ISSN (Online): 2583-7052

International Journal of Advanced Trends in Engineering and Management (IJATEM)
Vol. 2(09), September 2023, pp. 24-32

Article Title: Boat Tracking, Weather Monitoring and Ocean Cleaning System Based on IoT

Boat Tracking, Weather Monitoring and Ocean Cleaning System Based on IoT

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ABSTRACT

Sea cleaning is challenging these days, so humans invented a method to organically clean the sea or any other bodies of water utilising smart technology with the aid of hub MCU and Internet of Things (IoT) stage. This paper suggests developing a system that uses both a tracking unit and a monitoring unit independently to clear ocean garbage easily, monitor the weather, and detect border crossings. An Arduino Uno (microcontroller) with an ATmega328p chip is used to collect and change sensor data. The IR sensor and DHY11 sensor are the sensors used in the microcontroller. A NEO-6M GPS receiver module and Bluetooth module are used to locate the boat. The Global Positioning System (GPS) location is collected and uploaded to the IoT cloud via a wifi module. The system's microprocessor instructs the buzzer to sound. In order to communicate with the base station, which keeps tabs on the boats at sea, it also uses a message transmitter. The suggested system alerts both the coast guards and fishermen.

Keywords: IOT, IR sensor, GPS, Arduino Uno (microcontroller).

1 Introduction

The ocean is now home to numerous human activities thanks to technology like cloud computing, big data, and mobile internet. The future of humanity depends on the ocean, which makes up 70% of the earth's surface [1]. The maritime environment has been the focus of debate among experts and authorities in the world of constantly changing economies and societies. [2]. The tracking method for fishing boats is different from the GPS tracking system used on land. Because there are no (urban) canyons or trees to disrupt the feeble satellite signals reaching the GPS gadget, GPS tracking system performs well at sea [3]. An application will be created employing internet of things technology to track fishing vessels as they navigate using panic buttons to indicate emergencies, NRF24 modules to transport data from ships to receiving stations, and GPS modules to determine ship position. Sim800 module for data transmission to a web server [4]. The GPS Modem will continuously transmit a signal that will allow the

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anglers to know their location and determine their latitude and longitude [5]. Extreme and unpredictable weather, international maritime border crossings, and boat collisions all occur while fishing in the ocean [6]. The necessity for significant human involvement poses the biggest obstacle to protecting extensive border lengths. Utilising the most recent GPS and IOT monitoring technology, prevent such incidents and warn fisherman about border areas in advance [7]. The service, operational, and management levels make up the three-layer architecture that characterises the IoT concept. The service level included a variety of services, including management services for gateways and boat mobility. They can send GPS signals from boats to the base station and port officer and monitor those signals [8]. IoT is difficult to employ in the water due of communication coverage, power availability, and maintenance. Due to the lack of an effective strategy, lightweight boat communication has become more important [9]. It's important to keep track of ocean acidification for a longer period of time in order to quantify the aforementioned effects and research other biochemical variations in the ocean. [10].

The list that follows outlines the paper's structure: The introduction is described in Section I. Section II describes the most recent works. Part III provides an explanation of the proposed model. Section IV presents the results. The conclusion is provided in Section V.

2 Recent Works

Shihan Kong *et al* [2021] [11] proposed to gather floating plastic waste, an intelligent water surface cleaner system called IWSCR was designed. It can operate independently in three key areas: cruising and detecting, grasping and collection and tracking and steering. The challenges associated with these tasks include figuring out how to achieve accurate and real-time garbage recognition, how to withstand disturbances while IWSCR performs vision-based steering, and how to consistently grip the floating waste despite turbulence on the water's surface. Three crucial strategies are recommended for IWSCR to overcome these challenges. It will be put to the test in more complex field settings that are wider in scope, requiring considerably more stable and reliable procedures for the vision, motion, and grasping modules.

Bing Xue *et al* [2021] [12] described that a powerful deep neural network-based approach for detecting deep-sea debris. Because marine debris is made of some materials that are difficult to decay and because the majority of it will sink to the deep sea and remain there, it has a negative influence on the marine environment and the survival of marine life. However, models can quickly and reliably recognise it because of its unique shape and scale. Deep learning approaches for enhancing the detection of deep-sea debris will be taken into consideration, and based on the findings of this article's research, the issue of undersea debris being mistakenly identified will be further resolved.

