Chapter

Tackling of Illegal Fishing in Shallow Waters

Arun Raj Velraj

Abstract

Illegal fishing is one of the most prevailing problems across the oceans of the world. It causes both material loss and the loss of marine richness. There are many organizations that are concerned about this issue all around the world. All these organizations go for very complicated and costly solutions, such as satellite monitoring and image processing of the ships that involved in the illegal fishing activities all over the world. Here, we have gone for a simple as well as an effective solution in which we will detect the operation of the motors by attaching a live sensor to it, thereby continues monitoring of the boat becomes possible for the officials to monitor the boats throughout the day without involving complicated approaches that are costlier than this approach. This project not only involves monitoring systems, whereas there is also a provision to prevent the boat from involving in illegal activities. I have used for wireless speed control of the motor which is a very approach to prevent the boats from involving in illegal fishing. This can save the marine animals from extension or endangerment by many folds in total.

Keywords: remote monitoring, unregulated angling, speed control and alert systems

1. Introduction

The fishery is a run of the mill case [1] of a typical property asset, and along these lines experiences the normal property issue. Individual anglers have motivations to gather more than what is socially ideal, since they do not consider the stock externality of reaping. To manage overfishing [2] and overcapacity, the administration experts have presented guidelines, including rigging and exertion limitations, territory confinements [3], landing charges, reap quantities, least sizes, by-get guidelines, and so on.

Fishery guidelines [4] are not, by and large, self-upholding. Neither other anglers nor the group of other oceanic vessels educate the specialists of encroachments they witness. This implies implementation costs must be brought about. As the expense of authorization increments with the dimension of prevention, it probably will not be ideal to have full consistence as the target. This is talked about in more prominent detail in consequent segments. The issue of rebelliousness with guidelines emerges on the grounds that the presentation of principles and guidelines in the fishery does not consequently imply that the specialists' motivating forces to disregard guidelines are evacuated, despite the fact that the anglers' motivators absolutely can be changed.

With global warming being the center of the marine ecosystem, in addition to this, illegal fishing also adds to the marine ecosystem's destruction on a whole. The type of illegal fishing [5] that is being addressed in this project involves

fishing the oceans during the breeding seasons of the year. This has many adverse effects on the marine as well as the earth's ecosystem as a whole. This act reduces the amount of fish that is being regulated inside the oceans [6] as a whole leading to a collapse in the prey predator ratio, which is a very important aspect since the disturbance in this ratio can adversely affect the marine ecosystem [7] as well as the earth's ecosystem as a whole. This phenomenon is clearly being monitored and prevented in three distinct and independent modules operating as a single device.

2. Proposed method

The approach we used to detect the movement of the ships was to fix a vibrational sensor to the motor that is present in the boats that go into the ocean to fish. We went for fixing the vibrational sensors in the boat's motor because it is one of the most common things that is present in all the boats. As far as the Indian fishing boats are concerned, 99% of these boats are propelled by motors that are powered by a diesel engine [8]. The motors are prone to produce vibrations of their own in addition to the vibrations [9] that are produced by the boats when it is operational. But in the current scenario, boats comes with pre-determined vibrational arresters and hence we come with a novel approach of tackling illegal angling through the block diagram shown in **Figure 1**.

As mentioned in **Figure 1**, the proposed approach is categorized into three modules:

1. First module involves with detection of movement of boats by interfacing the ADXL345 (Accelerometer sensor) with the Arduino Uno board. This module gives the analog value of sensor when the boat moves in the water.

2. Second module involves with the updating the analog values into the RPi Server through node MCU (Wi-Fi module) in the form of tables. The values are updated with the time at which the value is detected in the database. These values are compared with the pre-defined values. Here, the pre-defined values include the prohibited times that is approved by government to prevent the fisherman from fishing during breeding times in order to protect the marine ecosystem.

3. Third module involves with the speed control [10] of the motor. This is achieved by controlling the motor wirelessly by sending the signal to Arduino Uno through node MCU (Wi-Fi module). The speed of the motor is varied by changing the

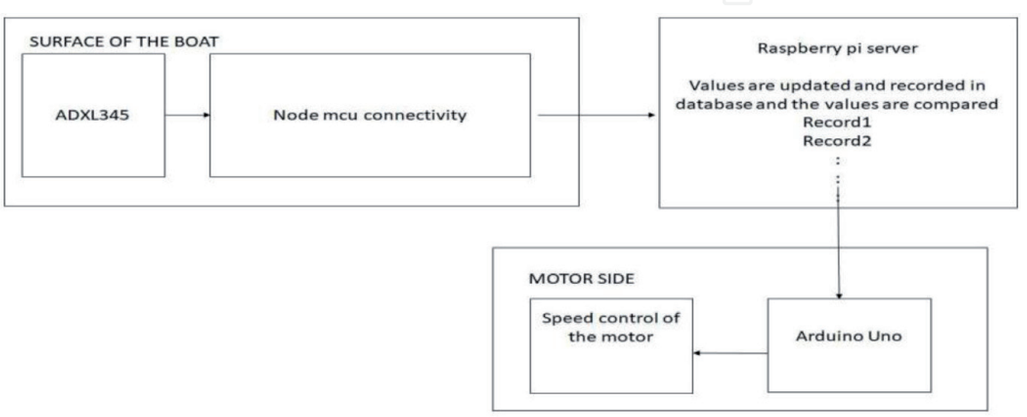

Figure 1.
Overall model of the proposed work.

firing angle. By increasing the firing angle, the speed of the motor can be increased; and by decreasing the firing angle, the speed of the motor is decreased.

