



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 10, October 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569



Water Pipe Leakage Management System for Domestic Applications Using GSM

K.Perumal¹, M.Venkatesh², R.Parthasarathi³, G.Srinivasan⁴, A.Gukulraj⁵, S.Saravanan⁶

UG Students, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Namakkal, India^{1,2,3}

Assistant Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Namakkal, India^{4,5}

Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Namakkal, India⁶

ABSTRACT-This project focuses on an application of wireless sensor networks for leakage detection in water pipes to overcome the problem of water dispersion in water distribution networks. Leakage prevention and breaks identification in water distribution networks are fundamental for an adequate use of natural resources. To address this problem, and simplify the leakage identification process, the authors have designed a wireless network system making use of mobile wireless sensors able to detect breaks and save energy, time and cost with having Smart Water Leakage Detection (SWLD) in pipelines, measure water level in tank and control in pump to turn it on when water level is low. It focuses mainly on two parts: The first part is alarm based on Global System for Mobile technology (GSM) to send Short Message Service (SMS) to the owner. The system is made up of basic components: sensors, GSM module, Arduino, relays to control the device. The second is the controlling part; it uses Android application mobile to control the pump. The result of using the proposed system is improving the efficiency of operation, reducing delay time and cost of maintenance pipelines after leakage detection.

KEYWORDS: Water detection sensor, DHT 11 sensor, IR sensor, Relay pump, GSM, Microcontroller

I. INTRODUCTION

Many of the electronics that we use today consist of some type of circuitry, which most of the time, we overlook this and take many of the devices we use for granted. As such, Water level Indicators employ a simple circuit to detect and indicate the water level in a container or a tank. We will be looking further into water level indicators used in overhead water tanks which can be found in many homes today. The idea of this project is to measure the level of water in a tank without any means of manual measurement. The inventor found a way to detect the water level in non-transparent coffee makers. Thus the idea came to be a useful way to detect the water level of an overhead tank in homes. There are many different types of water level indicators available on the markets which involve much more complex circuitry and complexity. For instance, automatic water level indicators are an advanced microcontroller based device which can detect not only the level of water, but can also power on and off of the water pump by using a sensing device. In order to stay with our original motivations for this project, we had to avoid the complex water level indicator circuits. Therefore, we were able to finish before the deadline. Many of water level indicators work in a similar fashion as the one we have built. When researching daily applications of circuits, we searched for a circuit that will be feasible to build within a month time and incorporate many aspects that we learned in class. After researching many circuits, we decided to look closer into a circuit that measures the water level in a container. Using P-Spice we will be able to design a water level indicator that will use transistors, resistors, a rectifier, a transformer, LEDs, and a sound buzzer. The transistors in our circuit will be used as switches. The resistors in our circuit will be used to lower the voltage going into the transistors and LEDs. The rectifier is used to convert the voltage from the transformer from AC to DC voltage. The LEDs are used to indicate the water level in the tank. It is found that much of the water is wasted due to the inefficient and poor water allocation and lack of integrated water management systems. So water level management system makes potential significance in home appliances, industries.



II. WORKING PRINCIPLE

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB. When an electric current is passed through the coil it generates a magnetic field that activates the armature and the consequent movement of the movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing. An intelligent sensor network system consisting of flow sensors and a set of active sensor network platform is used to monitor and detect the leakage in pipelines. The flow sensors provided in the pipes gather the data related to discharge through pipelines. The data collected by sensors is processed by microcontroller-Arduino Uno. Finally, the processed data is monitored on internet using cloud computing.

A. IR Sensor

Active infrared sensors both emit and detect infrared radiation. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots). Its range is 780nm.

B. Water Detection Sensor

Water sensor brick is designed for water detection, which can be widely used in sensing rainfall, water level, and even liquid leakage. Connecting a water sensor to an Arduino is a great way to detect a leak, spill, flood, rain, etc. The sensor has an array of exposed traces, which read LOW when water is detected.