Narmatha S *et al* [2020] [13] suggested an Many people nowadays suffer as a result of crossing the maritime boundary, so this method was created to prevent that. If the border crossing location will notify the ship's owner. This kind of procedure aids in minimising human

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casualties. These operations are all carried out using PIC microcontrollers. The power supply unit provides the device with a 5V operating voltage. The oscillator, which uses a 4MHZ crystal oscillator in this case, is the heart of the microcontroller.

Niveda, S *et al* [2021] [14] discussed the majority of people who live close to the seaside work in the fishing industry. Fishermen must catch more fish in order to meet their daily needs. Fishermen relocate to new locations to catch more fish after they get dissatisfied at one location. On occasion, they cross the boundary unknowingly. As a result, the navy of the other nation captures him and imprisons him. This occurs because the fisherman are not aware of their surroundings' boundaries. A strategy was proposed to raise awareness among the fisherman. This technology will serve as a backup source for preventing incidents of this nature and warning fisherman about boundary regions.

Jiucai Jin *et al* [2020] [15] suggested a Vision-Based Target Tracking for Unmanned Surface Vehicle Considering Its Motion Features. This approach provides a target tracking algorithm for the USV's vision that takes into account the USV's motion characteristics, such as pitch, velocity and heading. First off, a technique for target recognition known as CM (Centroid Matching) is based on the FT (Frequency-Tuned) saliency method, which has the potential to filter out external disruptions. Second, by using USV motion data from the onboard GPS and IMU, target tracking for an fDSST (fast Discriminative Scale Space Tracker) is improved. Here, the learning rates of the correlation filters are adaptively adjusted in accordance with a variety of the USV's pitch, velocity and heading.

3 Proposed System

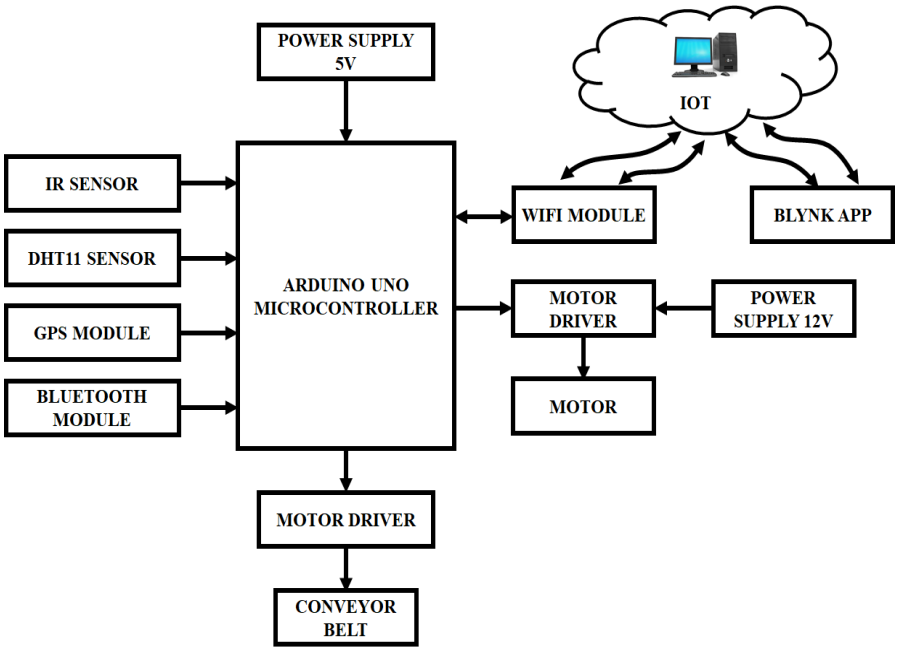

Figure 1: *The proposed system's block diagram*

ISSN (Online): 2583-7052

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3.1 Arduino Microcontroller

Arduino is a basic hardware and software platform for electronics that is open source. A microcontroller board based on the ATmega328 is used. It has 6 analogue inputs, a 16 MHz ceramic resonator, 14 digital input/output pins, an ICSP header, a USB connector, a reset button and a power jack. It contains everything needed to support the microcontroller; all you need to do to start using it is connect a USB cable, an AC-to-DC adapter, or a battery.

