

Solar Powered Unmanned Surface Vehicle for Surveillance

Adimurthy A, Manoj SY, Nisarga GS, Sandeep, Mr.vinod kumar H*
Student¹, Assistant Professor²

*Department of Telecommunication Engineering, Dayananda Sagar College of Engineering,
Bangalore, Karnataka, India*

Email: *nisargachinnu1997@gmail.com

DOI: <https://doi.org/10.6084/m9.figshare.8143280>

Abstract

The unmanned surface vehicle is more popular because of its low cost, flexibility and also it helps to reduce the danger to human beings. In this article we describe measurement of environmental monitoring applications using integrated sensors and also water ph. level, enemy monitoring using wireless camera. Solar panel is used power the model. It can float on the water and can also run on the surface of earth using servo motor. Using ESP8266 node MCU can send the data to cloud.

Keywords: *unmanned surface vehicle, signal jammer, integrated sensors.*

INTRODUCTION

Today, many military organizations take the help of military robots for risky jobs. The robots used in military are usually within integrated systems that include video screens, sensors, grippers, and cameras. Military robots also have different shapes and sizes according to their purposes, and they may be autonomous machines or remote controlled devices. There is a belief that the future of modern warfare will be fought by automated weapon systems. Unmanned surface vehicle (USV) are also called as autonomous surface vehicle (AVS). These vehicles can operate on the surface of the water without any onboard human operator, as well as it can be operate on the surface of the earth. Originally created by retrofitting previously manned craft with radio controls, a wide variety of purpose built unmanned surface vehicle. Nowadays the USV is playing a vital role in surveillance. It offers long term and cost effective solution with more flexible than commercial ships. Due to lack of crew, an unmanned surface vehicle can be manufactured with more number of sensors, such as sonar, imaging systems, weapons payloads, radar, and

environmental sensors [1]. Solar panel is used to power the electronics. Sometimes the seas are very harsh in environment and human beings can't face those situations like flood, tsunami etc. In those situations these unmanned surface vehicles can be used.

Object position detection and localization in robotics is one of the most important of issues in the control of moving robots. When robots' synchronization and aligning is considered, accuracy and speed of the measurement system installed on them is important. In addition, if robots' movement in open space is required, it will be necessary to install a camera on each robot. In this case, power consumption issue will be a challenge. The tracking of moving objects is also beneficial in sensor networks of self powered image sensors for surveillance tasks. If the sensor nodes only detect and transmit moving sections of the image scene, less power will be required and the sensor can be operated using the limited available energy resources such as solar power [2]. In many cases, autonomous systems are the best option to use to supervise and control sensitive

systems. To survey and protect these assets, multiple systems are deployed as aerial drones (UAV), unmanned surface vehicles (USV) and SCADA systems. Maritime navigation has different characteristics and uses different information sources. For example, waves can block camera views and pilots use a compass and radar to compensate this disadvantage. There also exists adapted solutions to control semi-autonomous USV. All considerations for maritime navigation have been taken into account. On the other hand, these systems do not consider different roles and tasks that exist in reality. That is, their focus is on

control software without paying attention to commandment chain [3].

METHODOLOGY

This unmanned surface vehicle contains ARDUINO UNO which controls whole system, ESP8266 node MCU use as Wi-Fi module it will send all the collected data to the cloud, and multiple sensors are used to collect environmental data like temperature, humidity, air pressure. Wireless camera is used to detect the enemy, signal jammer is used here to block all the radio signal around the surveillance boundary, to power up all these modules solar panel is used which consumes low cost.

