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INTELLIGENT WASTE MANAGEMENT SYSTEM IN SMART CITIES

Mr. Mohammed Hamed Ali [*1], Mr. Shaik Mahboob [*2],
Dr. Mohammad Iliyas[*3], Mr. Gade Rajesh Reddy [*4],
[*1, 2] B. Tech. Student Dept. of ECE, Shadan College of Engineering and Technology
[*3] Dean Academics, Professor & HOD, Dept. of ECE, Shadan College of Engineering and Technology
[*3] Assistant Professor, Dept. of ECE, Shadan College of Engineering and Technology
alimohammedhamed1@gmail.com [*1], shaikraouf1317@gmail.com[*2], ilyas.ece@gmail.com*[3],
rajesh.gbjr@gmail.com*[4]

Abstract: Waste management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the waste management is that the garbage bin at public places gets overflowed well in advance before the commencement of the next cleaning processes. It causes bad odor and ugliness in the surrounding and in turn spreads diseases. The cleanliness and hygiene of the region is maintained by mounting these smart dustbins. The main theme of the project is to develop an intelligent garbage system for efficient garbage disposal. This paper proposes an alert system to the municipal corporation by checking the level of garbage and making its disposal method easier. This process has an ultrasonic sensor which is connected to Arduino UNO to check the level of garbage in the dustbin and sends the alert to the municipal web server if garbage is filled or when it reaches the threshold level. After cleaning the dustbin, the driver confirms the task of emptying the garbage.

INTRODUCTION

An embedded system can be defined as a computing device that does a specific focused job. Appliances such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. are examples of embedded systems. Each of these appliances will have a processor and special hardware to meet the specific requirement of the application along with the embedded software that is executed by the processor for meeting that specific requirement. The embedded software is also called “firm ware”. The desktop/laptop computer is a general purpose computer. You can use it for a variety of applications such as playing games, *word* processing, accounting, software development and so on. In contrast, the software in the embedded systems is always fixed listed below:

· Embedded systems do a very specific task, they cannot be programmed to do different things. . Embedded systems have very limited resources, particularly the memory. Generally, they do not have secondary storage devices such as the CDROM or the floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded systems, called real-time systems, the deadlines are stringent. Missing a deadline may cause a catastrophe-loss of life or damage to property. Embedded systems are constrained for power. As many embedded systems operate through a battery, the power consumption has to be very low.

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· Some embedded systems have to operate in extreme environmental conditions such as very high temperatures and humidity.

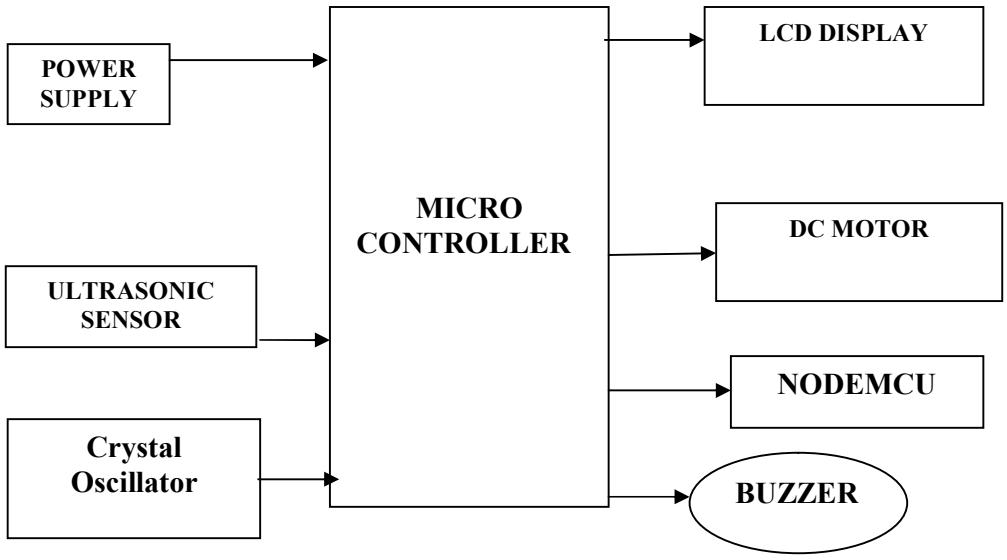
PROJECT INTRODUCTION

AIM: The main objective of this project is to create a user friendly waste management system

Purpose:

The project was designed in such a way that in order to reduce manual operation and we are implementing the auto intimation.

