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IoT Based Fisherman Assistance for Boat

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Abstract: An innovative Internet of Things (IoT) safety solution, the Fisherman Assistance System aims to lessen dangers encountered by fisherman when working at sea. Safety is of the utmost importance while fishing because of the unpredictability of the weather, the difficulty of communicating quickly, and the lack of proximity to help in an emergency. These problems are solved by this system, which combines several forms of sensor and communication technology into one small package. The system's construction relies on an ESP32 microcontroller, which permits wireless connectivity and real-time data processing. The air temperature and pressure are tracked using a BMP180 sensor, which offers valuable information about the surrounding environment. An essential feature in times of crisis, a GPS module keeps constant tabs on the boat's geographical position. If a fisherman were to go overboard or the boat were to become unstable, the MPU6050 accelerometer might pick it up. Furthermore, a float sensor may be used to determine whether the water level inside the boat is increasing, which might indicate potential issues with leaking or sinking. Both the local LCD panel and the distant Blynk IoT platform show all of the acquired data. The system notifies the user via their mobile app and sounds an alarm with a buzzer and LEDs in the event of an emergency, such as when it detects a fall, detects water incursion, or when the user manually activates the panic button. Because of this, critical situation awareness is guaranteed both aboard and remotely. Designed with small-scale fishers in mind, the suggested system is affordable, energy-efficient, and a breeze to set up. Improving the odds of prompt rescue and decreasing loss of life, it greatly promotes safety by offering real-time monitoring, rapid alarm systems, and position tracking.
Keywords: Esp32, LCD, GPS, IOT

I. INTRODUCTION

Particularly for small-scale fisherman working in isolated and unpredictable maritime habitats, fishing is among the most dangerous jobs in the world. Unpredictable weather, broken machinery, slips and falls, and capsized or leaking boats are common problems these people encounter. Delays in rescue efforts caused by unreliable communication tools and real-time monitoring systems sometimes have catastrophic results. Thanks to the lightning-fast development of IoT technology, smart systems that can track physical and environmental variables in real-time are now within reach. The Internet of Things (IoT) is ideal for mission-critical applications because it allows devices to remotely gather data, analyze it, and interact with humans. Using Internet of Things (IoT) and sensor technologies, this research unveils a smart Fisherman Assistance System that enhances maritime safety.

An ESP32 microcontroller was chosen for the system because of its energy efficiency, built-in WiFi, and excellent processing capabilities. Various safety elements are monitored by integrating many sensors. As a weather indicator, the BMP180 sensor keeps tabs on the air around us. Important for both navigation and rescue missions, the GPS module gives precise position data in real time. The MPU6050 can detect irregular motion or drops, and the float sensor may detect changes in the boat's internal water level, which might indicate that it is sinking.

Along with the automated detection feature, there is also a manual panic button that fisherman may use in emergency circumstances to send out distress signals quickly. Visual indications (LEDs), audible alarms (buzzer), and remote notifications (via the Blynk app) are all ways the system notifies users of impending danger.

The system provides an all-inclusive, cost-effective, and practically useful safety solution by integrating various technologies. Better safety, quicker emergency response, and more confidence for fisherman working in difficult circumstances are the end goals of this effort to unite traditional fishing methods with current technical advances.

II. LITERATURE REVIEW

Traditional methods of water quality testing required laborious, time-consuming, and unreliable human inspection and inquiry in laboratories. Regardless, a more organized and digital format has emerged for the display of IoT innovation. Internet of Things (IoT) systems monitor critical parameters of water quality, including temperature, pH, and turbidity, in real-time via a network of sensors In order to monitor conditions at sea, these sensors are linked to devices like the Arduino Uno. While earlier research has focused on various observational methods, the Internet of things (IoT the stands out due to its ability to screen online and communication in real time Incorporating sensors for temperature, pH, water level, turbidity, and movement position into an IoT-based architecture provides extensive testing capabilities [1]. The use of Sensor cloud computing m onitoring in fish farms has been the subject of many of research of investigating the internet of things (IoT) Using sensors for pH, temperature, and dissolved oxygen, Sharma et al. (2020) created an Internet of Things (IoT)-based system for monitoring water quality in real-time. For remote monitoring, their research highlighted the need of cloud storage and mobile apps [2]. To keep tabs on water quality indicators, Rathore and Sharma (2019) developed an Internet of Things (IoT) system using Raspberry Pi and Arduino. When compared to more conventional approaches, their findings demonstrated a considerable improvement in the effectiveness of water quality fluctuation detection [3]. A smart aquaculture system was developed by Gutiérrez et al. (2018) that uses machine learning algorithms to forecast the health of fish using data collected from sensors. The research showed that the use of AI in conjunction with the Internet of Things improves fish farming decision-making [4].

