

Robotic Automatic Ground Maintenance for Sports

K.Boopathy,2.P.Meera,3.R.Premiya rajani,4.M.Sakshita,
Department of Electronics and Communication Engineering
Muthayammal College of Engineering, Rasipuram

Abstract: It is most important to keep the water bodies around us to be clean. It is terrible that huge amount of garbage is deposited on water bodies every year. Cleaning the garbage and monitoring the quality of water is also very important in today's world. A cheap non-wired aquatic cleaning and monitoring system will enable cost effective water quality measurement by collecting data as well as assisting catchment managers to maintain the health of aquatic ecosystem. The "River cleaning machine" is utilized in areas where waste particles in the water body have to be eliminated. This machine is made up of a waterwheel-driven conveyor mechanism that collects and removes waste, rubbish, and plastic waste from bodies of water. This also reduces the problems that we have when collecting waste. A machine will lift the waste surface material from the water bodies, resulting in less water pollution and, as a result, fewer aquatic animal deaths from these problems. It has a belt drive system that pulls trash from the water. In addition, it helps to understand the water pollution using data analysis. The main feature of this project is to collect floating objects from the surface of the water into a trash container. The Secondary work of our project is to measure the water quality by using sensors, by measuring the water quality parameters we can be able to predict the unfavorable conditions of water living creatures. pH Sensor and Turbidity Sensor are used in our project to measure the acidity and basicity of the water and turbidity level of the water respectively. The main motto is to clean the surface of the water and check the quality of the water which helps for aquatic ecosystem.

KEYWORDS: IOT, Water cleaning and monitoring, ESP8266, ESP32, Sensors, Conveyor mechanism.

I. INTRODUCTION

In Olden days, the garbage that are floating on the water surface are cleaned by usage of small boats or by humans who used to risk their life for the environmental protection. The particles that are thrown on the river causes pollution. The above mentioned ways are being faced with high rate of risks and it will be taking a huge amount of time to be done. Having the water clean will be very much benefited to humans, animals and plants around the water. Many non-governmental organizations are taking responsibility of keeping the water around us clean but people we have the duty to keep our surroundings and environment a suitable place for living creatures to survive. Our project has an IOT based operation so it be very helpful for the people to get used to it. Maintaining good water quality in rivers and streams benefits both humans and aquatic ecosystem. The aim of our work is to develop a low-cost, wireless water quality monitoring system that aids in continuous measurements of water conditions and clean the garbage that are floating in the surface of the river. In India, people are more in population. Population is directly proportional to pollution. Pollution in recent times had been grown at a visible rate. People have no space to throw their waste so they use water bodies as their dustbin nowadays, which is a very sad truth of our nation. It should be reduced to avoid the problems that will be created in the future. Additionally, we also have numerous tools to measure the standard of water in real time. pH sensor is for acidity basicity check, whereas turbidity sensor is present to monitor the sediments in the water. All the data from the sensors are collected and stored in cloud platform for accessing anytime. Meanwhile Blynk is an application through which the motion of the project is being accessed in real time by WiFi connection.

II. HARDWARE AND SOFTWARE COMPONENTS

ESP8266:

ESP8266 is a Microcontroller, which has a wide range of variety applications like TCP/IP stack. The voltage at which the microcontroller works is described as 3.3V. ESP means Extra Sensory Perception. ESP also works on OSI Layers which is highly recommended in networking concepts that are widely used all over the world for communication. ESP8266 is used for measuring the sensor readings that are obtained and the work of the microcontroller is to gather the readings and process the data that are obtained. ESP has several variables available that can be used according to the need of the consumers. ESP8266 is used for gathering data from the sensors and uploading the received data to the cloud.

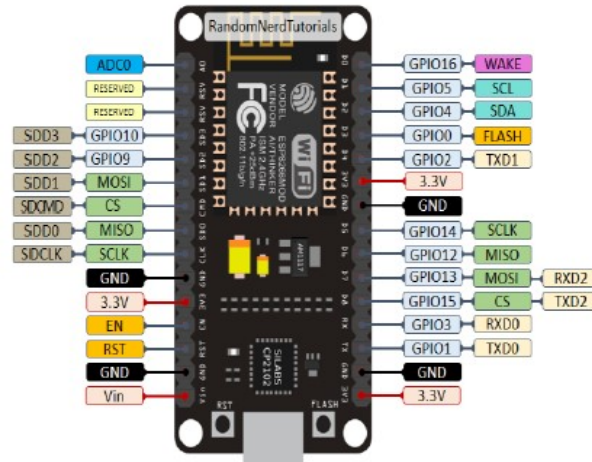


Figure 1: Pin diagram on ESP8266

ESP32:

