

Solar Based Smart Garbage Monitoring System Using IOT

Pravash Ranjan Tripathy¹, Subhendu Kumar Behera²

¹(Department of Electronics & Communication Engineering, Gandhi Engineering College, India)

²(Department of Electronics & Communication Engineering, Gandhi Engineering College, India)

Abstract: The Clean India scheme emphasizes maintenance of the city premises free from household and industrial waste. India being a heavily populous country generates a huge amount hold wastes in residential area due to the FMCG packaging material. The collection and proper disposal of such wastes are essential for maintaining the ambience clean. The Municipal Corporation has number of garbage collection units for collection of garbage from different areas with in the municipal corporation. The project proposes a solar based self-sustaining garbage collection unit which connects to the municipal server through a Esp. 8266 Wi-Fi module. The system provides the municipal system with the necessary data such as garbage level in the collection unit.

Key words: Angular JS, Ionic Framework ,HTML 5, Cordova.

I. Introduction

The Clean India scheme emphasizes maintenance of the city premises free from household the system has an android application for displaying the status of the collection units. The android application will provide intimation in the form of colored visuals in the app UI. The systems IOT unit is powered by a 12V/500ma Solar Panel. Thus the system will provide an efficient and smart way for monitoring the garbage level in a waste collection units and industrial waste. The collection and proper disposal of such wastes are essential for maintaining the ambience clean. The project proposes a solar based self-sustaining garbage collection unit which connects to the municipal server through a Esp. 8266 Wi-Fi module. The system provides the municipal system with the necessary data such as garbage level in the collection unit. The system has an android application for displaying the status of the collection units.

Thus the system will provide an efficient and smart way for monitoring the garbage level in waste collection units.

II. Proposed Model

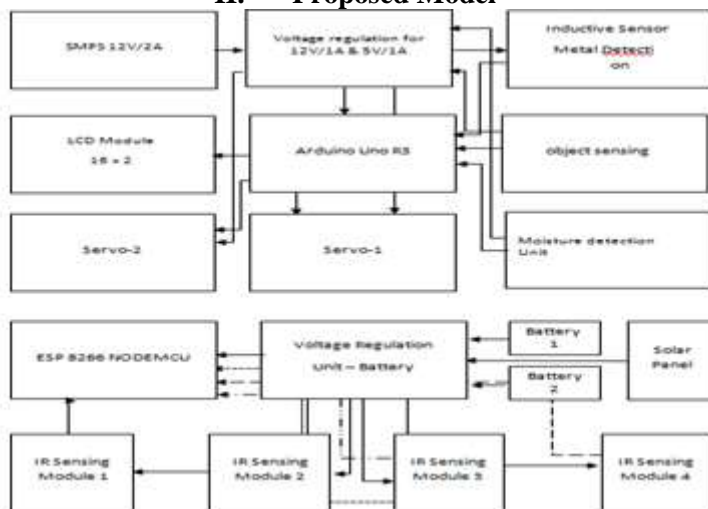


Figure 1 Dust separation unit and IR sensing module.

2.1 IrDectector

An infrared detector is a detector that reacts to infrared (IR) radiation. The two main types of detectors are thermal and photonic (photo detectors). The thermal effects of the incident IR radiation can be followed through many temperature dependent phenomena. Bolometer and microbolometers are based on changes in resistance. Thermocouples and thermopiles use the thermoelectric effect. Go lay cells follow thermal expansion. In IR spectrometers the piezoelectric are the most widespread. The response time and sensitivity of photonic detectors can be much higher, but usually these have to be cooled to cut thermal noise. The materials in these

are semiconductors with narrow band gaps. Incident IR photons can cause electronic excitations. In photoconductive detectors, the resistivity of the detector elements monitor Photovoltaic detectors contains a p-n junction on which photoelectric current appears upon illumination.

2.2 Metal Dectector

A **metal detector** is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator. Usually the device gives some indication of distance; the closer the metal is, the higher the tone in the earphone or the higher the needle goes. Another common type are stationary "walk through" metal detectors used for security screening at access points in prisons, courthouses, and airports to detect concealed metal weapons on a person's body. The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces a magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.

2.3 Esp8266Nodemcu

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. he firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs. NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a TensilicaXtensa LX106 core, widely used in IoT applications. NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGAdisplays.

2.4 ServoMotor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.^[1]It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

2.5 Single Mode PowerSupply

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

2.6 Software Development

Thing Speak Application

According to its developers, Thing Speak is an open source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". Thing Speak was originally launched by io Bridge in 2010 as a service in support of IoT applications. Thing Speak has integrated support from the numerical computing software MATLAB from Math Works. Allowing Thing Speak users to analyze and visualize uploaded data

using Mat lab without requiring the purchase of a Mat lab license from Math works. Thing Speak has a close relationship with Math works, Inc. In fact, all of the Thing Speak documentation is incorporated into the Math works' Mat lab documentation site and even enabling registered Math works user accounts as valid login credentials on the Thing Speak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Math works, Inc.