This article, published in November 2023 in IEEE Xplore, introduces a novel method by describing an IoFT-powered robotic system. Achieving higher levels of automation in freshwater aquaculture, this solar-powered floating device independently analyzes water quality and distributes food according to fish behavior. An example of a smart technology and embedded system in action in aquaculture is the robot's reliance on an RTOS for precise control (2023, IEEE Conference July 06-08) [5]. Another work in this area is the study of real-time water quality m ongoing facilitated by the internet of things (IoT) by Shete, Bongale, and Dharrao (2024). Timely and effective decision-making is supported by their system's emphasis on collecting and analyzing data from important water characteristics. Limited information is available, however it is consistent with larger trends in smart aquaculture technology that water monitoring should be sensitive and reliable [6].

An EPS32 Development board and several sensors including those for ammonia and water temperature are used in a species-specific application referred to as "Smart Aquaculture: IoT-Enabled Monitoring and Management of Water Quality for Mahseer Fish Farming" (2024). As an example of how user-friendly interfaces and wireless connectivity may promote efficient and sustainable aquaculture operations, the system uses the Blynk IoT platform for remote monitoring and visualization [7]. Finally, Abdallah et al. (2023) automated water quality and environmental management using an IoT-based monitoring and management system that the uses fuzzy logic controllers. Their method highlights the significance of adaptive management tactics to promote fish development and optimize production [8]. Each tank in their system has many sensors installed in it.

III. METHODOLOGY

Integrating several sensors and communication modules with the ESP32 microcontroller allows for continuous monitoring and safety in the proposed Fisherman Assistance System. In the beginning, the ESP32 is interfaced with all the hardware components, including the BMP180 sensor, GPS module, MPU6050 accelerometer, float sensor, LCD display, LEDs, buzzer, and panic button. Various sensors are constantly and in real-time collected by the system. The BMP180 measures air pressure and temperature, the GPS module gives coordinates of where the system is, and the MPU6050 watches acceleration to identify abrupt motions or drops. At the same time, the float sensor detects potential sinking circumstances by monitoring the water level inside the boat. In order to identify unusual occurrences, the ESP32 analyzes this data and compares it to predetermined threshold levels. The system is designed to promptly notify users by a buzzer and LED indications in the event that it detects any hazardous circumstance, such as a fall, an elevated water level, or the manual activation of the panic button. Simultaneously, WiFi is used to transfer processed data and alarm messages to the Blynk IoT platform, which allows for remote monitoring using a mobile app. The device also has an LCD panel that changes between multiple display modes to make real-time information easier to read, including environmental data, GPS position, and alarm status. The total safety of fishermen while their operations at sea is enhanced by this integrated strategy, which guarantees rapid detection, warning creation, and communication.

Watching the Environment A reading of the air pressure and temperature may be obtained using the BMP180 sensor. When the pressure suddenly drops, it can be a sign that storms or extreme weather are on the way. The ESP32 then relays the processed data to the monitoring app.

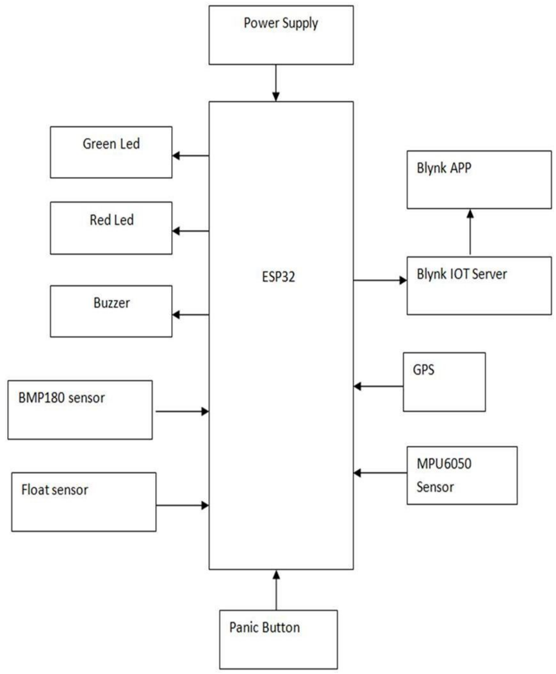
Detecting Movements of Boats A gyroscope and three-axis accelerometer make up the MPU6050 sensor, which measures the boat's acceleration and tilt. The device determines the boat's geographic coordinates and sounds an alarm if the tilt goes too far. To keep tabs on where things are at all times, this data is sent to the Blynk IoT platform.