ESP32 is also a microcontroller that has an inbuilt Bluetooth connection which is used in the project to control the direction of the boat. ESP is a small module which enables several microcontrollers and microprocessors to connect to a Wi-Fi network. The code for the ESP32 Microcontroller is done by using Arduino language. Computer will not understand any languages that are spoken by humans, to make the system or computer work we are in need to use commands that are predefined on a chip.

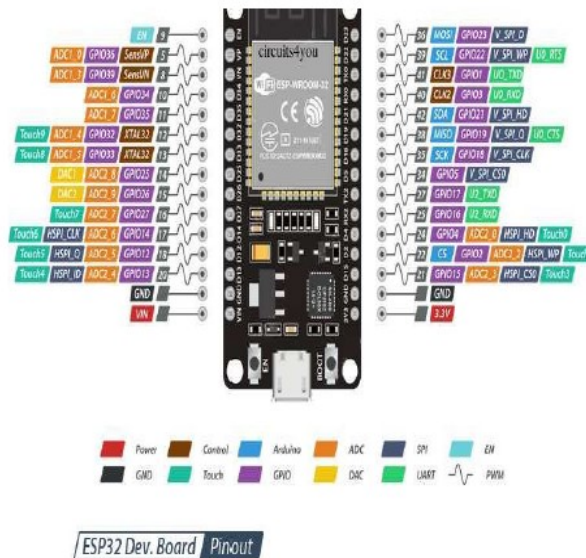


Figure 2: Pin Diagram of ESP32

Driver IC:

Driver IC is used to split the power that is given to the motors for their successive rotation. A huge amount of supply is given to the Driver IC which is further separated into small amount of supply and given to motors. When the motors are directly given a supply from the power source there is high chance of the circuit being malfunctioned or the end system will become short circuited. The total system will be left troubled. To find a result for these type of power issues, Driver IC can run both in forward and backward direction which enables the motor to be run in every possible direction that are in need. Here the input voltage is given evenly to two motors. Driver IC has several configurations. Driver IC has Enable which acts as a switch making in On and OFF. The input and output terminals that are used as basic input and output terminals.

pH Sensor:

pH sensor is used to find whether the water that is provided to be known as acid or base according to its standard. Basically there are three types of water standards which included acid, base and neutral. Acid has a pH value between 0 and 7. Base which is also said as Alkaline has a pH value between 7 and 14. The water which has the pH level almost 7 is said as neutral. The measuring of the pH is generally done between 0 to 14. pH is

nothing but the power of hydrogen in the water. The activity of the hydrogen in the water is measured in the scale of pH. The connection of pH sensor is made with ESP8266 and pH value of water is continuously monitored and the data is uploaded in cloud for future references.

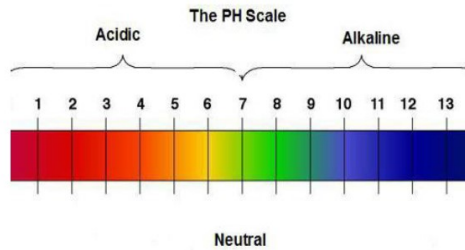


Figure 3: pH Scale

Turbidity Sensor:

Liquid created due to several suspended particles or sediments that cannot be seen through open eye, which is like fog in the atmosphere. If the turbidity of the liquid is more, the oxygen level of the water becomes low. The Turbidity level and the oxygen level are inversely proportional. If one increases the other decreases. When the oxygen level of the water decreases the aquatic creatures find it difficult to live. The underwater creatures such as fish and other plants find it difficult to breathe. This is a main problem that is occurred when the turbidity of the water goes high so it is necessary to keep the turbidity of the water even. Turbidity Sensor is connected with the microcontroller and its readings are shared in Blynk Cloud platform.

Blynk:

blynk App is used as a gamepad controller which transforms mobile phone to a virtual I/O device and enable users to control hardware using WiFi module and enable communication with it. It makes sensor and accumulators to be connected with it and has several features used to it accelerometer, GPS, proximity sensor of user mobile phone. Blynk is basically used as a WiFi Controller Application and several Internet usage or IOT applications. User can dump 0120230120234Arduino IDE or PictoBlox (graphical programming based on Scratch 3.0). Blynk has several button like structures which can be accessed to control the motion of the boat by pressing several optional keys.