III. Working Of Proposed System

The Clean India scheme emphasizes maintenance of the city premises free from household and industrial waste. India being a heavily populous country generates a huge amount hold wastes in residential area due to the FMCG packaging material. The collection and proper disposal of such wastes are essential for maintaining the ambience clean. The Municipal Corporation has number of garbage collection units for collection of garbage from different areas with in the municipal corporation. basket will sense the level in the three basket and will pass the information to the IOT by using ESP8266 module which will be indicated through the app. The System has a level sensing system inside the waste collection facility. The sensors will sense the level of waste and send the information to the ESP8266 Module the module will display the status a LCD Display and also send data to the IOT server. The Server will send the details of the status to the mobile application by means of Internet, The status of the waste collection unit along with the location will be sent to the android application. The system also has solar powered battery storage unit for powering the Systems. Waste monitoring Unit making itself sustainable. Esp. 8266 Wi-Fi module. The system provides the municipal system with the necessary data such as garbage level in the collection unit. The system has an android application for displaying the status of the collection units. The android application will provide intimation in the form of colored visuals in the app UI. The systems IOT unit is powered by a 12V/500ma Solar Panel. The project proposes a solar based self-sustaining garbage collection unit which connects to the municipal server through a Thusthesystemwillprovideanefficientandsmartwayformonitoringthegarbagelevelinwaste collection units. The system contain three different garbage unit which has a three different level of sensors which contain ATMEGA 378P motor inside the garbage unit which will rotate the garbage collection unit .the main garbage collection unit is placed on the top of the three basket which contain the flap unit once the garbage dust is dumped it will segregate the type of waste and will move the dust near the flap and it will automatically opens the flap and dumb the dust towards it. Level sensor which is placed in the three basket will sense the level in the three basket and will pass the information to the IOT by using ESP8266 module which will be indicated through the app. The System has a level sensing system inside the waste collection facility. The sensors will sense the level of waste and send the information to the ESP8266 Module the module will display the status in a LCD Display and also send data to the IOT server. The Server will send the details of the status to the mobile application by means of Internet, The status of the waste collection unit along with the location will be sent to the android application. The system also has solar powered battery storage unit for powering the Systems. Waste monitoring Unit making itselfsustainable.

IV. Result

The project can be equipped with separate units for collection of metal and plastic wastes providing revenue for the municipal corporation on waste collection. The concept is essential for the Smart city project The concept will attract government Funding in the future The concept will provide a proper way to monitor waste collection The project will be a foundational stone for the swatch bharath scheme.

References

- [1] Daniel Hoornweg et al., "WHAT A WASTE A Global Review of Solid Waste Management", Urban Development & Local Government Unit World Bank, Washington, DC., No.15, Mar.2012.
- [2] NishigandhaKothari , "Waste to Wealth", NSWAI, New Delhi, Jul.2013.
- [3] Claudine Capel, "Innovations in Waste", Waste management-world, Volume 11, Issue 2, Mar2010.
- [4] J.S. Bajaj, "Urban Solid Waste management in India", Planning Commission Government of India, NEW DELHI,1995.
- [5] Claudine Capel, "Waste Sorting - A Look at The Separation And Sorting Techniques in Today's European Market", Waste-management-world, Volume 9, Issue 4, Jul2008.
- [6] LDC1000 Inductance to Digital Converter, Texas instruments, Dallas, TX, September 2012
- [7] MSP430x2xx Family User's Guide, Texas instruments, Dallas, Tx, Dec 2004–Revised Jul 2013.
- [8] "Relative Dielectric constant ϵ_r (dk value) of liquids and solid materials", Endress **Hausz**,Weil am Rhein, Baden Württemberg, 2000.
- [9] M.S. Venkatesh et al., "An Overview of Microwave Processing and Dielectric Properties of Agri-food Materials", Biosystems.
- [10] Kunzmann K.R., Smart Cities: A New Paradigm of Urban Development. Crios, 1/2014doi: 10.7373/77140.
- [11] N. Komminos Intelligent Cities: Innovation, Knowledge Systems, and Digital Spaces Spon Press (2002)
- [12] Open Data Copenhagen: <http://data.kk.dk/>.
- [13] T. C. G. on behalf of the Global eSustainability Initiative, The ICT behind cities of the future. SMART 2020, 2010.
- [14] G. Piro, I. Cianci, L. Grieco, G. Boggia, P. Camarda Information centric services in smart cities Journal of Systems and Software, 88 (0) (2014), Article PDF (7MB)
- [15] Kostakos V., Ojala T., and Juntunen T., Traffic in the smart city: Exploring citywide sensing for traffic control center augmentation, Internet Computing, IEEE, vol. 17, Nov 2013.

- [16] Mitton N., Papavassiliou S., Puliafito A., Trivedi K. S., Combining Cloud and sensors in a smart city environment, EURASIP Journal on Wireless Communications and Networking, 2012:247, 2012.
- [17] Nuortio T., Kytöjoki J, Niska H., Bräysy O., Improved route planning and scheduling of waste collection and transport, Expert Systems with Applications, Volume 30, Issue 2, February 2006, ISSN 0957-4174.
- [18] Byung-In K., Seongbae K., Surya S., Waste collection vehicle routing problem with time windows, Computers & Operations Research, Volume 33, Issue 12, December 2006, ISSN 0305-0548.
- [20] Viswanath Naik.S, S.Pushpa Bai, Rajesh.P and Mallik arjuna Naik.B, IOT Based Green House Monitoring System, International Journal of Electronics and Communication Engineering & Technology (IJCET), 6(6), 2015, pp.45-47.
- [21] Hariharr C Punjabi, Sanket Agarwal, Vivek Khithani, Venkatesh Muddaliar and MrugendraVasmatkar, Smart Farming Using IoT, International Journal of Electronics and Communication Engineering and Technology, 8(1), 2017 , pp. 58–66.