3. Results and discussions

The proposed method is preceded with the above-mentioned working process and the findings are discussed here.

The entire setup of the project that is involved in controlling the speed of the motor is shown in **Figure 2**. The sensor AD XL345 is interfaced with Arduino and it is used for the calculation of movement of boats. The output is generated by the movement of ship. The output is generated when the ADXl345 is moved, and results are displayed in serial monitor, as shown in **Figure 3**.

Figure 2.
Setup of the project.

COM25 (Arduino/Genuino Uno)

x = 320	y = 321	z = 321	Roll = 19.47	Pitch = 69.33
x = 320	y = 321	z = 320	Roll = 19.10	Pitch = 69.72
x = 318	y = 320	z = 319	Roll = 19.77	Pitch = 68.08
x = 318	y = 320	z = 319	Roll = 19.77	Pitch = 68.08
x = 318	y = 320	z = 319	Roll = 19.77	Pitch = 68.08
x = 319	y = 320	z = 320	Roll = 20.14	Pitch = 68.69
x = 319	y = 320	z = 320	Roll = 20.14	Pitch = 68.69
x = 318	y = 320	z = 319	Roll = 19.77	Pitch = 68.08
x = 318	y = 319	z = 318	Roll = 20.41	Pitch = 68.47
x = 318	y = 319	z = 319	Roll = 20.78	Pitch = 68.08
x = 74	y = 18	z = 0	Roll = 40.88	Pitch = 54.34
x = 234	y = 347	z = 283	Roll = 354.04	Pitch = 39.42
x = 297	y = 319	z = 309	Roll = 17.52	Pitch = 55.48
x = 315	y = 321	z = 318	Roll = 18.39	Pitch = 65.59
x = 320	y = 323	z = 321	Roll = 17.31	Pitch = 69.33
x = 321	y = 323	z = 322	Roll = 17.66	Pitch = 70.00
x = 318	y = 320	z = 319	Roll = 19.77	Pitch = 68.08

Figure 3.
Output of ADXL345.

Firing angle (%)	Speed of motor (RPM)	Status of motor
0.4	10	OFF
25	400	ON
45	700	ON
75	1000	ON

Table 1.
Variation of motor speed based on firing angle.

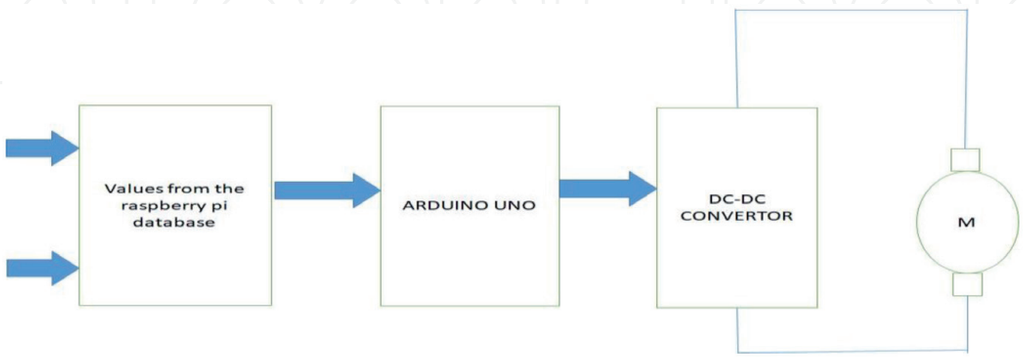

Figure 4.
Speed control of a motor.

The values from the ADXL345 are updated through the raspberry pi through MYSQL language. The values are stored in the form of tables with the ANALOG value of sensor and the time at which the boat enter into the sea. The obtained results are compared with the pre-defined data stored in the database and a trigger pulse is given to the motor to control the firing angle as shown in **Table 1**.

The speed of the motor is controlled by the PWM technique [11, 12]. This is done by varying the firing angle. The beacon signal produced is of 5 V which is not sufficient to control the 115 V motor and thus the signal is given to the DC-DC, which boosts the produced signal to control the 115 V DC motor, as described in **Figure 4**.

The motor is varied wirelessly to tackle illegal fishing activity. The motor speed is varied by adjusting the firing angle of the PWM signal. This will then freeze the motor of the boat and prevent the fisherman in entering into the sea.

4. Conclusion and future scope

This approach helps in the prevention and tackling of illegal fishing activities of fishermen in the water surfaces. The first phase of the project involves in the prevention of the illegal fishing, and the other phase involve in the tackling of illegal fishing. The proposed idea is very efficient and it is applicable for every boat in fishing. This is very cheap and cost effective. Another main advantage of the project is that the boats are prevented from involving in the illegal activities at a very close distance of 50–60 m from the coastal region. This will reduce the risk of illegal fishing as well as the boats will be easily detected. The stopped boats can also be retrieved from the ocean because the boats have been topped from the ocean at an accessible distance from the seashore. This approach can be further extended by attaching a solar panel to the module to replace the batteries and tampering mechanisms can be included.

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