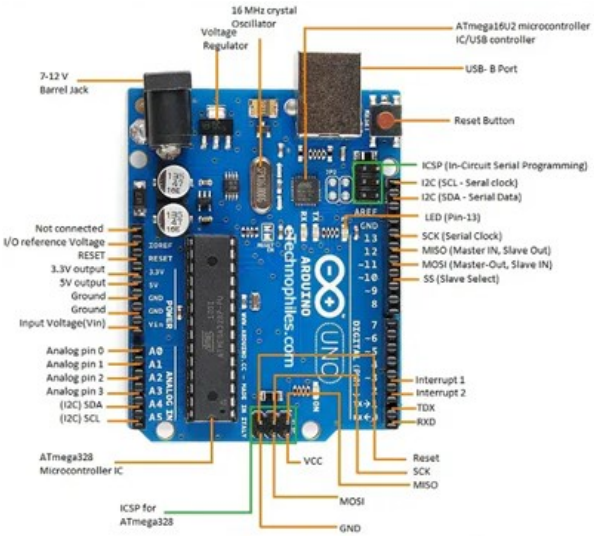

Figure 2: *Arduino Microcontroller*

3.2 IR Sensor

Figure 3: *IR Sensor*

An IR sensor is a type of electronic sensor that emits light to identify objects around it. An IR sensor can detect movement as well as track the heat of an object. Most objects release some form of thermal radiation in the infrared spectrum. Infrared sensors can identify these radiations even if they are undetectable to the human eye. A photodiode may be able to detect infrared

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light with the same wavelength as an IR LED generates. When IR light reaches a photodiode, the resistances and output voltages change in direct proportion to the intensity of the IR light.

3.3 DHT11 Sensor

Digital humidity and temperature sensors, such the DHT11, are reasonably priced. The DHT11 temperature and humidity sensor is available as a sensor and module. This sensor and module differ out from others owing to the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To monitor the ambient air, this sensor uses a thermistor and a capacitive humidity sensor.

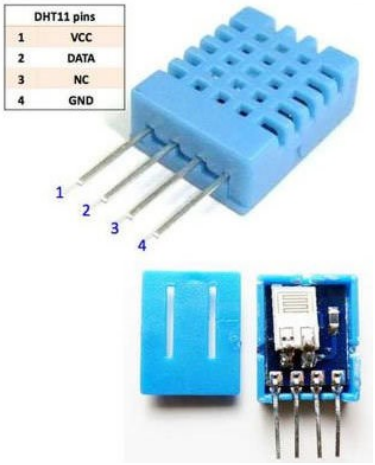

Figure 4: *DHT11 Sensor*

The two electrodes of the humidity-detecting capacitor are separated by a substrate that can act as a dielectric for moisture. This sensor measures temperature using a thermistor with a negative temperature coefficient, which causes the resistance value to decrease as temperature increases. For this sensor to have higher resistance values even for the smallest temperature change, semiconductor ceramics or polymers are often used in its construction.

3.4 GPS Module

Figure 5: *GPS Module*

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A global positioning system that is used for navigation and object and location detection normally operates on the basic principle of radio wave exchange between ground stations, satellites, and receivers. According to the trilateral mechanism, a device or object must be inside the coverage area of at least four satellites in order to estimate its accurate location. The precision of the data processed by the GPS directly relates to the number of satellites that send and receive data to and from the item. This means that the accuracy of estimating the location of the device improves proportionally as the number of satellites that can communicate with the device increases. Both two-dimensional and three-dimensional images allow for the verification of the trilateration technique. Longitudes and latitudes are used in the two-dimensional trilateration technique to pinpoint a specific location. A three-dimensional trilateration system, on the other hand, uses values for longitudes, latitudes, and height.

3.5 Blynk App

The Internet of Things (IoT) platform Blynk allows Android and iOS mobile devices to control Arduino, Raspberry Pi, and NodeMCU. With the use of this application, a graphical user interface (GUI) or human machine interface (HMI) can be created by compiling and providing the correct address on the widgets that are readily available. Using the Blynk library, it is possible to directly control Arduino or ESP32 pins from a user phone without writing any code.

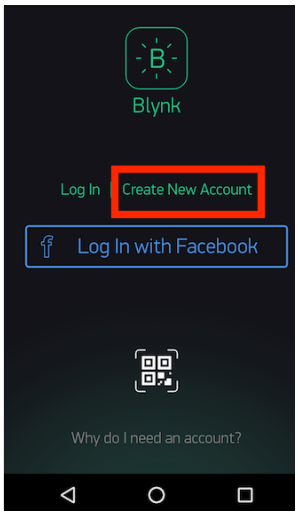

Figure 6: *Blynk App*

4 Result and Discussion

This section discusses the simulation findings from the proposed work. Figure 7 depicts the hardware set up. Using the Blynk App, DC motors for buoy forward/reverse movement, including left and right direction movement, were programmed and simulated. As the cloud-based mobile Blynk application shows the IoT result. For the purpose of trash identification and measuring the distance of the trash from a boat on the water, passive IR sensors and

ultrasonic sensors are simulated. The Ardinuo microcontroller gathers the sensor data and sends it to the cloud via ThingSpeak (IoT Platform).