BLOCK DIAGRAM:



DESCRIPTION:

The system designed here is very useful for municipality and punchayat cleaning purposes. Here we consider a bucket in which the waste is being dumped. On the sides of the waste bucket or dustbin will be placing Ultrasonic sensors to identify the level of the waste in the dustbin. The information related to the waste level in the dustbin is displayed in the LCD and sent to the server and can be monitored using BLYNK app in smart phones.

SOFTWARE USED:

1. Embedded C
2. Arduino IDE
3. Uc-Flash or ISP
4. Express PCB

HARDWARES:

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1. Micro controller
2. Power supply
3. Ultrasonic Sensor
4. NodeMCU
5. Buzzer
6. LCD

L293D

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL
- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V
- (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES

DESCRIPTION

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.

To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

ARDUINO

Overview:

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The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

The board has the following new features:

1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Node MCU is an open-source IoT stage. It consolidates firmware that abrupt spikes notable for the ESP8266 Wi-Fi SoC from Express if Systems, and stuff which relies on the ESP-12 module. The articulation "Node MCU" usually implies the firmware rather than the Dev Kit. The firmware uses the Lua scripting language. It relies on the Lua undertaking and subject to the Express if Non-OS SDK for ESP8266. It uses many open sources project, for instance, Lua - Jason, and spiffs.

FIG 5: Node MCU

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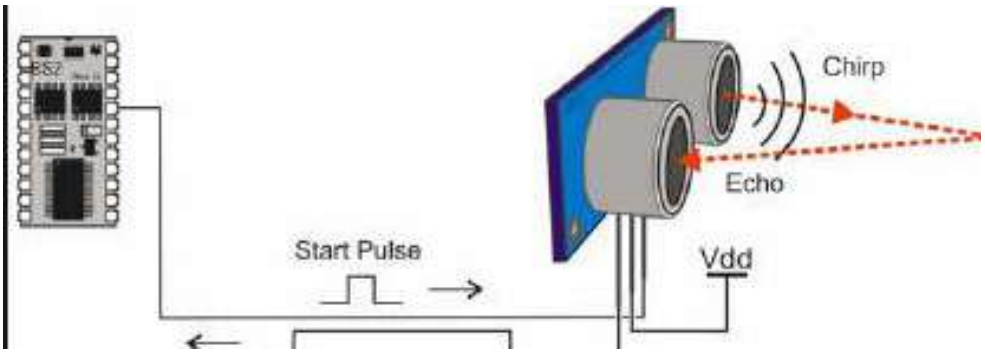
Ultrasonic transducer:



Ultrasonic transducers are transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called **ultrasound transceivers**; many **ultrasound sensors** besides being sensors are indeed transceivers because they can both sense and transmit. These devices work on a principle similar to that of transducers used in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Active ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions, convert it to an electrical signal, and report it to a computer.

