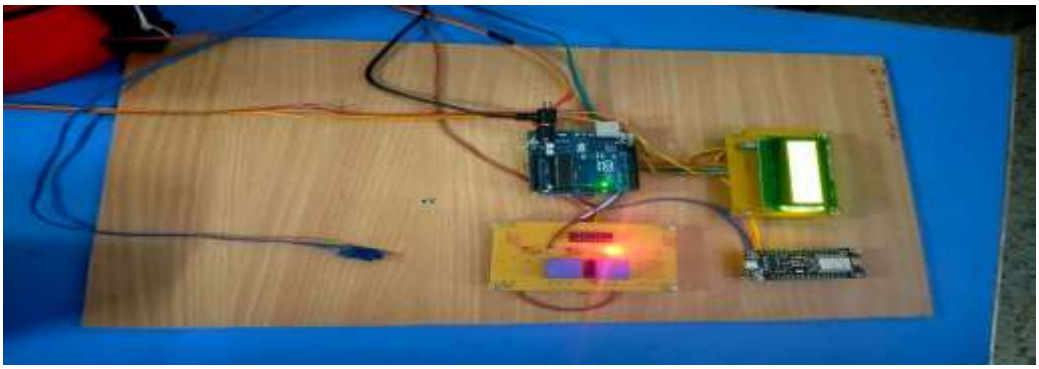
• In Microcontroller is used to interface the sensor system with IOT platform.

• To monitor the desired information related to the garbage for different selected locations.

• This will help to manage the garbage collection efficiently.

The implementation starts by setup ESP8266 by flashing the latest version of the firmware. This enable s the Blynk libraries efficiently communicate and avoid producing error.. To flash the latest firmware, download the ESP8266 flasher tool and the latest firmware from the internet which would be in the bin format and flash the ESP8266 with it.





PROPOSED BLOCK DIAGRAM DESCRIPTION

Power supply is given to all the units. A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters. The circuit operation can be controlled by Arduino and it is one of the most popular microcontrollers. The Arduino will get the level of the garbage from the ultrasonic sensor Ultrasonic sensor emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance. The tilt sensor adxl335 is used in dustbin title detection. Another ultrasonic sensor is used in front of object detection in dustbin. The driver IC uln2003 is used to control the relay. The relay is used automatically door open/close in dustbin door.

Hardware Tools

1. Atmega328
2. Ultrasonic sensor
3. LCD
4. Max 232
5. Driver
6. Relay
7. DC Motor
8. Tilt Sensor
9. IOT

ATMEGA 328

Microchip's ATmega328 is an 8-bit, 28-pin AVR Microcontroller with RISC architecture and a 32KB flash-type program memory. It is found in the Arduino UNO, Arduino Pro Mini, and Arduino Nano boards and has 1 KB EEPROM memory and a 2 KB SRAM memory. It features eight pins for ADC operations, which come together to form Port A (PA0–PA7). It also contains three built-in timers, two of which are 8-bit and one 16-bit. Figure 3.2.1. Shows the image of the ATMEGA 328. The Uno differs from all preceding boards because it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter. Table 3.2.1. Describes the features of ATMEGA 328. It consists of 6 analog inputs that are shown in the pin diagram. Analog inputs can be represented as PC0 to PC5. These analog input pins possess the continuous-time signal, which acts as an analog input for the system.

ULTRASONIC SENSOR

The UTR (Ultrasonic Transmitter / Receiver) is a hybrid circuit that allows to realize an ultrasonic detector adding few external components. Detection is based on amplitude variation of received ultrasonic signal (40 KHz) due to the movement of an object. It shows stable electric characteristics thanks to the "Thick film hybrid" technology. Ultrasonic sensors have an acoustic transducer which is vibrating at ultrasonic frequencies. The pulses are emitted in a cone-shaped beam and aimed at a target object. Pulses reflected by the target to the sensor are detected as echoes. The device measures the time delay between each emitted and echo pulse to accurately determine the sensor-to-target distance.

Theory of Operation

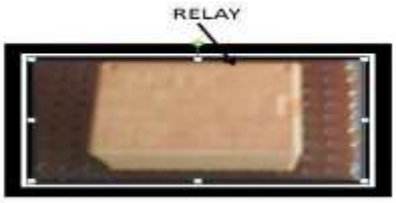
The PING))) sensor detects objects by emitting a short ultrasonic burst and then "listening" for the echo. Under control of a host microcontroller (trigger pulse), the sensor emits a short 40 kHz (ultrasonic) burst. This burst travels through the air at about 1130 feet per second, hits an object and then bounces back to the sensor. The PING))) sensor provides an output pulse to the host that will terminate when the echo is detected, hence the width of this pulse corresponds to the distance to the target. 21

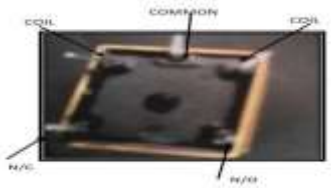
HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively.

$$\text{Distance} = \text{Speed} \times \text{Time}$$

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below

RELAY





Relays are switching devices. Switching devices are the heart of industrial electronic systems. When a relay is energized or activated, contacts are made or broken. They are used to control ac or dc power. They are used to control the sequence of events in the operation of a system such as an electronic heater, counter, welding circuits, and X-ray equipment, measuring systems, alarm systems and telephony. Electromagnetic relays are forms of electromagnets in which the coil current produces a magnetic effect.

Relays are usually dc operated. When dc is passed to the coil, the core gets magnetized. The iron armature towards the core contacts 1 and 2 open and contacts 2 and 3 close.The heart of the relay is the 'junction' of the contact points. The relay contact points may be flat, spherical, pointed and combination of all these. Flat contacts require more pressure for perfect contact closing. Half round contacts are better because the surface contamination will be minimum. The twin contacts give reliable operation. Relay contacts are made of silver and silver alloys in small power applications. For large relays, contacts are made up of copper. Certain relays use silver – palladium of platinum – ruthenium alloys for contacts. The special types mentioned above give long life, carry moderate currents and keep shape for long time.

LCD-DISPLAY

Liquid Crystal Displays (LCDs) have materials, which combine the properties of both liquid and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarizer are pasted outside the two glass panels. This polarizer would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizer and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating / highlighting the desired characters.

CONCLUSION

This project shows the implementation of smart garbage management system using wireless sensor embedded controller and IOT. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient.

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