

FISHERMEN GUIDANCE SYSTEM USING LI-FI TECHNOLOGY

Abstract

In this study, a model navigation and application of the Global Positioning System (GPS) and Global System for Mobile (GSM) in the Fishing Guidance System are being developed. The model aims to improve the popularization of Fishing Guide System and improve its reliability and accuracy in Dynamic fishing environments. The modifications made in this system enable it to effectively utilize the GPS and GSM in poor visibility conditions. This technique is employed for geographic coordinate system control, monitoring, and communication. The fishermen receive coordinate information via GPS, SMS, or in printed maps. The systems performance based on Acquisition of fish and the fishermen having a high success rate in catching fish using the location information provided. This model presents a significant improvement in the fishing guide system by effectively utilizing GPS and GSM technology. If any fishermen crosses the one country region during the fishing, they are being suspects by other country naval force because of boarder crossing violation. This can be avoided by creating a warning system that tells the fisherman when they are nearer to the bounder. This framework can be done by using GPS (Global Positioning System), but it causes the system more expensive. In the place of GPS, Light Fidelity (LiFi) network can be used. LiFi is less cost and it can send signals to the boat. LiFi networking refers to data transmission by Visible Light Communication (VLC) and remote information transmission using light energy. Both of them contribute to keeping an ongoing check on the vessels. When a fisherman unintentionally goes over the allowed limit, this will be the response.

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I. INTRODUCTION

A 2/3 of Indonesia's territory lies at sea level, making it the largest archipelagic nation in the world. Indonesia has vast marine consisting of almost 17000 islands, 81,000km coast line, and abundant natural resources, especially fishes [1]. However the utilization of Indonesian marine resources is uneven and some regions are facing solid state fishing. It was carried out by Department of fisheries and Marine Resources. This system can be introduced by delivering location information in an easy and understand form. A system is needed to help fishermen benefit from the online information and increase the productivity of their fishing activities. One of the main reasons why potential management of fisheries resources is not handled in an integrated manner is the lack of data and knowledge regarding Indonesia's potential fishery resources. This study's goal is to develop a system model that may be used to direct fishermen using a GPRS-based application at a fish concentration. The FGS system model can alter fishermen's behavior so that they no longer take fish solely for the sake of catching it. The delivery of location information should be digest for fishermen, such as distance from their current position.

Three clearly distinct towers of transmission are placed in a strategic location along the coast. Fishing boats are equipped with useful machines that use sine wave generators and microcontrollers to verify the sea limit [2]. This will facilitate wave transmission with suitable repetition rates. After the data has been collected, the receiving unit performs the demodulation. The radio signals can be used to determine the boat's location [3]. The position of the boat may be estimated in three directions using the data from the three transmitters combined. A warning circuit is turned on when the fishing vessel is drawing close to the limit. By doing this, the fisherman won't go over the oceanic limit. It is more economical to use this architecture across all boats. Due to its intended use as a fishing boat, the construction has been built to be strong, watertight, and well-crafted. Naval forces catching unknown boats of fishermen that cross their jurisdictions. An alarm system that sounds an alarm when fishing boats approach the security zone can prevent all of this from happening. And when a boat's condition exceeds the limitations and when a fisherman is going to leave the security zone, respectively, this framework should alert the naval force.

The design of underwater acoustic networks is a crucial factor that affects their performance. A well-designed network topology can increase its reliability and minimize its energy consumption [4]. This is why it is important that an optimized model is adopted for the deployment of these networks [5]. Classification of underwater acoustic networks is carried out by using various methods. These include the mobility of the nodes, the dynamic and static models, and the depth of the models. In addition to this, communication between the nodes is also done through acoustic mode [6], [7]. This is because of the attenuation that occurs when radio frequencies are used underwater. Over time, the design of underwater acoustic networks has been improved to address various issues. These include the unstable sensing abilities, long delays, and high disparities [8].

The motivation behind developing a Fishermen Guidance System is to enhance the safety, efficiency, and productivity of fishermen in their daily operations. Fishermen face various challenges and risks while navigating the waters, such as changing weather conditions, unpredictable ocean currents, and potential hazards.