C. DHT 11 Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data.

SPECIFICATION

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40mA
- DC Current for 3.3V Pin: 50mA
- Flash Memory: 32KB (ATmega328) of which 0.5 KB used by boot loader
- SRAM: 2KB (ATmega328)
- EEPROM: 1KB (ATmega328)
- Clock Speed: 16MHz
- Revision 3 of the board (A000066) has the following new features:
 - ATmega16U2 instead of 8U2 as USB-to-Serial converter
 - 1.0 pin out: added SDA and SCL pins for TWI communication placed 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 and the second one is a not connected pin, that is reserved for future purposes



- Stronger RESET circuit

D.Communication

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 ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf 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 Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

E.Programming

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 pre-burned 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). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega8U2 firmware source code is available. The ATmega8U2 is loaded with a DFU boot loader, which can be activated by connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information.

III. SIMULATION

ISIS - The ISIS Intelligent Schematic Input System (Intelligent Switching input system), is the environment for the design and simulation of electronic circuits. The component library includes claims more than 10,000 circuit components with 6000 Pro-spice Simulations models. Own components can be created and added to the library. VSM - The VSM Virtual System Modeling provides a graphical SPICE circuit simulation and animation directly in the ISIS environment. The SPICE simulator is based on the Berkeley SPICE3F5 model. It can microprocessor-based systems can be simulated. With the VSM engine can interact during the simulation directly with the circuit.

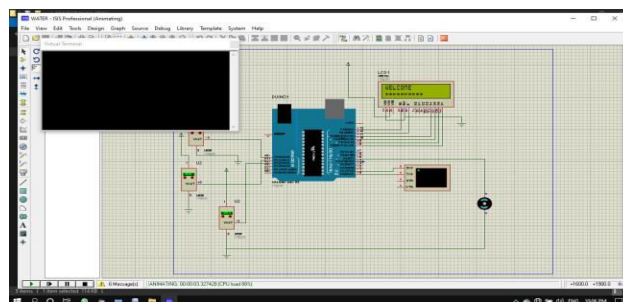


Fig.1.Simulation Result

IV. CONCLUSION

This system feature is expected to draw much attention in the next decades. Water is one of the most important basic needs for all living beings. But, unfortunately a huge amount of water is being wasted by uncontrolled use and uncontrolled leakage. The main issue that is being addressed in this system is about using an efficient wireless sensor based on water monitoring system. Two different ways to monitor the water such as water level monitoring and water pipeline leakage monitoring. Finally, the water monitoring system of homes/offices research concept will be completed by using wireless sensor technology. By using the monitoring system, we can easily prevent the water and the water

will be saving to our generation. In our system we mainly depend on technical method which deals with control and features and effective methods for monitoring the plumbing at homes. Based on Arduino mega2560 and GSM technology we achieved the main general purpose of this system topic idea which is water leakage detection and wireless control of the water pump. Using GSM technology makes the work more efficient and ease the data translating.

REFERENCES

1. R. Anand, S. Saravanan "A Correlative Study of Perturb and Observe Technique and GA- RBF-NN Method Supplying a Brushless DC Motor," International Journal of Circuits and Systems, 2016, vol.7, pp 1653-1664.
2. C.Sowmiya, N.Mohananthini, S.Saravanan and M.Ranjitha, "Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.
3. S Prasanth, G Praveenkumar, V Sridhar, S Saranraj, Dr.S Saravanan, "Paddy Harvesting Using Vacuum Inhalation Mechanism", International Journal of Innovative Research in Technology (IJIRT), ISSN: 2349-6002, Volume 6, Issue 11, April 2020.
4. P.Manikandan, S.Karthick, S.Saravanan and T.Divya, "Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.
5. R.Satheesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.
6. K.Prakashraj, G.Vijayakumar, S.Saravanan and S.Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.
7. J Mohammed siddi, A. Senthil kumar, S.Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.
8. S. Raveendar, P.M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
9. T.R. Vignesh, M.Swathisriranjani, R.Sundar, S.Saravanan, T.Thenmozhi, "Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01, pp.49-53, 2020.
10. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan, "Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.
11. C. Sowmya, N. Mohananthini, S. Saravanan, and A. Senthil kumar, "Using artificial intelligence inverter power control which is based on DC link voltage regulation for IPMSM drives with electrolytic capacitor," AIP Conference Proceedings 2207, 050001 (2020); <https://doi.org/10.1063/5.0000390>, Published Online: 28 February 2020.
12. M.Revathi, S.Saravanan, R.Raja, P.Manikandan, "A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm," International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.
13. Dr.S.Saravanan, S.Karthick, K.Rajeshkumar, S.Sriramachandran, P.Surjeethkumar, "Fishermen Border Alert System," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.9, Issue, 03, pp.236-241, 2020.
14. A.Ananthan, A.M.Dhanesh, J.Gowtham, R.Dhinesh, G.Jeevitha, Dr.S.Saravanan, "IoT Based Clean Water Supply", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.154-162, 2020.
15. S.Karthikeyan, A.Krishnaraj, P.Magendran, T.Divya, Dr.S.Saravanan, "The Dairy Data Acquisition System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.163-169, 2020.
16. A.Arulkumar, S.Balaji, M.Balakrishnan, G.Dineshkumar, S.Saravanan, "Design and Implementation of Low Cost Automatic Wall Painting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.170-176, 2020.
17. N.Harish, R.Jayakumar, P.Kalaiyarasan, G.Vijayakumar, S.Saravanan, "IoT Based Smart Home Energy Meter", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.177-183, 2020.