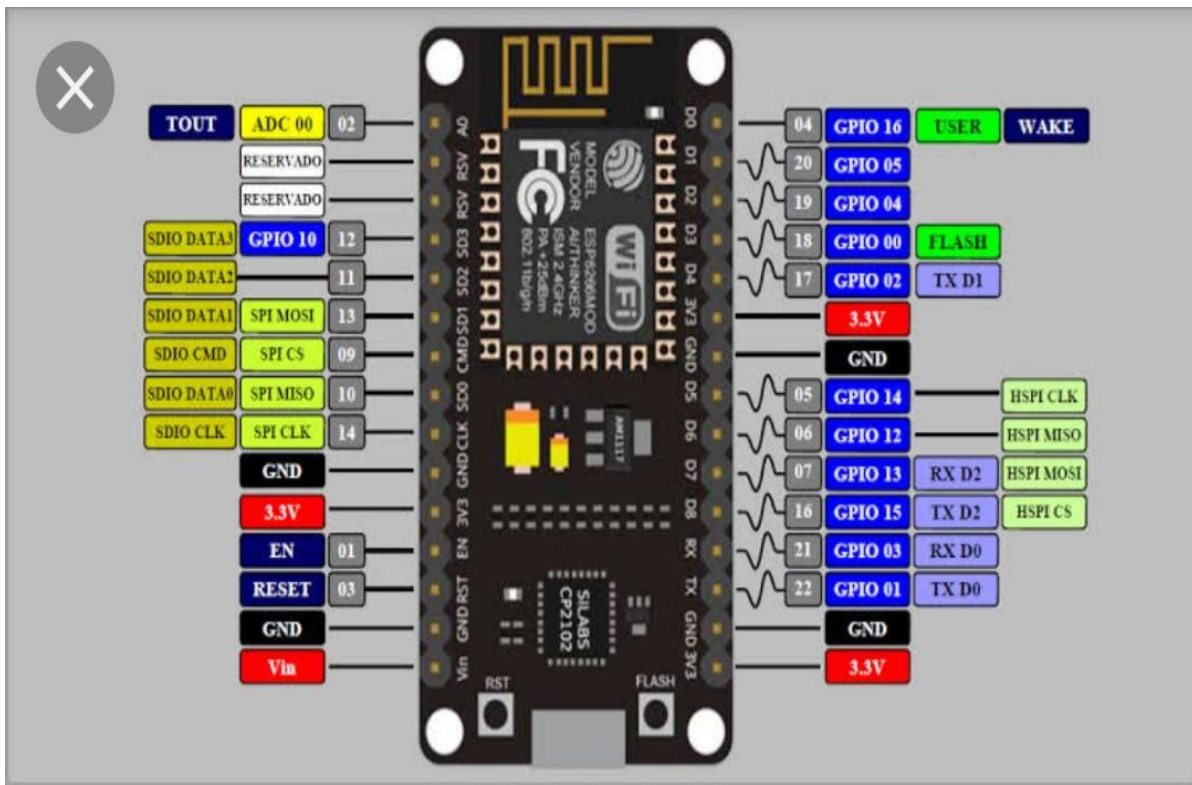


Figure 1: ESP8266

Node MCU is a wifi system on chip. It is based on ESP8266-12E wifi module. It is an highly integrated chip designed to provide internet connection in a small package. It can be programmed directly through USB port using Arduino IDE. Node MCU is the wifi equivalent of ethernet module. It combines the features of wifi access point

and station with microcontroller. These features make the node MCU as powerful tool for wifi networking. It can also be used as access point, host a web server or connect to internet to fetch or upload data. It is low cost wifi module chip. Using this we can also do some stuffs like controlling, monitoring, analysis etc.