Here are some key motivations behind the development of a Fishermen Guidance System:

- 1. Safety:** Fishing is inherently risky, and safety is of paramount importance. A Fishermen Guidance System can provide real-time information on weather conditions, including wind speed, wave height, and storm warnings. This enables fishermen to make informed decisions about when to venture out to sea and when to seek shelter, reducing the risk of accidents or getting caught in dangerous situations.
- 2. Navigation Assistance:** Fishing grounds can be vast, and navigating through unfamiliar waters can be challenging. A guidance system equipped with GPS and mapping technology can provide accurate location information, navigational charts, and routes to help fishermen navigate safely and efficiently. It can also help them avoid obstacles such as reefs, sandbars, or other hazards that may not be clearly visible.
- 3. Fish Location and Tracking:** Finding fish in the vast expanse of the ocean can be time-consuming and unpredictable. A Fishermen Guidance System can incorporate technologies such as sonar, fish finders, or satellite imagery to identify areas with higher fish populations. This information can help fishermen make informed decisions about where to cast their nets or lines, increasing their chances of a successful catch and optimizing their fishing efforts.
- 4. Resource Management:** Sustainable fishing practices are crucial for the long-term viability of the fishing industry. A guidance system can provide fishermen with information about fishing quotas, restricted areas, or protected species, helping them comply with regulations and minimize their impact on the environment. It can also provide data on fishing patterns and trends, which can assist in resource management and contribute to the conservation of fish populations.
- 5. Efficiency and Cost Reduction:** By providing accurate information on weather, navigation, and fish location, a Fishermen Guidance System can help fishermen optimize their operations, reducing fuel consumption, travel time, and operational costs. It can also help them plan their trips more effectively, avoiding unproductive fishing areas or unfavourable weather conditions. Overall, the motivation behind developing a Fishermen Guidance System is to empower fishermen with technology that improves their safety, productivity, and sustainability [9]. By leveraging advanced tools and information, fishermen can make better-informed decisions, reduce risks, and enhance their overall fishing experience.

II. RESEARCH METHODOLOGY

The diffusion of science and technology involves three phases, they are a) Design and consolidation of systems, b) implementation and application of system, and c) evaluation of the system. The first step entails preparatory tasks like setting up a tracking subsystem for fishing vessels utilizing GPS coordinate data and satellite data transfer. The National Institute of Aeronautics and Space Administration and the Ministry of Marine and Fisheries have interpreted and distributed location data conversion prospective fish [10].

The first phase also entails performing recurring spatial analyses to locate the closest fish concentration to the location of the fishermen and communicating the results to the relevant fishermen through SMS. The second phase, which comprises the adoption of GPRS-based fishing guide systems, is divided into three stages: system installation and socialization, team formation for field operations, and system usage training. Monitoring and evaluating the use of the GPRS-based fishing guide system is the third and last phase.

The software utilized consists of the Linux operating system, MapServer and OpenLayers for managing and displaying maps, PHP, and JavaScript for building websites, and Gammu for SMS sending. Some experts and users validated the system using criteria that included common aspects, software engineering aspects, and visual communication aspects. Two features of the operational guidance system and the fishermen's success in catching fish are monitored and evaluated during the system's implementation.

Developing a Fishermen Guidance System would involve a research methodology that encompasses several steps and approaches. Here's an outline of a possible research methodology for the development of such a system:

- 1. Problem Identification and Definition:** Identify the specific challenges faced by fishermen in their daily operations, such as safety concerns, navigation difficulties, or fish location uncertainties.
 - Define the scope and objectives of the Fishermen Guidance System, including the desired features and functionalities.
- 2. Literature Review:** Conduct a comprehensive review of existing research, academic papers, and industry publications related to fishing safety, navigation technologies, fish finding methods, and related guidance systems.
 - Identify gaps in the current knowledge and technology that the Fishermen Guidance System aims to address.
- 3. Data Collection:** Gather relevant data through various sources, such as historical weather data, oceanographic data, fishing activity records, and fish distribution information.
 - Collect data on existing navigation technologies, fish finding tools, and other relevant technologies that could be incorporated into the system.
- 4. System Design:** Based on the problem definition and available data, design the architecture and components of the Fishermen Guidance System.
 - Determine the appropriate technologies to be employed, such as GPS, mapping software, sonar systems, satellite imagery, and communication tools.
 - Consider the user interface and usability aspects to ensure that the system is user-friendly and accessible to fishermen.
- 5. Prototype Development:** Develop a working prototype of the Fishermen Guidance System based on the system design.

