ASTUTE ABLUTIONS AND PLANATAE IN TRAIN USING IOT

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Abstract - *In this today's modern world, many advanced features are emerging, yet at the same time the cleanliness in our nation is under risk. The main aim of this paper is to provide clean and hygiene toilets to everyone. The public toilets all over the world should be clean and hygienic. In our country, there is a scheme called "Swachh Bharat" (Clean India) which is initiated by the Indian Government. The objective of this scheme is to keep the toilets uncontaminated. This paper can be helpful to encourage the clean India project in railways also. This paper elaborately explains how to overcome the water crisis in railways. This whole system is controlled using a microcontroller (Node MCU) with in-built Wi-Fi (ESP8266 12E) module in it. It is also monitored and maintained continuously through IOT using various sensors such as water level, smoke and IR sensors.*
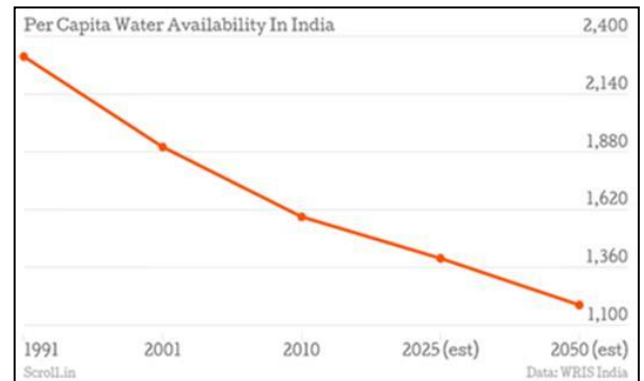
Key Words: **Node MCU, ESP8266 12E, Water sensor, Smoke sensor, IR sensor.**

1. INTRODUCTION

Water scarcity is the major crisis faced by the people all over the world. Clean and Freshwater is an essential thing for the humans to lead healthy and a happy life. The main cause of water shortage all over the world is climate change, drought, floods, over usage of water, increased pollution, etc. Nowadays the water shortage is increased all over Tamil Nadu and in fact all over the country due to scorching summer, which results in drying of rivers, lakes and wells which are considered as the main sources of water supply for railways, industries, etc. Despite this challenging situation, many places all over India are taking all the necessary steps to ensure watering of all trains to the maximum extent possible. Only 4% of world's water resources are available to us, and we have to provide it for 16% of world's population. The water shortage in India will sure land us in a crucial situation, if urgent steps are not taken.

In today's modern world, water management system is essential one to overcome this water crisis. Water management process can be carried out in industries, houses, railways etc. Some of the strategies to adapt water scarcity are as follows:
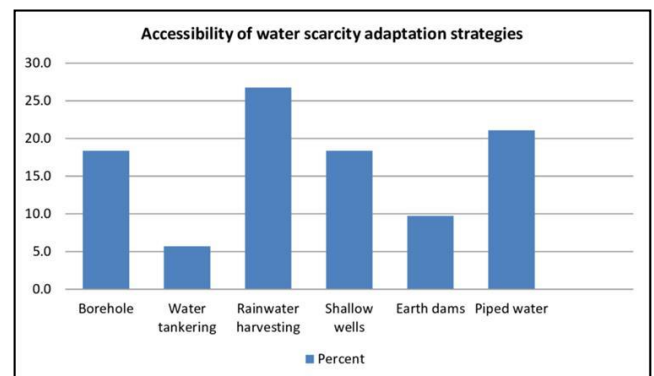

Chart -1: Per Capita Water Availability in India (Source – WRIS)

- Borehole
- Rain water Harvesting
- Water Tinkering
- Shallow Wells
- Earth Dams
- Piped Water

Chart -2: Accessibility of Water Scarcity Adaptation Strategies

This paper mainly focuses on water management system in trains which is the one of the major causes of water crisis. This system is enhanced with human detection with automatic door unlock system and automatic flushing system with the help of relay, solenoid valve and water level sensor.

IOT technology is the added advantage to this concept where we can monitor and control the entire system using WIFI.

1.1 Internet of Things

The Internet of things (IOT) is the technologies that are embedded with sensors, processors, software, hardware and other technologies. It connects and exchange data with other devices and systems over the Internet or through Wireless-Fidelity.
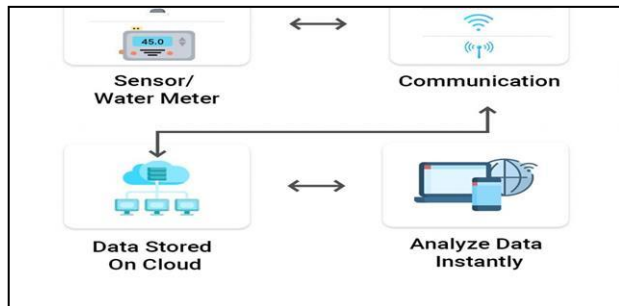

