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# OCEAN GUARD: ADVANCED TECHNOLOGY FOR DEEP-SEA FISHERMEN MONITORING AND MARITIME SAFETY

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***Abstract:*** The development of an Android application designed to monitor fishermen via satellite using a Geographic Information System (GIS). To develop the application, we did thorough research on GIS, including the functionalities, advantages and disadvantages of different GIS controls. We also researched existing software with a similar Fisherman Monitoring System. After the research, we selected the best GIS that met the company's criteria. The chosen GIS had an accessible API, did not require a license, allowed editing of the map, was developed in WPF and supported shapefiles and WMS. We then implemented the code and carried out tests to ensure that the application met all the criteria. In conclusion, the application meets all the company's requirements. After receiving feedback from the company and colleagues, we can confirm that the Application Programming Interface (API) of the application is accessible as intended.

***Keywords:*** Fisherman monitoring system, Satellite monitoring, Geographic Information System, Web Map Service, Application development.

## I. INTRODUCTION

Geographic Information System (GIS) is a computer-based tool that is designed to help process, store, manipulate, analyze, and display data related to positions on the surface of the Earth. The primary objective of GIS is to collect, organize, and interpret geographic data in a way that is useful to individuals in various fields, such as urban planning, environmental management, and emergency response.

GIS can be used to locate geographical information on a map, which can be represented using maps with a coordinate system or shapes (polygons) of the geographic information. These maps can be presented in cartographic, graphic, or report formats. GIS has the ability to create new information from existing data and represent maps as several different layers, each holding data about a particular kind of feature. This means that GIS can be used to display a wide range of information, from physical features such as rivers and mountains to demographic data such as population density and income levels.

GIS is a powerful tool because it can relate different information into a spatial context and reach a conclusion about this spatial relationship that cannot be seen when the information is looked at independently. GIS can be utilized to decide where an person highlight is found and to assist discover designs by looking at the conveyance of covered features on the outline, rather than fair a set of person not connected together.

If the purpose of the application is to monitor fishermen via satellite, this type of system is called a Fisherman Monitoring System (FMS), which is a form of satellite tracking using transmitters on board fishing boats. A basic FMS consists of a Global Positioning System (GPS) receiver that plots the position of the boat coupled with a communications device that reports the position.

In collaboration with the company XSealence - Sea Technologies, an Android application will be developed to monitor fishermen via satellite. This application will be a Fisherman Monitoring System (FMS) and will use a GPS receiver to plot the position of the boat and a communications device to report the position. The Android application will provide a user-friendly interface for monitoring the location of the fishermen and will be presented in detail later.

## II.MOTIVATION

FMS's objective is to screen and track fishermans through partisan with the utilize of GPS. Due to the ease of GPS being coordinates into the angler administration framework, got to be simpler for fishermans to depend on the exactness of it and its viability gets to be indeed more solid once the GPS does not endure the impact of any climate condition. This venture will be bolstered by the company XSealence - Ocean Innovations, which points to have total restrictive command, control and observing arrangements for marine applications, both respectful and military. These arrangements incorporate farther checking units that communicate with central and farther command and control centers (on board ships and/or airplanes), utilizing earthly and fawning versatile communications. The utilitarian goals of the ultimate venture will be the representation of the positions of the fishermans and alter those information, to be able to back shapefiles and WMS layers.

## III. LITERATURE SURVEY

Abubakar Shameez etal.( 2022) proffered a system that uses Global Positioning System( GPS), Global system for movable message( GSM), and TV exhibits to track the position of fishing crafts. The system divides the ocean into four necks, and if a boat reaches the final belt near the rim, the machine will make off. This system helps fishers identify public ocean boundaries, but the TV light may not work in all crafts. The system obtains current latitude and longitude valuations utilizing a microcontroller unit. However, an alarm will turn on and the boat's machine celerity will drop by 55, If a boat enters the rim line of another country. However, the boat will enter the defined belt, If the fisher doesn't take any action and moves farther. The alarm will remain to ring, and once it reaches the defined belt, the boat's machine will make off, which may beget cost cases or mechanical effects in the energy tank and to the manufacturer while intending.