- Implement the chosen technologies and integrate the collected data into the prototype.
 - Conduct iterative testing and refinement of the prototype to ensure functionality and usability.
- 6. Field Testing and Evaluation:** Deploy the prototype system in real-world fishing scenarios and collect feedback from participating fishermen.
- Evaluate the system's performance, effectiveness, and user satisfaction through field observations, surveys, and interviews.
 - Identify strengths, weaknesses, and areas for improvement based on the feedback received.
- 7. System Optimization and Finalization:** Incorporate feedback and make necessary refinements to the system based on the evaluation results.
- Optimize the system's performance, reliability, and accuracy.
 - Finalize the Fishermen Guidance System design and prepare it for potential deployment.
- 8. Deployment and Monitoring:** Collaborate with relevant stakeholders, such as fishing communities, industry organizations, and regulatory bodies, to deploy the Fishermen Guidance System.
- Monitor the system's usage, performance, and impact on fishermen's safety, productivity, and sustainability.
 - Continuously gather feedback and data to identify areas for further improvement and enhancement.

This research methodology provides a general framework for developing a Fishermen Guidance System. The specific steps and approaches may vary depending on the context, available resources, and technological advancements.

III. SYSTEM MODEL

Global Positioning System (GPS) is used for tracking the boats of the fisherman. The GPS unit on the boat receives data from the GPS satellites via an antenna. The latitude and longitude of the oceanic boundary should be pre-loaded into the onboard devices so that data can be collected utilizing them. The gathered data should now be regularly compared to the existing data set. If gathered data is matching, then alarm alerts the fisherman. But due to the cost of GPS is more and It isn't the superior option for a big project. In this technique, the distance between the boats and the transmitters is determined by listening to radio broadcasts.

The concept of Li-fi idea is that it uses the light as a transmission medium. In the communication, it is necessary to have components like Transmission and collection. The photodetector in the recipient module can handle the very high data rate, which is transmitted through an LED in the transmitter module. Li-Fi receivers should be installed in the commander's lodge, while Li-Fi transmitters should be installed at the boat's workstations.

Long-distance and short-distance data transport, as well as data transfer through reflections and views, are all covered in the gigabits category.

Oscillator is the most common technique for giving the user a continuous signal. The constant wave shape is created by oscillators. Modern correspondence systems use voltage-controlled gem oscillators (VCXO), which are powered by electricity passing via the piezoelectric response of the gem. To alter the thunder's frequency, voltage control may be utilized. In a temperature-controlled boiler, an oscillator is integrated to prevent variations in temperature.

The signal is received by the receiving radio wire from the exterior, or outside, world. By using microprocessor, Warning circuits are activated. A microcontroller that plays a warning sound will alert fishermen when their boats draw close to the barrier. This procedure is carried out by the microcontroller synchronising with an NTP device. In this framework, 3 microcontrollers are used which fed information from the communication towers. LED will lights up whenever there is a match of value. And when all three of these characteristics are present, a warning light will blow.

- 1. Training of System:** The final stage of the system implementation involves monitoring and evaluation of both the system's operation performance and fishermen performance. Fishermen are trained to understand the systems output, particularly catchment maps, without being burdened by operational issues. Every time fresh information is gathered, whether it comes directly from the space agency or through the admin center, the coordinate system is updated. The System displays position coordinates on the map using different colours to indicate the age of the data. The system informs fishermen of potential fish locations through either SMS or printed maps, with fishermen generally preferring printed maps due to their ease of use. Fishermen receive more accurate location information about potential fish compared to their previous experience-based knowledge.
- 2. Testing of System:** For fishing communities, the system offers the most recent and important information. The system offers discourse information that can increase the fishermen insight and knowledge on various topics. The key significance of the system is providing information on fish location, which is the major destination for fishermen.

The system is able to offer information on the overall position of fish, but it is unable to estimate their number. Fishermen's performance is measured by their ability to catch more fish with low cost and easy access to the right fishing locations. The system still has limitations in providing information during storms, dangerous waves.