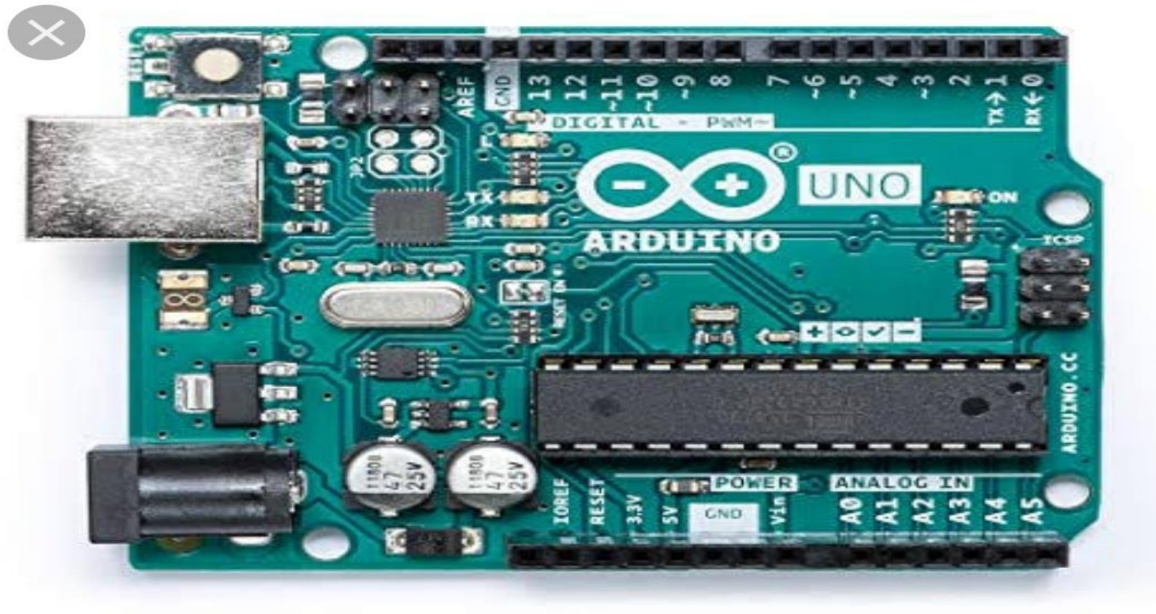


Figure 2: ARDUINO UNO

Arduino Uno is an open source microcontroller board based on the microchip ATmega328p microcontroller and developed by Arduino.cc. this board consists of digital and analog input/output (i/o) pins these can be used for interfacing. The board has 14 Digital pins, 6 Analog

pins, and programmable with the [Arduino IDE](#) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. This arduino Uno microcontroller is used as a central office in our robot which will control all the blocks

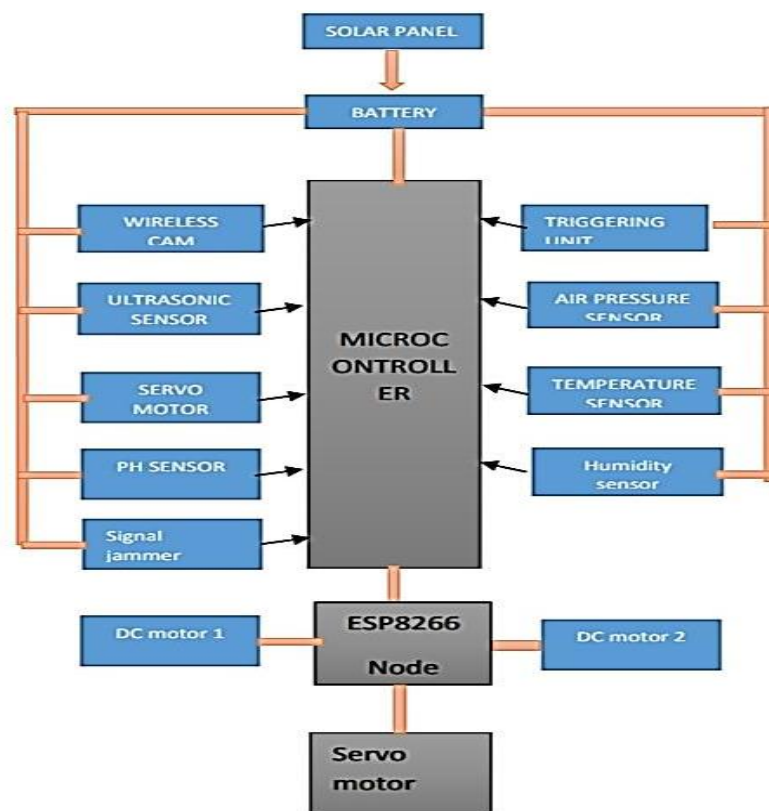


Figure 3: Block Diagram

We are design and implementing the Floating robot for marine with multi applications. And it can also run on surface of the earth. Here RADAR system exist, which is constructed by ultrasonic sensor and servo motor, which will monitor the presence of enemies or unauthorized objects and send the information to server unit.

The wireless camera unit, which will capture the live video and send it to the Wi-Fi module which is made by ESP8266 node MCU.

The remotely controlled Weapon/Triggering unit, which will helpful to destroy the enemies or suspicious things. We have weather monitoring system, which will monitor the environment conditions like Air Pressure, Temperature, Seismic waves. All monitored data will be uploaded into cloud for future analysis using Wi-Fi module and water PH sensor is used, which will use to monitor the lake or river's water PH level. Based on the output of the PH sensor value we can use water for agriculture, industries or drinking purpose.

The whole robot will be powered by solar panel. Robot application are controlled from central station which is made by arduino Uno. Robot wings are made by plastic and dc motor, which will helpful for robot movement.