LCD screen:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

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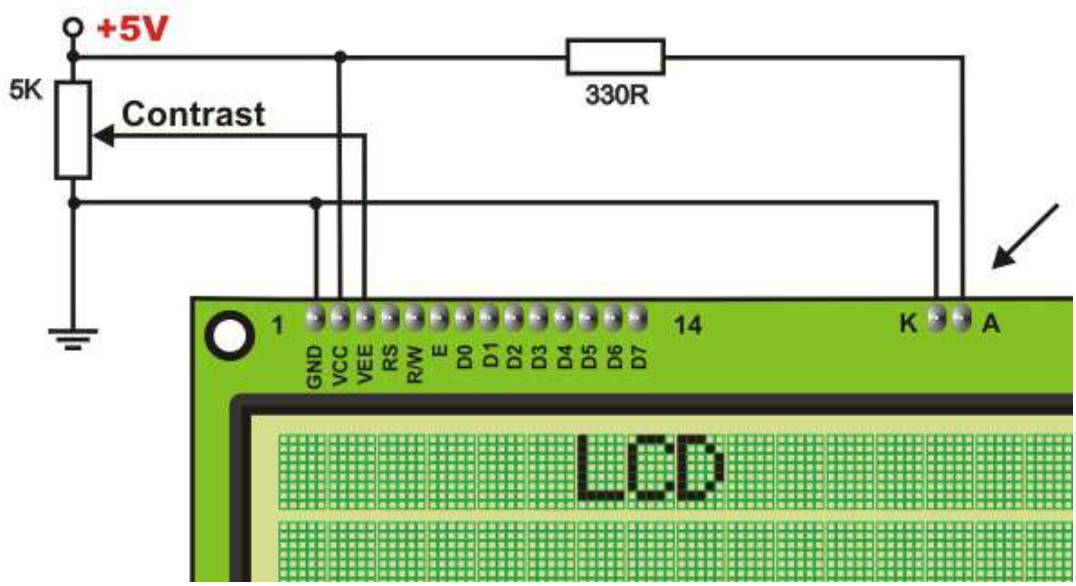

DC MOTOR

WORKING PRINCIPLE OF A DC MOTOR

A DC motor is an electric motor that runs on DC electricity. It works on the principle of electromagnetism. A current carrying conductor when placed in an external magnetic field will experience a force proportional to the current in the conductor.

OPERATION OF A DC MOTOR

There are two magnetic fields produced in the motor. One magnetic field is produced by the permanent magnets and the other magnetic field is produced by the electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous

Torque output this makes the motor to run.

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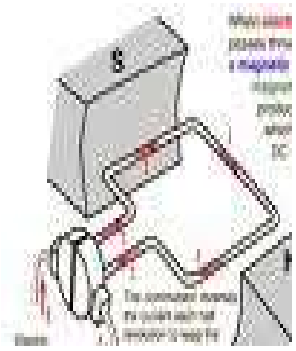

Arduino software

The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preburned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).We can also bypass the boot loader and programs the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .information file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a library to simplify use of the I2C bus.

PROCEDURE FOR CREATION AND CONNECTING BLYNK TO MICRO CONTROLLER

1. Create a Blynk Account

After you download the Blynk App, you'll need to create a New Blynk account. This account is separate from the accounts used for the Blynk in case you already have one.

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We recommend using a real email address because it will simplify things later.

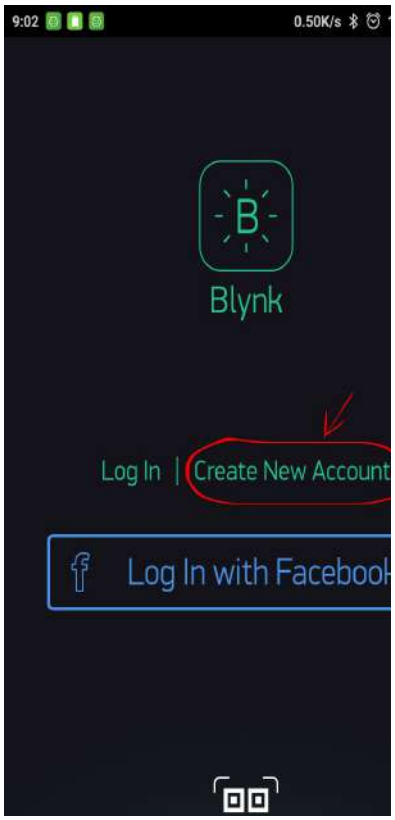

Fig 5.1 : Creation of blynk account

2.Create a New Project

After we have successfully logged into our account, start by creating a new project.

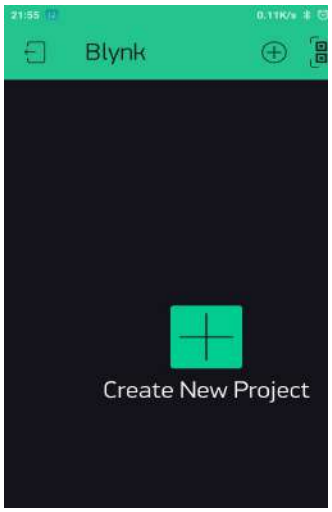

Fig 5.2 : Creation of a project

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2. Choose Hardware

Select the hardware model that we will use.