The workflow of the proposed system is shown in Figure 1 and the performance of each block is explained as follows

- **IoT Device:** The primary piece of hardware is an Internet of Things device, like a Raspberry Pi. It has sensors like a camera for taking pictures and a GPS module for getting location information.

- **Data Processing and Analysis:** The module that processes data. The Fisherman Detection Algorithm, which might be based on computer vision methods or machine learning algorithms, is included in this subject. To find fisherman, the program examines the sensor data, particularly the photographs.
- **Fisherman Identification :** Once a fisherman has been recognized, the system moves on to the Fisherman Identification module, where further analysis or database matching can be done to ascertain the fisherman's identity.

The system will generate an alert or notification if a fisherman is found. This can be in the form of an email, push notification, auditory alarm, or any other kind of communication.

- **Communication Interface:** The IoT device and the cloud platform can exchange data more easily thanks to the communication interface. To create a connection, it makes use of a communication protocol like Wi-Fi or GSM.
- **Cloud Platform:** A central hub for collecting and storing data from many IoT devices is the cloud platform. It has data storage features that make it possible to save and retrieve fishermen detection data over an extended period of time.
- **Web/Mobile App:** Finally, a user interface for monitoring and engaging with the system can be created using a web or mobile application. This program may show historical data, provide information in real time, and offer system configuration controls

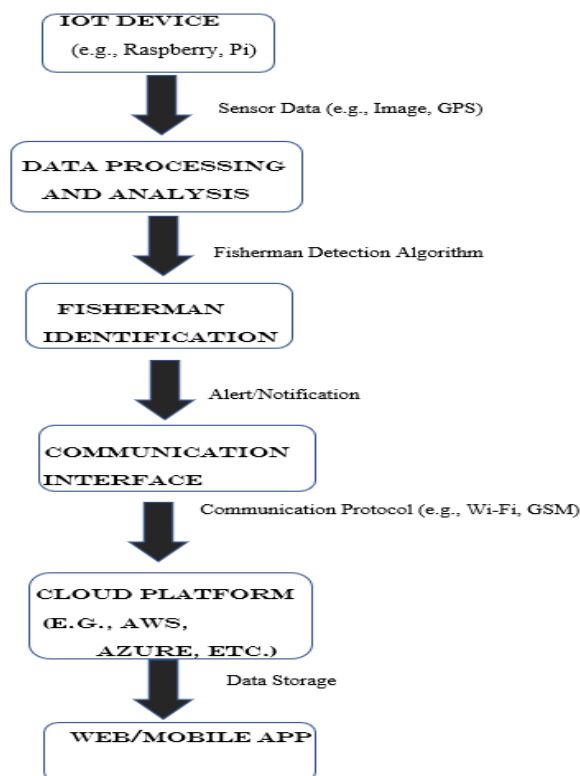


Figure 1: Workflow

IV. CONCLUSION

Fishermen Guidance System (FGS) Model Based on the development of GPS and GSM, institutions and individuals can now monitor, control, and communicate in a geographic coordinate system (map). The operator will sign in to the relevant application when access is permitted. The resulting device have characteristics like easy to use, applicative, easy to carry, high technology. Based on daily monitoring, the fisherman are provided with coordinate information through GPS, SMS, or a printed map. The performance of fisherman is determined by their ability to catch fish using the previously provided coordinate data; there have been no reports of fishermen failing to catch fish. With easy-to-reach fish locations known, the intention of catching the fisherman was changed to taking fish. The technology and productivity opportunities should be regularly explained to the fisherman. Continued initiatives and attention should be given to fisherman in need of regeneration. The program was created to be user-friendly, portable (for mobile devices), educational, useful, and network-wide.

To maintain the better communication inside the boat, Li-Fi technology is very convenient. The Li-Fi module inspects and contacts every boat, and it does not need to transmit data at a high speed across long distances.. So, for this framework this is the best technology. Underwater, where no other kind of connection would be dependable, Li-Fi technology is also deployed. The usage of an alert mechanism not to cross the sea limit is identical.

When fishermen cross the ocean's edge, this framework provides them with information. A warning may be issued to the headquarters and they will be informed if a fisherman crosses the line through the boat. A transmitter must be fastened to the boat for this framework.

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