18. M.Amaran, S.Mannar Mannan, M.Madhu, Dr.R.Sagayaraj, Dr.S.Saravanan," Design and Implementation of Low Cost Solar Based Meat Cutting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.184-190, 2020.
19. R.Anbarsan, A.Arsathparvez, K.S.Arunachalam, M.Swathisriranjani, Dr.S.Saravanan," Automatic Class Room Light Controlling Using Arduino", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.192-201, 2020.
20. S.Monika, M.Priyadharshini, R.Rajalakshmi, T.Rajeshwari, C.Ramkumar, Dr.S.Saravanan," Design and Implementation of Electrochemical Etching Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.37-44, 2020.
21. V.Periyasamy, S.Surya, K. Vasanth, Dr.G.Vijayakumar, Dr.S.Saravanan," Design and Implementation of IoT Based Modern Weaving Loom Monitoring System", International Journal Of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.11-18, 2020.
22. M.Yogheshwaran, D.Praveenkumar, S.Pravin, P.M.Manikandan, Dr.S.Saravanan," IoT Based Intelligent Traffic Control System", International Journal of Engineering Technology Research & Management", Vol.4, Issue.4, Pp.59-63, 2020.
23. S.Shenbagavalli, T.Priyadharshini, S.Sowntharya, P.Manikandan, Dr.S.Saravanan," Design and Implementation of Smart Traffic Controlling System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.28-36, 2020.
24. R.Pradhap, R.Radhakrishnan, P.Vijayakumar, R.Raja, Dr.S.Saravanan," Solar Powered Hybrid Charging Station For Electrical Vehicle", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.19-27, 2020.
25. M.Pavithra, S.Pavithra, R.Rama Priya, M.Vaishnavee, M.Ranjitha, Dr.S.Saravanan" Fingerprint Based Medical Information System Using IoT", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.45-51, 2020.
26. S.Umaheshwari, M.Thilagavathi, S.Sivaranjani, N.Mohananthini, M.Selvakumari, S.Saravanan," A Study Of Renewable Energy In Smart Grid Technology", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
27. D.Ajithkumar, J.S.Akilan, K.Dileep, R.Lokesh, E.Viswanathan S.Tamilselvan S.Saravanan," Design and Development of Electric Two Wheeler With Fast Charging", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
28. V.Annamalai P.S.Isaiyalagan T.Manikandan T.Premkumar N.Sathya R.Prakash S.Saravanan," Design and Implementation of Automatic Rope Robot for Supplying Poultry Feeds", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
29. S.Arvinthraj, M.Arun, S.Inbhakumar, R.Sagayaraj, S.Saravanan," Multipurpose Hybrid Electric Vehicle for Agricultural Applications", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7366-7371, 2021.
30. G.Boopathi raja, K.Dhinesh, S.Gobi, G.Nandakumar, G.Nagarajan, G.Vijayakumar, S.Saravanan," Cotton Harvesting Machine", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7372-7377, 2021
31. S.Anbarasu, K.Hariharan, S.Hariharan, R.Vinoth, T.Divya, N.Mohananthini, S.Saravanan," Battery Monitoring for E-Scooter Using Internet of Things", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7384-7389, 2021
32. S.Mangalraj, L.Manimaran, C.Kumaresan, R.Manikandan, G.Srinivasan, A.Gokulraj, S.Saravanan," IoT Based Smart Energy Meter", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7390-7395, 2021
33. M.Dhanarasan, T.Jothimurali, S.U.Manishkumar,, G.Dineshkumar,P.Sakthilakkia, A.Senthilkumar, S.Saravanan," Gas Booking Using IoT", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7396-7400, 2021
34. D.Manoj kumar, C.Kavinkumar, S.Kesavan, S.Saranraj, M.Selvakumari, P.Dhivyabharathi, S.Saravanan," Intelligent Water Level Management for Domestic Application Using GSM", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7401-7404, 2021
35. Jaladi Kishan Kanna, S.Muniyappan, A.Ajay, M.Swathisriranjani, N.Balaji , K.Prakasam , S.Saravanan ," IOT Based Multi Functional Robot", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7405-7413, 2021
36. G.Naveen, S.Guna, P.Praveen Kumar, P.Manikandan, S.Sandhiya, M.Dineshkumar, S.Saravanan ," Smart Agriculture Using IoT", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7414-7419, 2021