Fig -1: Working Principle of Internet of Things

2. LITERATURE REVIEW

Mr Souvik Deb, Mr Prakash Chakraborty, Aritra Ghosh, Mr Sangib Roy, Sohan Patra and Dwaipayan Biswas" WIRELESS PUMP CONTROL WITH WATER LEVEL MONITORING SYSTEM" Indo-Iranian Journal of Scientific Research (IIJSR) Peer-Reviewed Quarterly International Journal, Volume 2, Issue 2, Pages 05 - 10, April - June 2018

Water and energy are the two main pivotal reason of concern in today's world. With the rise in population the demand for both energy and water is increasing day by day. To reduce the wastage of these two essential resources and to save time an automated water pump has been designed, involving cheap electronic devices like RF module, relay, PV cell etc. The pump works on renewable power source i.e. solar energy and includes an automated water level indicator which indicates the water level at various stages, being full, empty and middle. Thus in the processes switching on the pump when the tank is empty and switching the pump off when the tank gets full so that no water is wasted and the hole system will wireless.

Salunkhe Ajay Rajendra, Chavan Namdev Damu, Wadar Avdhut Ashok, Patil Dhairyashil Sunil "BIO-TOILET" International Journal of Electronics, Electrical and Computational System IJEECS ISSN 2348-117X Volume 7, Issue 3 March 2018

All this tremendous amount of waste generated needs to be put for greater cause. Initially we have thought for management of human solid waste. Considering this we come up with idea of introducing use of Inoculum bacteria for treatment of human solid waste. By literature we surveyed waste water. Our major concern was to save thousands of litre waste water and to convert in to pathogen free water. In due course of time we got positive results by using Inoculum bacteria. By this technique we can save as well as we can convert waste water in to potable water. An eight decade old multi-product engineering company has developed BIOLOGICAL TOILET SYSTEM towards its contribution to its corporate social responsibility, after serving the Indian Railways for decades, and now leveraging its talented pool of technical resources, creativity and innovation, to save the planet with its green products. The R&D team has spent 35000 man hours in research to develop ENBIOLET™ by which human waste is completely digested by the bio-media present in the bio-digester tank and converted into nontoxic water and gas, there is no chance of solid waste being discharged to the ground. This will revolutionise hygiene and sanitation in the country.

3. EXISTING SYSTEM

In the existing system, manual flushing is done; sometimes the toilets will not be a hygienic condition. Because it does not have any automatic flushing method. They are not focused on providing a clean and hygienic toilet. In the railways smoking has been carried out by the passengers, but there are no other systems to prevent the smoking. When the detection is not done, penalty for smoking cannot be carried out. In the existing system, there is no presence of automatic door .There is no tube connection between the auxiliary and main tank. So, if there is need of water for auxiliary tank in railway compartment, it should be filled only at the station, where they refill the tanks. Sometimes the passengers may suffer, if there is no presence of water in the auxiliary tank, if needed for emergency. In the railways, there is no sensor or device for detecting the levels of septic tank.

4. PROPOSED SYSTEM

In the proposed system, automatic flushing in the toilets is carried out. So, by this system the toilets will be cleaned properly and it will be hygienic condition. Because it contains automatic flushing method and also they are focused on providing a clean and hygienic toilet. Smoking is detected using the smoke sensor, severe actions will be taken to the offenders by catching and asking them to pay penalty with the help of automatic door and buzzer .This system also comprises of connection between the auxiliary and main tank. Once if it indicates that the water level is below the needed level in the auxiliary tank, it supplies the water to auxiliary tank through main tank .So, there is no need for passengers to wait for water if it is emptied, it automatically gets filled from main tank. In addition to that, the level of the septic tank is also monitored using IOT. This entire system is monitored from the engine using android app built for it.

5. BLOCK DIAGRAM

The proposed system shown in fig. The IR sensor used to detect the person entering the toilet. The water level sensor is used to detect the water level. The change in water level, signal is given to the microcontroller which in case turns on the solenoid valve.

The Smoke detector is used to sense the smoke and this signal is given to the controller. The microcontroller gives the information to the driver and door is closed and the buzzer alert is initiated.
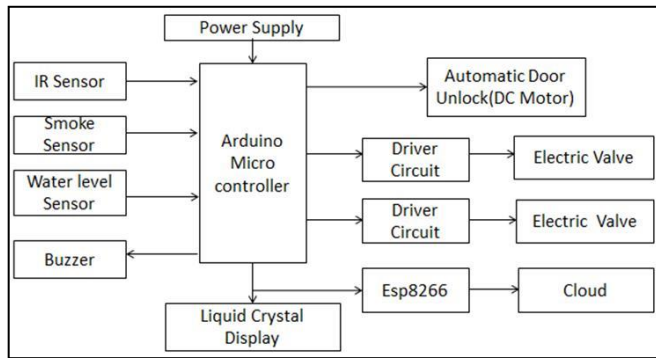
Fig -2: Block Diagram

6. MODULE DESCRIPTION

6.1 Node MCU

The Node MCU (Node Micro Controller Unit) is open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SOC) called the ESP8266. The ESP8266 contains all the indefinite elements of the modern computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for IOT projects of all kinds.