BO Motor:

It is a BO Series 1 100RPM DC Motor Plastic Gear Motor. The BO motor used in the project is to control the movement of the boat. The rotation of the BO Motor makes the boat to move in numerous directions which can be controlled by the blynk mobile application. BO Motor has effective torque and rpm at low operating power, which makes the BO Motor best of it. A small loft with mismatching blades gives exclusive design for our application or arm. Mounting holes on the body & low mass makes it suitable for on-circuit usages. BO Motor can be used with 37mm radius wheel for synthetic motors and 45mm radius single purpose ring for synthetic blade rings. It can be also used as a metal blade DC rings. It works on a power of 5-15V and is mainly used for constructing huge arms for robots. It is Available with 35 and 70 RPM.



Figure 4: BO Motor

EXISTING METHODOLOGY

The physical structure of the project contains the essential tools, the roller belt, the garbage pin instrumentation, therefore a management box. Our project is constructed by froth material for simple cleaning. The project is supplied through non-wired management, supply, and a roller belt to gather garbage. A management kit contains Driver IC and power offer. The roller belt holds the garbage during a garbage pin that's hooked up on the rear of the boat. The boat can hold the floating waste at hand on its way. The roller belt is created of Poly VC material that protects roll back and offers viciousness of objects back on the water surface. Particles like polyethylene,

eatables, etc. is meant to be the destination. The conveyor belt rotates and accumulates all the floating refuse that haphazardly involves the fore. Once the rubbish trash collector pit is maximized, then it's brought back to the initial purpose and every one the rubbish gift within the collector is often removed manually by doing away with the gathering box. After the waste is off from the trash container, it is often hooked of the boat for more assortment. During this means, the trash gift on the water surface is often gathered. Once the boat is within the water, its direction is monitored by control box manually. The control box of the boat contains of the receiver, decoder, pull buttons, and supply. On a control box, there's a receiver circuit that features the two pull buttons, decoder, and receiver. The boat uses the RF (Radio Frequency) module rather than infrared due to long-distance application. The RF module additionally controls the direction of the DC motor through a driver IC L298N IC. The RF module is based on the principle of radiofrequency that has bandwidth between thirty rate and 300GHz. The RF module is employed alongside Associate in nursing encoder/decoder combine. Two pull buttons square measure connected in series to the decoder that represents backward, right, left, and forward movement of boat severally. Knowledge from every push is given parallelly to the decoder, that successively coverts it into parallel knowledge and forwards it to the receiver. Since a 12V battery is employed, the power required to be stepped all the way to 7V employing a buck boost convertor to recharge up the decoder and therefore the receiver. The knowledge reception is completed victimisation the decoder. The pin14, i.e., TE, of the HT12E decoder, is given an occasional voltage to modify the reception. The varied pins of the HT12E square measure won't to management the motors, i.e., pin ten and eleven square measure won't to management one motor, and pin twelve and thirteen square measure wont to management the opposite. A selected signal is distributed by giving an occasional input to the corresponding knowledge pin of the encoder HT12E since the decoder works on positive logic. The signals received by RF receiver that square measure initial decoded into the parallel format by HT12E then send through RF transmitter, square measure encoded by HT12D. The encoded serious knowledge is distributed to the Arduino, counting on the signal received by the Arduino, program is processed and individual output is created. The signal from the PWM of the Arduino is given to the input pins of the L298N motor driver IC. The output pins of the driving force square measure connected to the ends of the motor that successively monitors the motion of the 2 motors at the same time.