The float sensor can identify when the boat is being submerged in water. The system sends an emergency warning over the IoT platform and turns on the buzzer and red LED if the water level goes above a certain threshold. The alarm system In case of manual emergency, there is a panic button available. Upon pressing the button, the device promptly notifies the monitoring application of the boat's GPS position and sends an alarm message. Internet of Things 6. Communication For sensor data transmission to the Blynk

IoT platform, the ESP32 makes advantage of its built-in Wi-Fi. The system may be monitored by users via a mobile app, Tracking your location and displaying weather conditions, The integration of status, location, and automatic notifications

When the system is powered ON, all modules such as the GPS, GSM, sensors, and display unit are initialized by the microcontroller (Arduino/ESP32). The system checks connectivity with the GPS satellites and GSM network. Once a stable connection is established, the LCD displays a "System Ready" message along with initial coordinates.

Block diagram



A. Real-Time Location Tracking

The latitude and longitude of the boat are constantly updated by the GPS module, which receives signals from satellites. The microcontroller is updated with these coordinates at regular intervals. Because it checks for accurate GPS data and filters out noise, the system keeps its accuracy high. The uggested system may be put into action by combining sensors, microcontroller hardware, and Internet of Things connectivity.

B. Maritime Boundary Detection

The microcontroller's memory has predefined border coordinates that denote safe fishing zones. In real time, the system checks the GPS locations against these preset restrictions. The boat enters a warning stage as it gets close to the barrier. The critical alert stage is initiated in the event that the barrier is crossed.

C. Alert and Warning Mechanism

As soon as the fisherman enters a danger zone: An intermittent sound is produced by a buzzer. The LCD shows the message "Boundary Warning Zone." Should the limit be violated: It activates a continuous buzzer alert. Indicator on LCD reads: "Boundary Crossed - Move Back" RED light-emitting diode alerts are possible. This makes sure that the warning may be understood by people who are illiterate thanks to the usage of sound and color.

D. Communication via GSM Module

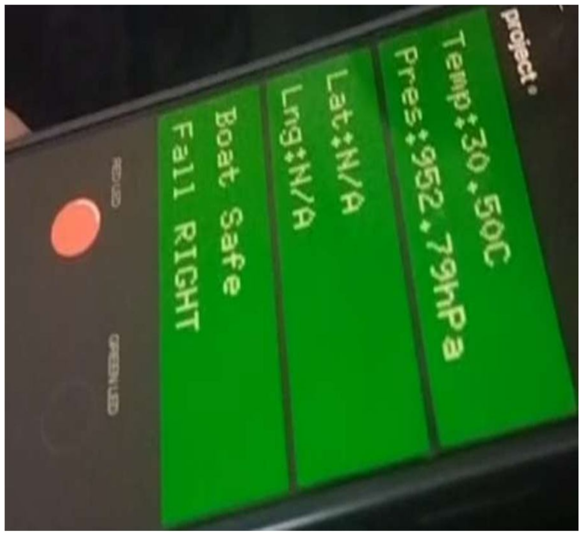
When it comes to distant communication, the GSM module is vital: Notifies designated recipients by text message (e.g., family, coast guard, control center) The alert type and GPS data are included in the message. When set to emergency mode, notifications will be issued until they are acknowledged.

Here is an example of an SMS: Attention: Boat has breached the border! Coordinates: 16.50N, 82.30E

E. Weather Monitoring and Alerts

Sensors measuring temperature, humidity, and pressure may be included into the system, or meteorological data can be retrieved via GSM. When unexpected changes in the environment (such a high wind likelihood) happen: Message of caution shown on LCD Notification made audible Fishing enthusiasts are urged to come back

V. RESULTS



VI. CONCLUSION

The Internet of Things (IoT) and sensor technologies are effectively used by the Fisherman Assistance System to enhance maritime safety. The device lessens dangers in fishing by offering real-time tracking, emergency notifications, and monitoring. It shows how inexpensive technology may improve safety measures in faraway places and save lives.