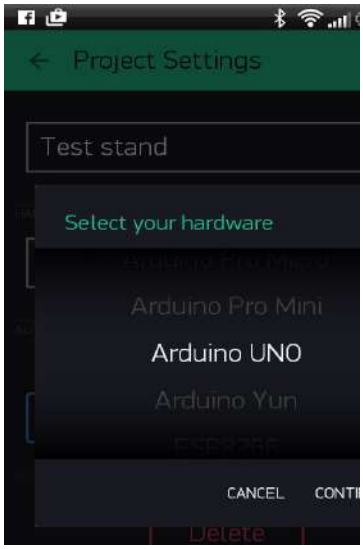

Fig 5.3: Selection of controller

3. Auth Token

Auth Token is a unique identifier which is needed to connect our hardware to our smart phone. Every new project that we create will have its own Auth Token. We will get Auth Token automatically on your email after project creation. we can copy it manually. Click on devices section and selected required device: and we see the token.

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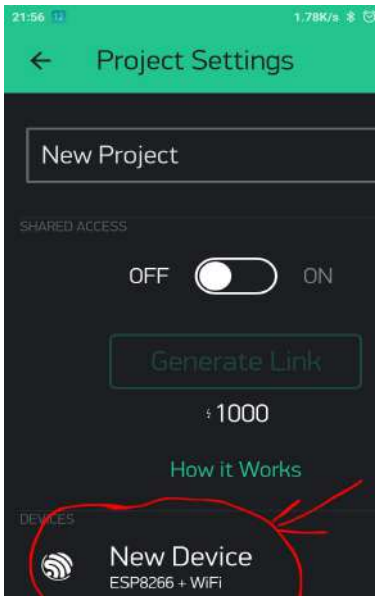

Fig 5.4 : Generation of auth token

4. Blynk Tools Creation

Required tools are taken and laced in proper positions. Various tools, Switches, joysticks, sliders, etc., are available. The required video display, two joysticks, one button and GPS tools are taken.

Fig 5.5: App Appearance

5. Internal Of Joystick

Limits for the joystick are given and the refresh rate is also given so that the value is changed very frequently.

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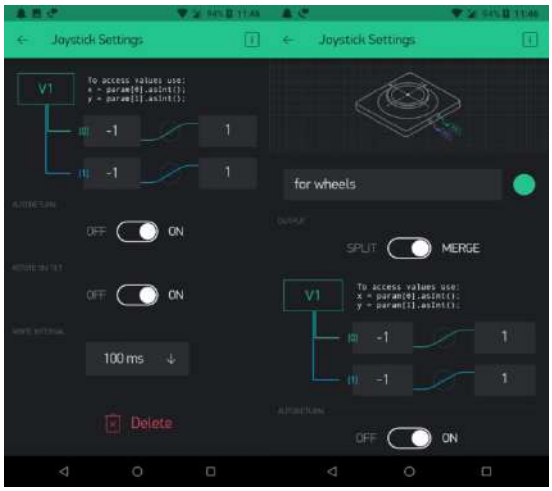

Fig 5.6 : Internal of Joystick

APPLICATIONS: Data collection is the essential application of WSN and more importantly it is the foundation of other advanced applications in IOT environment

ADVANTAGES : Sensor data acquisition interface equipment is one of the key Parts in IOT applications.

CONCLUSION

The propagation at ultra sonic sensor is carried out through the air at the velocity of sound. If they strike on object and it must reflect as echo signal to the sensor. It then self-calculates the distance to the target based on time interval between the transmitting signal and receiving the echo. This ultra-sonic sensor will be placed on the interior side of the lid, the one facing the solid waste. As the amount of waste increases in the bin, the distance between the ultra-sonic and the waste decreases. This live data will be sent to our microcontroller. In future, we will implement the intelligent bins using tools from IoT and will move towards optimization of the waste management system.

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