37. K.Karan, M.Nirmal Kumar, S. Pugalenth, R.Suresh V.Deepika, Dr.S.Saravanan ,” Design and Development of E-Vehicle Based on Roller”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7420-7426, 2021
38. S.Priyadharshini, D.Sivaranjani, S.Sowbaranika, S.Saravanan, N.Mohananthini,” Automatic Solar Panel Tracker Using Artificial Intelligence and Data Science”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.13729-13735, 2021
39. S.Ashok, R.Mohanraj, K.Nandhini, P.Prakash, S.Saranraj, M.Swathisriranjani, N.Mohananthini, S.Saravanan,” Solar Powered Highway Dust Cleaner”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7427-7426, 2021
40. S.Tirumal, T.Suresh, S.Vignesh Kumar, R.Sagayaraj, S.Saravanan,” A Novel Pesticide Spraying for Agriculture Crops Using Drones”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.13797-13801, 2021
41. V.Srikumar, V.Senthil Raja, Y.Sathish, R.Prakash, S.Saravanan,” BLDC Motor Driven Solar PV Array Fed Water Pumping System Employing Zeta Converter”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.13790-13796, 2021
42. S.Siva, V.Venkatesh, R.Vigneshwaran, C.S.Satheesh, S Saravanan,” Automatic Solar Tracking System using MPPT with Mirror Booster”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.6859-6865, 2021
43. S.Prem Kumar, M.Rubeshan, V.Surya Prakash, N.Mohananthini, S.Saravanan,” Wireless Communication System based Automatic EB Billing and Disconnection Schemes”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.6866-6871, 2021
44. R.Vijay, V.Vignesh, M.Nithyanantham, R.Raja , S.Saravanan, T.Premkumar, E.Viswanathan,” Design of Electric Vehicle Drive Using Regenerative Power”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.6872-6879, 2021
45. S.Satham Hussian, T.Surya, G.Vignesh, R.Manikandan, S.Saravanan,” Smart Communicative Covid-19 Informative and Scanning BOT”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.6880-6885, 2021
46. AVR.Vimalkanth, S.Vimal, NM.Santhoshkumar, G.Dineshkumar, S.Thamilselvan, N.Sathya, S.Saravanan,” An Intelligent Fire Fighting Robot using WSN ”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.13840-13846, 2021
47. A.Parthipan, S.Vijay, D.Sridhar, M.Swathisriranjani, S.Saravanan, S.Thamilselvan, N.Sathya,” Automatic Grinding System for Food Products Using Embedded System”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.13847-13854, 2021
48. V. Priyadharshini, V. Vijayalakshmi , S. Vidhyashri , G.Nandakumar, G.Nagarajan, S.Saravanan ,” Design and Development of Garbage Collector Robot”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.13855- 13862, 2021
49. R.Thiruvrasu, V.Vallarasu, V.Vignesh, R.Sundar, R.Vinoth, T.Divya, S.Saravanan,” Smart Safety Monitoring System for Sewage Workers using Arduino”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.10, Issue.10, Pp.13863-13868, 2021



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details