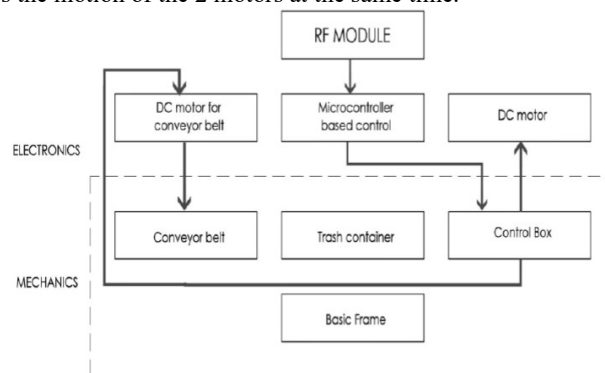


Figure 5: Block Diagram of Existing Method

PROPOSED METHODOLOGY

In the proposed methodology, the project has an ESP32 microcontroller which has an inbuilt Bluetooth module used for movement of the boat instead of RF (Radio Frequency) module because of long-range application. The motors were connected to Driver IC L293D in a serial way. Totally, it has 4 motors which was shorted and make it as 2 motors. In that, one was connected to IN1, IN2, and EN1 pins and other was connected to IN3, IN4 and EN2 pins. 9V power supply is applied to the driver IC and it convert to 5V and it was passed to motors. The movement of boat controlled through using Dabble which is a Mobile application. In the Dabble application, it has a four push buttons for the upward, downward, right and left directions. With this the project has trash container (roller) for collecting the garbage or unwanted floating materials on the surface of the water to make it tidy. It also helps the living things on the water-bodies for air circulation and maintain the eco-system clean. The roller which is made up of a PVC material with the help of conveyor belt the floating materials or garbage is collected. With these, the project has two sensors. One is pH sensor and the other is Turbidity sensor.

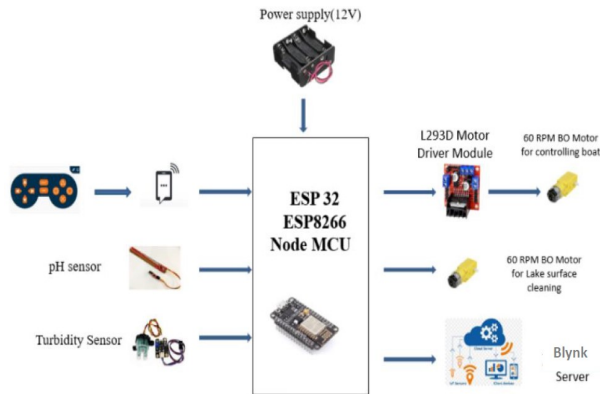


Figure 6: Architecture of Proposed Methodology

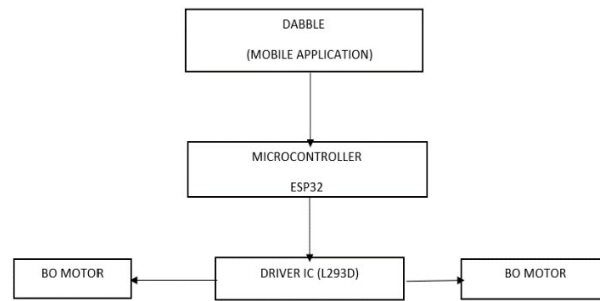


Figure 7: Block Diagram of Motor Operation

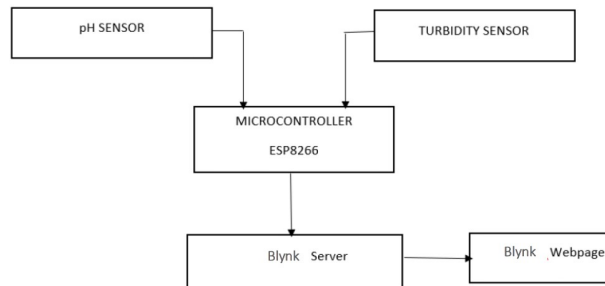


Figure 8: Block Diagram of Sensor Output

The sensors were controlled by ESP8266 microcontroller. The pH sensor was connected to D7, D8, 5V and GND and the Turbidity sensor was connected to A0 pin. The sensed information from the sensors are send to cloud through Blynk (IoT Platform). It was accessed through internet.

III. RESULTS AND DISCUSSION

A pilotless floating cleansing boat is created. Non- Wired communication is created victimization Bluetooth modem by pressing the individual push buttons like forward, backward, left and right aspect the movement of boat seen on the project's way, motion of is controlled artificially victimization the control box and that area unit are measured by roller and drop within the garbage collected at the front aspect of the boat.

The sensed data from the sensors are collected by the ESP8266 microcontroller and send it through Blynk (IoT Platform) to the Cloud. The output is updated 15 minutes frequently. We can able to check wherever we are, because of Internet of Things.