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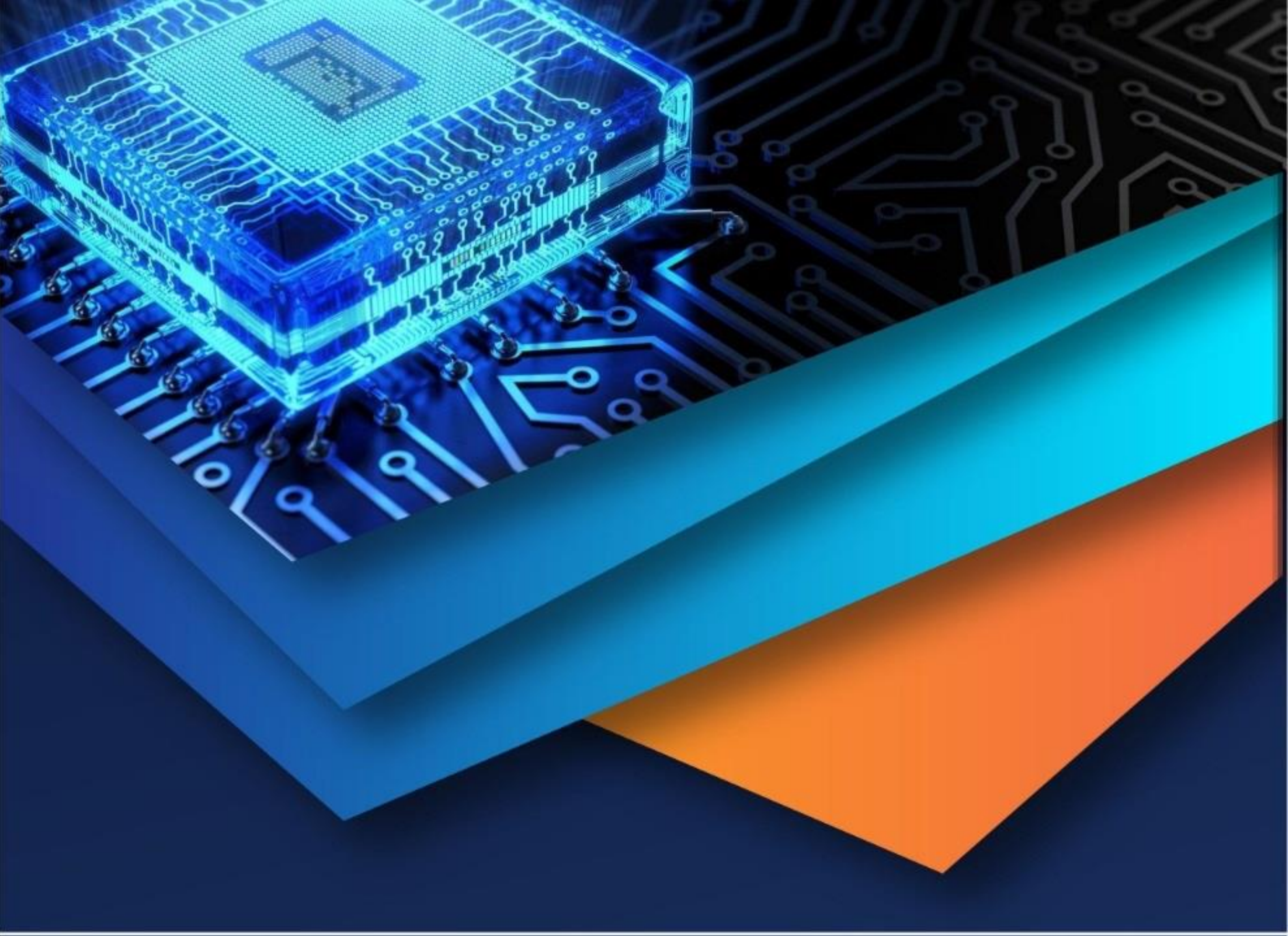

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