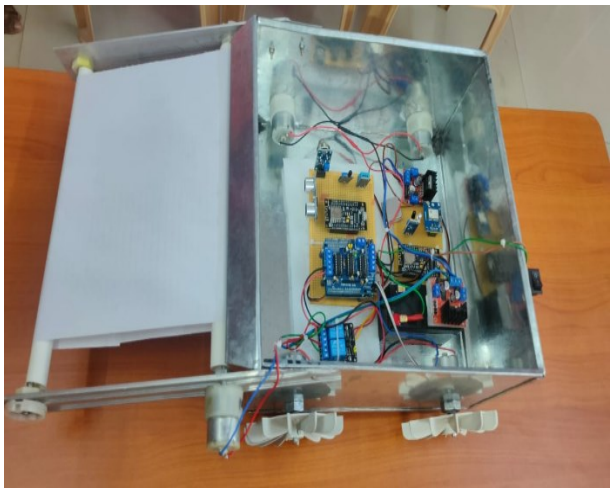

Figure 7: *Hardware setup*

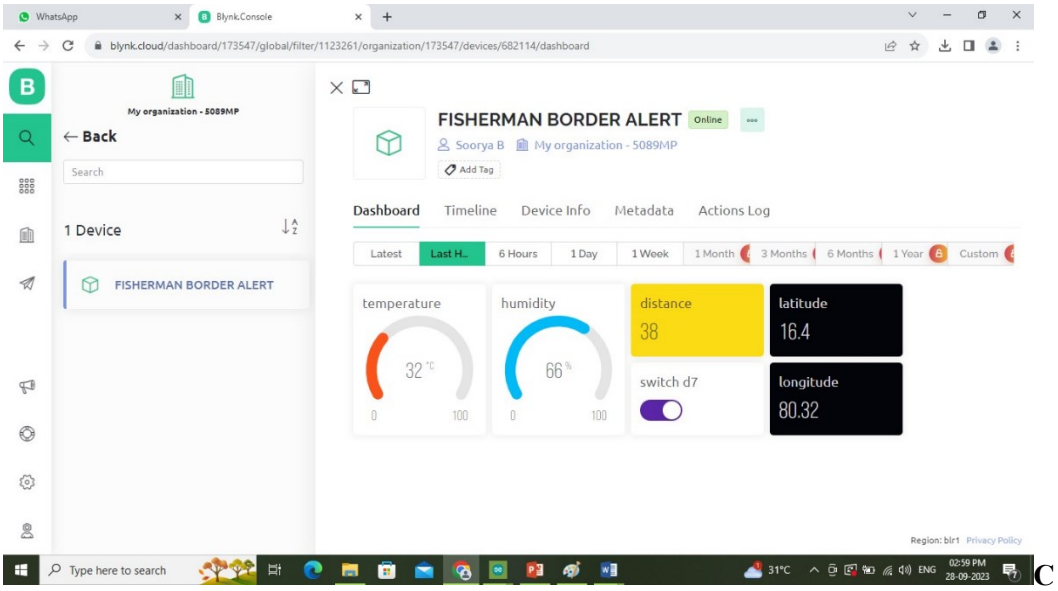

Figure 8: *IoT Output*

5 Conclusion

In this paper, a border warning system, weather monitoring, and ocean garbage cleanup system are created using distinct tracking and monitoring units. In this article, the IR and DHT11 sensors are employed. The IR sensor determines if an object is nearby or not, while the DHT11 sensor measures temperature and relative humidity. The location of the boat is determined by the NEO-6M GPS receiver module, and the boat is operated by the Bluetooth module. The conveyor system removes waste from the water, which ranges in size from very small to very

huge. The GPS location is collected and uploaded to the IoT cloud using a Wi-Fi module. The system's microprocessor instructs the buzzer to sound. In order to communicate with the base station, which keeps tabs on the boats at sea, it also uses a message transmitter.

References

1. Jiachen Yang; Jiabao Wen; Yanhui Wang; Bin Jiang; Huihui Wang; Houbing Song, Year: 2020, "Fog-Based Marine Environmental Information Monitoring Toward Ocean of Things", in IEEE Internet of Things Journal, Vol: 7, no: 5, pp. 4238 – 4247.