6.2 MQ-7 Smoke Sensor

This is a sensor which is used to sense the Carbon Monoxide (CO) concentrations in the air. The sensing range of MQ-7 smoke senor is from 10 to 500ppm. This sensor has a high sensitivity with fast response time. The sensor's output is an analog resistance. The driver circuit is very simple. We should power the heater coil with 5V, and we should add a load resistance to it, and connect the output to an Analog to Digital converter.

6.3 IR Sensor

Infrared radiation (IR) is also known as electromagnetic radiation. Its wavelength is between 0.7 and 300 micrometers, which is equal to the frequency range between approximately 1 and 430 THz. The wavelength of IR sensor is longer than that of visible light and shorter than that of terahertz radiation microwaves.

6.4 Water Level Sensor

This sensor can be used to measure the water level in the main tank. The working of the water level sensor is very simple and straight forward. The series of exposed parallel conductors, together acts as a variable resistor similar to the potentiometer. There is a difference in the resistance values according to the water level.

6.5 Solenoid Valve

A solenoid valve is also known as an electromechanical valve. The solenoid coil inside the solenoid valve is controlled by the electric current through which the solenoid valve changes its idle state .The valve consists of two main parts: one is solenoid and the other one is valve. The valve mechanism is controlled by the solenoid which converts electrical energy to mechanical energy.

6.6 Relay

A relay is an electromagnetic switch and it is also known as electrically operated switch. It consists of input terminals and contact terminals. Single and multiple control signals are used by input terminals. This electromagnetic switch can make contact, break contact, or combinations thereof.

6.7 DC Motor

The Direct Current motor is a motor which converts the direct current into the mechanical work. The DC motor works under the principle of Lorentz Law which states that "the current carrying conductor experiences a force when it is placed in electric and magnetic field"

6.8 Buzzer

A buzzer or beeper is known as a signaling device which converts the electrical signal to the audio signal. It can either be of mechanical, electromechanical, or piezoelectric (Pizeo for short). The uses of buzzers and beepers are used in alarm devices, timers, etc. The confirmation of user input such as a mouse click or keystroke can also be indicated by using buzzers.
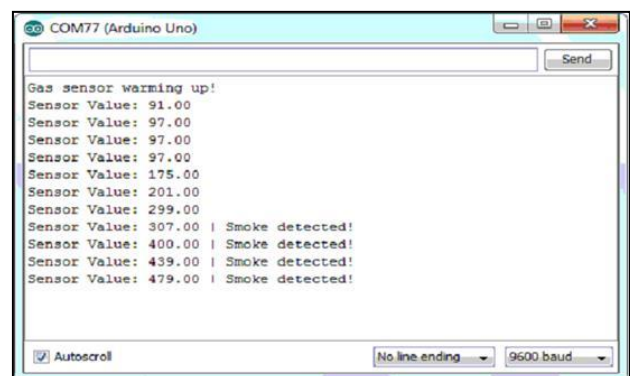
7. EXPERIMENTAL RESULTS

Fig -3: Human Detection
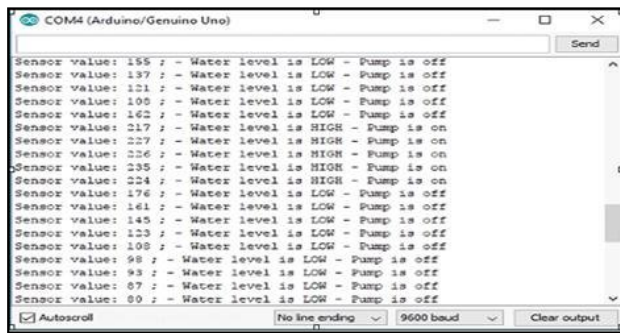

Fig -4: Smoke Detection
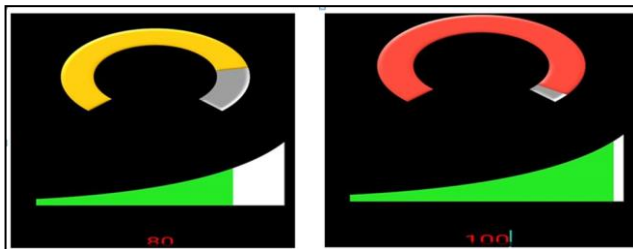
Fig -5: Water Level Detection

Fig - 6: App Screenshot

8. FUTURE SCOPE

Using camera in each coach to avoid accidents and anti-social elements. Cameras are also used for monitoring the situation of each and every compartment so that we can avoid lot of problem. Replacing with smart door system in each compartment entrance helps us to avoid over crowd and near practices in ticket counters. Lane detection may be added in future so that we can prevent train accidents and protect loss of life.

9. CONCLUSIONS

In our proposed model we have implemented automatic smoking detection, flushing system and also control the water flow from main tank to the auxiliary tank. Automatic flushing system disposes human waste by using water through the drain pipe with specified quantity to conserve the water at the same time it is cost effective and simple. Today we are all getting aware of automation than manual system. Thus the problem of arising accidents, wastages can be completely reduced by using automation system.

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