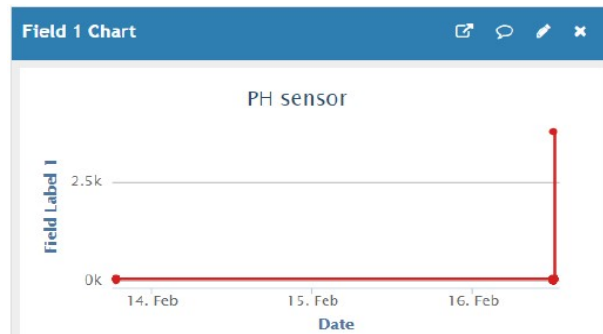


Figure 9: pH Sensor Readings

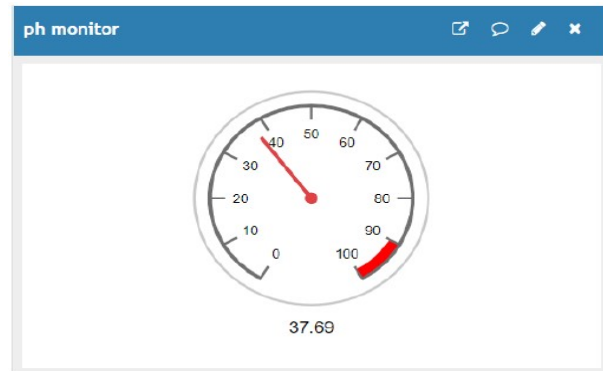


Figure 10: pH Sensor output

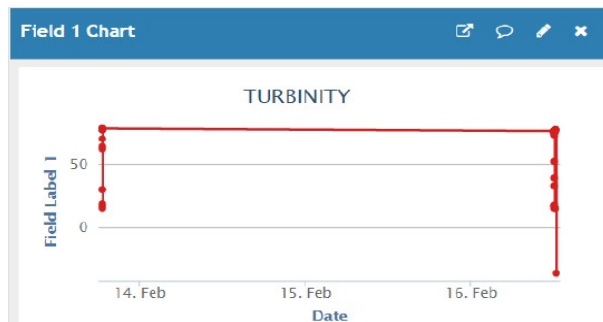


Figure 11: Turbidity Sensor output

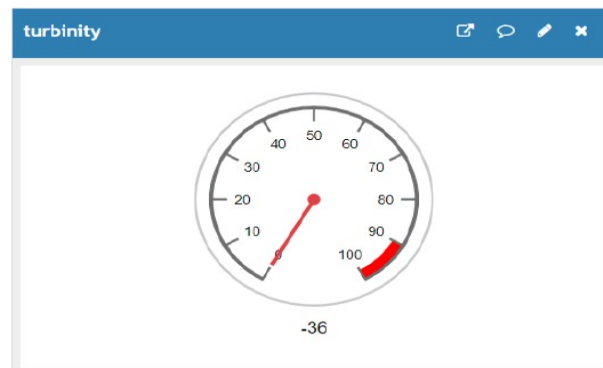


Figure 12: Turbidity Sensor Readings

IV. CONCLUSION

In the gift state of affairs of global temperature changes and world global warming, the pollution caused by surface garbage of water on watercourse and alternative water sources cannot be left unnoticed. The huge marketing of garbage material thrown into water sources makes a brief discussion of each harmful hazards and unhealthy environment. During this work, the planning and demonstration of a epitome inexpensive, water-

quality observation system is delineated. This project makes use of sensors and open source tool to provide timely mensuration of water quality at considerably minimized value. The govt. is disbursement more cash on cleansing the useless things as they break the atomic number 8 provide for each water life which are flora and fauna. Because the lifetime of water creatures is harmed it creates harmful hazards within the circle of water creature life cycle. The most distinguished strategy gift nowadays for disposing those wastes square measure the standard ones. Disposing and assortment of those trash from a water surface square measure labour intensive in India and therefore will more and more men power. Science must be proposed in such the way that cleansing the surface is completed with efficiency, here arrives the scope of our work as our main vision is to gather the garbage and trash to scale back men labour for these type of job. Our work has incorporated with management supply alongside conveyor belt hooked up to that. We have a tendency to finish the epitome is appropriate for field preparation to produce continuous long water quality mensuration. This technique delivers reliable, continuous water physiochemistry information at a lot of lower value than existing methodology permitting construction managers to considerably improve the special and predominant revolution of water condition police work. To change the dimensions of the project and to implement completely dissimilar ships which may be connected of every way to facilitate maximize the potency scrub total square measure a lot of with efficiency. Solely smaller water bodies square measure thought of presently and bigger water bodies is cleansed by creating some modifications to its size and capability.