Jaganath K etal.( 2021) exercised GPS, GSM, and buzzers to design a position shamus for fishing boats. However, an alarm is indicated by the buzzer, if a boat crosses the rim. The fisher can identify transnational boundaries and help capturing of other littoral rim units. The VMSS (Virtual agent Monitoring and Screen System) is a agent shadowing system that uses GPS for screen operations.

Jayasundere. N D etal.( 2021) represents a localization system that tracks the localization and celerity of the motive of interest seasoned with GPS and GSM bias. The proprietor can get the current position of the agent at any time and descry unauthorized motion.

Yi- Hsuan Yeh etal.( 2023) proffered another system of shadowing the position utilizing GPS, dynamic threshold, and SMS. This system is extensively exercised, but the perpetration of Android makes it need internet to track the position, indeed though the position alone is grassed utilizing SMS. Border discovery is insolvable utilizing this system.

Micheal Drieberg etal.( 2021) developed a agent shadowing system's tackle prototype utilizing Arduino microcontrollers. The result isn't accurate for long distances in the ocean.

P Dhivyabharathi etal.( 2022) also swelled utilizing Arduino. The rim discovery and alert system is more bettered utilizing android phones. still, the main case is the operation of internet, and no fisher takes android movable phones to ocean due to ignorance in utilizing them.

Friedrich Samuel etal.( 2020) directed a network that contains ZigBee transmitter/ receiver, which connects the boat and the controller space. ZigBee protocol is exercised to transmit data to the control space, and GPS helps fishers detect the position coordinates and rainfall conditions. still, the relief of Zigbee- biddable jiggers can be expensive.

J Charles Finny Joseph etal.( 2020) exercised an android operation that proposes the position of the boat to the rim screen man powers. still, it'll only indicate when it crosses the rim, scoring only 40 of the result.

Kishore KumarReddy.N.G etal.( 2020) dissociate the area into three necks, and the boat is allowed in the security zone. However, a buzzer alarm will ring, and if it reaches the peril belt, If the boat reaches the moderate zone. However, the machine gets stopped automatically, and the control of the boat goes to the control space, if he fails. The boat will be released only after examination by the seacoast guard or after exigency help is given away. The nonidentical ranges are linked utilizing entered Signal Strength Indicator (RSSI). still, it's impracticable in enclosed surroundings as it requires an unstopped line of presence between the device and combination satellites.

## IV.EXISTING SYSTEM

In this method, a GPS tracking system is used to track the position of a boat. The speed of the boat motor can be controlled in case of an emergency, and an alert message is sent to the fisherman. This system is advantageous because it enables mariners to navigate, measure speed, and determine location with the fastest and most accurate method available, while also increasing safety and efficiency. However, a disadvantage of this system is that the border alert is only sent to the fisherman and not to the control station. The application will notify the location of the devices, and compare the current value with predefined values. If these

values are the same, the microcontroller will instruct the alarm to sound. The system also uses a message transmitter to send a message to the base station, which monitors the boats in the sea. This system provides an indication to both the fisherman and the coastal guard.

## V. PROPOSED SYSTEM

We have created an Android computer program that empowers anglers to enlist their information. Our proposed framework addresses the issue of "Anglers Following their area within the ocean" by partitioning the ocean zone into three zones: secure, middle, and peril. This framework gives communication with clients such as fishermen's families and control centers.

Our mobile application could be a chief asset for angling devotees, whether they are novices or experts. Angling with our versatile application gives the extreme combination of devices to upgrade the angling involvement and grow the association to the world of fishing. With our versatile application, anybody can log on from anyplace within the world for viable angling.

Our versatile application gives important calculating devices such as progressed climate detailing, counting radar maps, figures, and occurrence announcing, GPS progressed following, and catches potential angling zones, among others. This special versatile application is supportive for anglers since it bunches all the basic characteristics into one, sparing important space on versatile phones.