2. Dinh Tung Vo; Xuan Phuong Nguyen; Thai Duong Nguyen; Rahmat Hidayat; Thanh Tung Huynh; Dinh Tuyen Nguyen, Year: 2021, "A review on the internet of thing (IoT) technologies in controlling ocean environment", Energy sources, Part A: Recovery, utilization, and environmental effects, pp. 1 – 19.

3. Homera Durani; Nirav Bhatt; Hardik Mehta; T. Dist-Rajkot, Year: 2014, "RFID and GPS combination approach implementation in fisher boat tracking system", International Journal of Computer Science and Information Technologies, Vol: 5, no: 2, pp. 1836 – 1838.

4. Arief Budiman; Taryana Suryana, Year: 2019, "Fishing Boat Safety Monitoring System Based Internet of Things",

5. Uthayakumar Jothilingam; Liston Deva Glindis, Year: 2018, "IoT based border alert and secured system for fisherman", International Journal of Trend in Scientific Research and Development, Vol: 3, no: 1, pp. 700 – 706.

6. Gnana Yashaswini Sriram; M. R. Jivtesh; M. R. Gaushik; N. B. Sai Shibu; Sethuraman Rao, Year: 2022, "August. MarineServe: An IoT-based AI-enabled Multi-Purpose Real-time Alerting System for Fishing Boats", In Proceedings of the 2022 Fourteenth International Conference on Contemporary Computing, pp. 591 – 596.

7. V. Arul Murugan, G. Jeevitha, M. Jothikrishnan, S. Nandha Kumar; S. Pooja, Year: 2020, "Fisherman Detecting System Using IOT", International Research Journal on advance science hub, Vol: 2, no: 04.

8. Diaz Saputra; Ford Lumban Gaol; Edi Abdurachman; Dana Indra Sensuse; Tokuro Matsuo, Year: 2023, "Architectural Model and Modified Long Range Wide Area Network (LoRaWAN) for Boat Traffic Monitoring and Transport Detection Systems in Shallow Waters", Emerging Science Journal, Vol: 7, no: 4, pp. 1188 – 1205.

9. A. M. H. M. Alweera; H. W. M. V. A. Wijesinghe; R. M. S. Chandrasiri; W. A. D. S. De Silva; I. Gamage; T. Thilakarathna, Year: 2022, "Location Tracking, Messaging, and Monitoring System for

Lightweight Boats Using LoRa Technology 'Safe Ride'", International Journal of Engineering and Management Research, Vol: 12, no: 6, pp. 62 – 68.

10. K. V. Gopika; Nitin Kumar; Maneesha Vinodini Ramesh, Year: 2022, "IoT based Ocean Acidification monitoring system with ML based Edge Analytics", 2022 4th International Conference on Inventive Research in Computing Applications (ICIRCA), Coimbatore, India, 2022, pp. 345 – 353.

11. Shihan Kong; Manjun Tian; Changlin Qiu; Zhengxing Wu; Junzhi Yu, Year: 2021, "IWSCR: An Intelligent Water Surface Cleaner Robot for Collecting Floating Garbage", in IEEE Transactions on Systems, Man, and Cybernetics: Systems, Vol: 51, no: 10, pp. 6358 – 6368.

12. Bing Xue; Baoxiang Huang; Weibo Wei; Ge Chen; Haitao Li; Nan Zhao; Hongfeng Zhang, Year: 2021, "An Efficient Deep-Sea Debris Detection Method Using Deep Neural Networks", in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Vol: 14, pp. 12348 – 12360.

13. S. Narmatha, D. Roopasri, S. Vinitha, S. Vijayakumar, Year: 2020, "Border Alert System and Emergency Contact for Fisherman using RSSI", International Research Journal of Engineering and Technology (IRJET), Vol: 7, no: 1, pp. 394 – 395.

14. S. Niveda, Year: 2021, "Implementation of Boundary Alert system for Fishermen. Turkish Journal of Computer and Mathematics Education (TURCOMAT), Vol: 12, no: 9, pp. 991 – 995.

15. Jiucai Jin; Jie Zhang; Deqing Liu; Junnan Shi; Dong Wang; Fangxu Li, Year: 2020, "Vision-Based Target Tracking for Unmanned Surface Vehicle Considering Its Motion Features", in IEEE Access, Vol: 8, pp. 132655 – 132664.