REFERENCES

- [1] Asst. Prof. R. Raghavi, Varshini, L. Kemba Devi, "Water Surface Cleaning Robot", "International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering", Volume 8, Issue 3, March-2019, pp. 831-837.
- [2] Associate Prof. Suraya Muben, M. Kumar Yadav, B. Sirisha Reddy, T. Sowmya Reddy, B. Praneetha, "Wireless Electrical Apparatus Controlling System with Speed Control of AC motor using RF communication", "Global Journal for Research Analysis", Volume 6, Issue 4, April 2017.
- [3] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques' - Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [4] Devika Mohan and Vivek A, "Navigation of Two-Wheeled Mobile Robots Corporatively carrying on objects", "International Conference on Circuits Power and Computing Technologies", 2017, pp 1-6.
- [5] Ganesh U L and Vinod V Rampur "Semi-Automatic Drain for Sewage Water Treatment of Floating Materials" International Journal of Research in Engineering and Technology, 2016, vol.5, 7, pp.1-4.
- [6] Houssam Albitar, Anani Ananiev, Ivan Kalaykov, "In-Water Surface Cleaning Robot: Concept, Locomotion and Stability", "International Journal of Mechatronics and Automation", Volume 2, Number 2, 2014, pp 104-114.
- [7] H. Albitar, A. Ananiev, I. Kalaykov, "New Concept in Water Surface Cleaning Robot", "International Conference on Mechatronics and Automation", August-2013, pp. 1582-1587.
- [8] Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [9] Harsha Gopinath, Indu .V, Meher Madhu Dharmana, "Autonomous Underwater Inspection Robot under Disturbances", "International Conference on circuits Power and Computing Technologies", 2017.
- [10] Jayasree P.R, Jayasree K.R, Vivek A, "Dynamic Target Tracking using a 4-Wheeled Mobile Robot with optimal path planning technique", "International Conference on Circuits Power and Computing Technologies", 2017.
- [11] Mr. P. M.Sirsat, Dr. I. A. Khan, Mr. P.V. Jadhav, Mr. P.T. Date, "Design and fabrication of River Waste Cleaning Machine", IJCMES 2017, pp.1-4.
- [12] M. Mohamed Idhris, M.Elamparthi, C. Manoj Kumar, Dr. N. Nithyavathy, Mr. K. Suganeswaran, Mr. S. Arunkumar, "Design and fabrication of remote-controlled sewage cleaning machine", IJETT - Volume-45 Number2 -March -2017, pp. 63-65..
- [13] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756
- [14] Niramoon Ruangpayoongsak, Jakkrit Sumroengrit, Monthian Leanglum, "A Floating Waste Scooper Robot on Water Surface", "17th International Conference on Control, Automation and Systems", October-2017, pp. 1543-1548.
- [15] Prof. H. M Preeti, M.Tech scholar Soumya, research guide and Prof. Baswaraj Gadgay, "Pond Cleaning Robot", "International Research Journal of Engineering and Technology", Volume 5, Issue 10, October 2018, pp. 1136-1139.
- [16] Prof. Khunt Sagar P, "Wireless DC Motor Speed and Directional Control using RF", "International Journal of Novel Research and Development", Volume 2, Issue 4, April-2017, pp. 1-8.
- [17] Prof. N.G. Jogi. "Efficient Lake Garbage Collector by using Pedal Operated Boat", International Journal of Modern Trends in Engineering and Research", Volume 2, Issue 4, April-2016, pp. 327- 340.
- [18] G.Neelakrishnan, M.Kannan, S.Selvaraju, K.Vijayaraj, M.Balaji and D.Kalidass, "Transformer Less Boost DC-DC Converter with Photovoltaic Array", IOSR Journal of Engineering, October 2013; 3(10): 30-36.
- [19] Prof. Ajay Dimal, "Study of River Harvesting and trash cleaning machine", "International Journal of Innovation Research in Science and Engineering", Volume 2, Issue 3, March -2016, pp. 884-894.
- [20] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis' - Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [21] Prof. Kean V. Dhande, "Design and Fabrication of river cleaning system", "International Journal of Modern trends in Engineering and Research", Volume 4, Issue 2, February-2017, pp. 8-18.
- [22] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.