## VI. SYSTEM ARCHITECTURE

The following Fig 1.1 provides an overview of Geographic Information System (GIS), including its definition, architecture, controls, and functionalities. Additionally, it discusses the advantages and disadvantages of each GIS. The Fig 1.1 also presents research on Global Positioning System (GPS), which includes its definition, components, functionalities, and architecture.

Furthermore, the Fig 1.1 provides a detailed description of shape files and their functionalities. It explains how to read such files and provides a technical explanation of each file required to obtain the final file. The Fig 1.1 also covers the architecture of shape files and provides a clear explanation of how they work.


*Fig.1 System architecture*

The above Fig.1 shows the system architecture of Ocean Guard App

## VII. MODULES

### 7.1 TRACKING MODULE

One of the main features of the app is the ability to track the departures and arrivals of fishing boats. Authorized personnel can use the mobile app to submit departure entries, which provide crucial details about their voyages into the sea. The system captures essential information, such as the departure time, destination, passenger count, and boat identification, for each voyage.

Similarly, upon returning from their fishing trips, the authorized person must submit an arrival entry for the corresponding departure entry made when leaving the port. This comprehensive tracking system allows for a more efficient and accurate overview of fishing boat activities.

### 7.2 ACTIVITIES MODULE

The app includes a dedicated activity history section, which lets users access their previous submissions and fishing activity records. Fishermen can easily view information about their activities, the originating port, fishing activities, and when they returned. This feature is very useful, as it allows fishermen to track their travel patterns and make informed decisions for future expeditions and for the benefit of their communities.

### 7.3 MODEL TRAINING

In this module, we first define the YOLO architecture. After that, we train the model by using preprocessed video data. During the training process, we optimize the model's parameters to minimize a suitable loss function such as binary cross-entropy. We use techniques like stochastic gradient descent (SGD) or adaptive optimization algorithms like Adam to iteratively update the model's parameters. It's essential to split the data into training and validation sets to monitor the model's performance and avoid overfitting.

### 7.4 CHECK-IN LOGIN MODULE

The Officer App is a game-changer for any third persons, officers, and security personnel. This companion app allows officers to search and verify details and history with ease. By simply viewing the map, officers can access current and previous departure and arrival records for specific fishermen. This real-time and easily accessible information equips officers with the tools they need to ensure security and enforce regulations effectively.

### 7.5 WEATHER MODULE

The model analyzes weather patterns and detects high-risk events using learned representations and predictions. Alerts or actions can be triggered based on set thresholds.

## VIII. RESULTS AND DISCUSSION


*Fig.2 Home Page and Login Page*

The above Fig.2 shows the Home Page and Login Page. User can enter their mail and password to create an account.

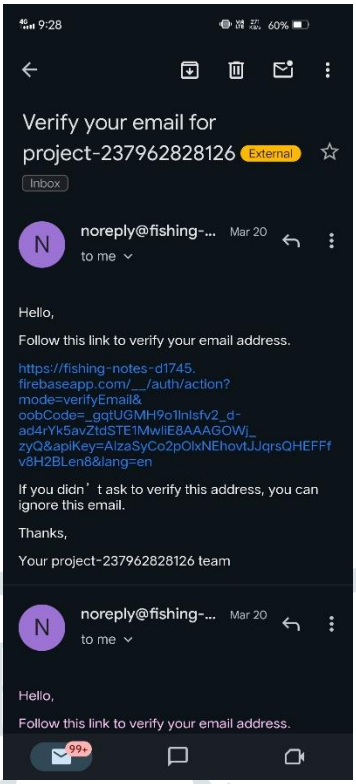


*Fig.3 E-Mail Verification Page*

The above Fig.3 shows the e-mail verification page. User should verify their account for Login.