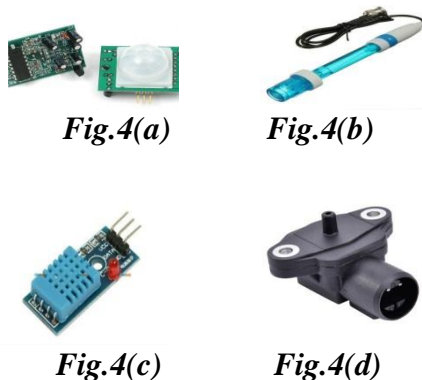


Figure 4: (a) PIR sensor, (b)PH sensor, (c) Temperature and humidity sensor, (d) Air pressure sensor.

PIR (passive infrared) sensor shown in Fig 4(a) is also called as PID (passive infrared detector). This is a motion detector sensor. It is used to sense movement of people, animals which will generate heat. Here we are using this sensor to detect intruder by his body temperature, when a human passes in front of the sensor in certain range the temperature of that body will recognize in the form of infrared radiation, this radiation will covert to the voltage and this triggers the detection, then the light on the PIR sensor will turned ON this indicates that there is an intruder.

PH sensor shown in Fig 4(b) is used to measure the alkalinity and acidity present in the water, this will help to agricultural application as whether this water is useful for agriculture or not, this is just an additional feature of this robot.

Temperature and humidity sensor shown in Fig 4(c) is used to measure the environmental condition like temperature and humidity for surveillance purpose because it is very dangerous to visit some places with fire in that situation we can send the robot with this application is helpful, we can monitor this data by remote places Air pressure sensor shown in the Fig 4(d) is used to detect air pressure for surveillance purpose, all these sensors data will send to the arduino Uno microcontroller which acting as central office in our robot, this information will send to the cloud using which is called as Wi-Fi module ESP8266 node MCU

DRIVER MODU1E

Here we are using 1293D as motor driver IC which can control 2 DC motor with single IC. It will operate with 5V which will not run our DC motor, so we are using power supply with 12V