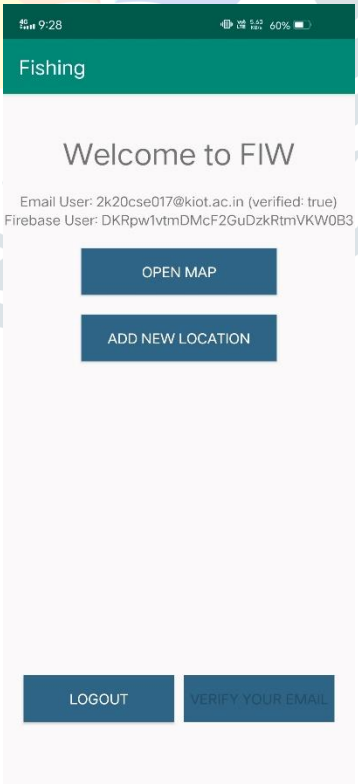


*Fig.4 User Dashboard*

The above Fig.4 shows the User Dashboard Page. User can use Open Map Button for Tracking Fishermen.

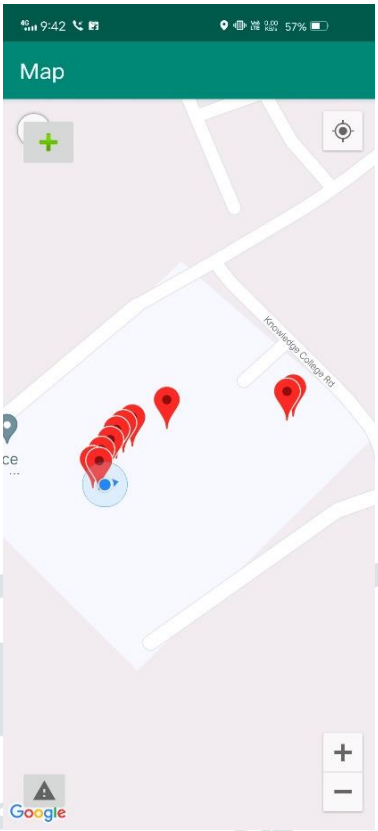


*Fig.5 Fisherman Tracking Page*

The above Fig.5 shows the fishermen tracking page. Live Fishermen Route will be shown in the Map

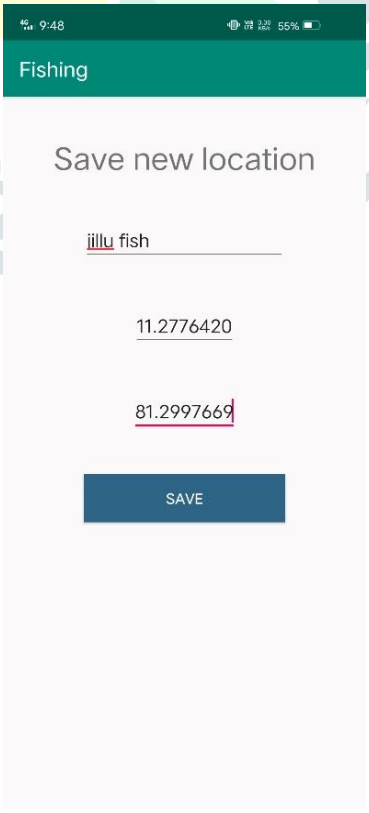


*Fig.6 Save Location for Fishing*

The above Fig.6 shows the Save Fishing Page. The fishing location can be saved


*Fig.7 Weather Report Page*

The above Fig.7 shows the Weather Report Page. If any natural calamities happen it will notify through notification.

## IX. CONCLUSION AND FUTURE ENHANCEMENT

The Fishing Mobile Application aims to bridge the gap between the lack of data and effective fisheries management. It saves fishermen time and helps them harvest fish more efficiently. The app also predicts storms and weather conditions, which is crucial for the safety of fish farmers. This type of application reduces overhead costs and motivates fish farmers to embrace technological growth. To ensure efficiency, the fishing application should be developed after rigorous software testing in all marine environments and with input from hundreds of experts.

The current system suggests that only one fisherman can track the location, and it has limited coverage of nautical miles. However, in the future, the system could be expanded to track multiple boats using a single system, with a larger coverage area. Another idea is to enable the system to control the boat's motor and make it reverse when it enters a restricted zone.

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