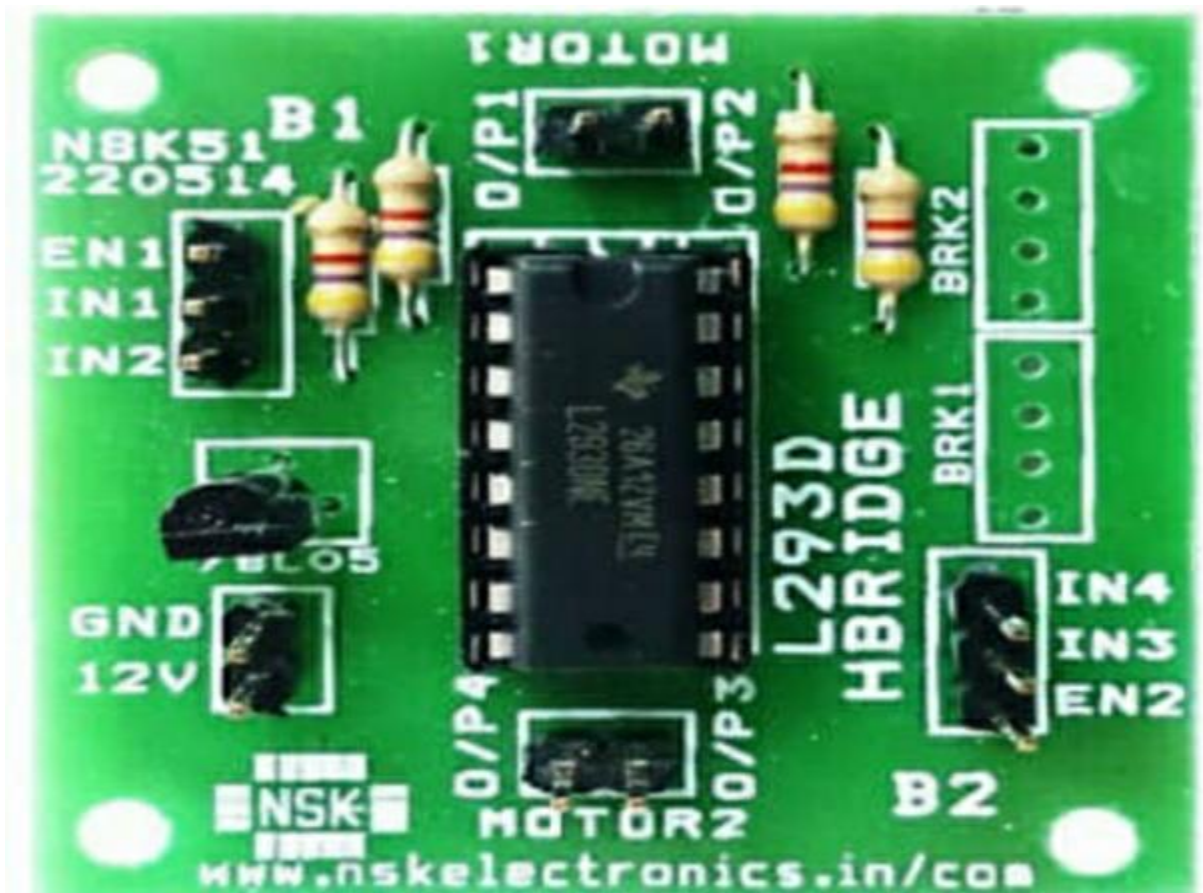


Figure 5: 1293D

In this robot we are also using 1 stepper motors in precise angular direction motor which will help to move DC

JAMMER CIRCUIT

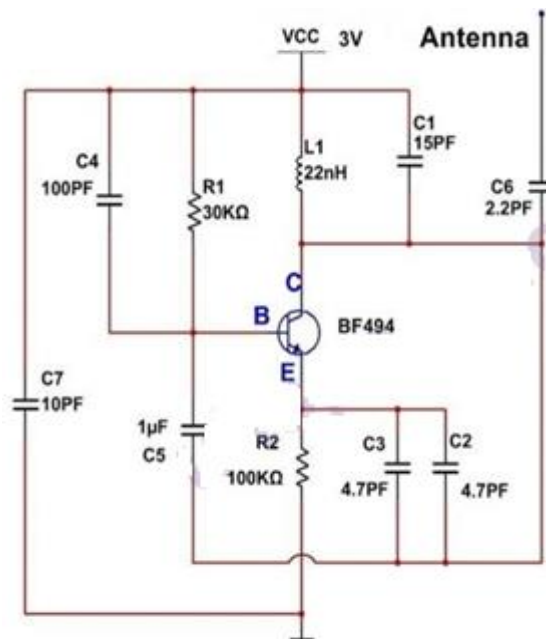


Figure 6: Jammur Circuit.

Signal jammer is a circuit which will help to block all the signals like mobile phone signal, radio signal etc. it will help us to jam or disable all the signals surrounded within the range of the jammer which is built on our robot, this will block all signals from an intruders

APPLICATIONS

- Navy
- lake/river cleaning
- Weather condition monitoring
- Flood affected area for Rescue operation

CONCLUSION

There are no present methods to clean our water source like lake/river etc. therefore implementation of android-based robot for River cleaning robot could be more helpful. It reduces human involvement in the lake cleaning. This method reduces the Health issues related to water. We can use this system for river/lake water cleaning floating waste from river. Which will helpful for maintain the hygiene in water. Which helps to build healthy society. The measurement of environmental conditions and water pH level using integrated sensors, cleaning of water, the detection of enemy using wireless camera is experimentally done successfully.

REFERENCES

1. Ngoc-Huy, Tu-Cuong Nguyen, Vuong-chi Nguyen, "The Design of an VIAM-USV1000 Unmanned Surface Vehicle for Environmental Monitoring Applications" *"International conference on green technology and sustainable development, vol. 4, 2018, pp. 33-37.*
2. Pedro Merino Iaso, David Brosset, Marie-Annick Giraud, "Secured Architecture for Unmanned Surface Vehicle Fleets Management and Control", *IEEE conference on dependable, autonomic and secure comp, vol. 2018, pp. 373-375.*
3. Seyed Maryam Noorbakhsh, Mehdi Habibi, "Design of a low Power Multiple Object Tracking Vision Sensor for Use in Robot localization and Surveillance Tasks", *ICSPIS, Vol. 14-15 dec 2016.*

Cite this article as:

Adimurthy A, Manoj SY, Nisarga GS, Sandeep, Mr.vinod kumar H. (2019). Solar Powered Unmanned Surface Vehicle for Surveillance. Journal of Switching Hub, 4(2), 22-27 <https://doi.org/10.6084/m9.figshare.8143280>