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IOT based Fisherman Tracking System Using Node Microcontroller Unit

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ABSTRACT - Ensuring the safety of fishermen is a critical concern, particularly in situations involving sudden wave crashes or other emergencies. To address this issue, we propose the implementation of a Fisherman Tracking System, which aims to enhance fisherman safety comprehensively. Our solution involves the development of an embedded system based on GPS (Global Positioning System) and GSM (Global System for Mobile Communications) technologies. By utilizing this system, we can effectively monitor and assist fishermen in various hazardous situations. The primary objective of our proposed device is to create an environment where fishermen can be easily located, minimizing the efforts required by multiple agencies to track their whereabouts. In our research, we present a software-based alert mechanism that will promptly notify coastal guards if a fisherman requires assistance. This innovative approach aims to significantly improve the overall safety and well-being of fishermen.

Keywords: GPS, GSM, Text Message, LDR Sensor

1. INTRODUCTION

Fishing is widely recognized as one of the most perilous occupations worldwide, often impacting individuals from marginalized backgrounds. Despite historical anecdotes, fishermen continue to venture into international marine boundaries for their livelihood. The primary goal of our paper is to provide a fair and user-friendly environment for fishermen to navigate hazardous situations. To achieve this, our system utilizes GPS [1] and GSM[3] technologies. By employing GPS route devices, we can precisely determine natural areas and obtain data from GPS satellites. The Coastguard plays a crucial role in enhancing fisherman safety, as fishermen are susceptible to various calamities, including accidents, casualties, abductions, and the foreign interventions. While the Indian Coast Guard has multiple responsibilities, safeguarding fishermen remains central to its mission. By protecting fishermen during hazardous situations, such as being trapped in high tides, the Coastguard fulfills its strategic mandate. This paper primarily focuses on ensuring fisherman safety during fishing activities, especially in critical scenarios like wave crashes, boat leakage, or instances where fishermen find themselves helpless. In such situations, it becomes the responsibility of the Coastguard to safeguard the fishermen who are unable to handle these circumstances themselves. To ensure their safety, it is imperative to track their location. This system displays the location through latitude and longitude coordinates and sends SMS alerts[8] to both the Coastguard and the fishermen's registered mobile numbers. An alert message is triggered if the boat approaches a restricted zone. The restricted zone is determined by comparing predefined coordinates with the current location coordinates. The system is designed based on the underlying concept of GPS (Global Positioning System). Its main objective is to track and monitor the location of fishermen to ensure their safety

2. LITERATURE SURVEY

GPS based vehicle tracking and monitoring system proposes a solution for tracking and monitoring public transportation vehicles using devices like

Raspberry Pi and GPS Antenna [1]. The Raspberry Pi processing board is utilized for receiving and processing data, enabling the monitoring of the vehicle's location throughout its journey. The GPS receiver module is employed to continuously receive latitude and longitude values, providing real-time vehicle location information. Passengers input different locations between the source and destination, which are stored in the Raspberry Pi database. The Raspberry Pi processor compares the passenger-specified values with the current vehicle location, and if they do not match, a warning message is displayed to inform the passenger that the driver may be heading in the wrong direction.

Real-time GPS vehicle tracking system presents the implementation and design of a real-time GPS tracker system using Arduino. This system is designed to track and monitor various applications such as salesman tracking, private drivers, and vehicle safety. It aims to address the needs of owners with expensive cars who want to observe and track their vehicles, including monitoring vehicle movement and retrieving historical activity data.

The system utilizes GPS and GSM modules controlled by Arduino MEGA [2], which are installed inside the vehicle. The GPS module continuously updates the vehicle's position as it moves. Users can send an SMS to a registered number and receive the coordinate location of the vehicle in response. Simultaneously, the data is continuously stored on an SD card for future reference. To access the vehicle's location, users can utilize a system that provides access via a website over the internet. This enables convenient and remote access to the real-time and historical location data of the vehicle.

Accident Alert and Vehicle Tracking System presents a system capable of tracking vehicles and detecting accidents. It introduces an automatic accident detection mechanism using vibration sensors [3] or a piezoelectric sensor. These sensors are responsible for sensing and detecting accidents, and their output is transmitted to a microcontroller.

Upon detecting an accident, the GPS module within the system determines the latitude and longitude position of the vehicle. The GSM module then sends this location information to the nearest ambulance stationed in the vicinity. This message transmission is performed automatically, and an alert message may also be sent to the central emergency dispatch server. The system incorporates components such as vibration sensors, Raspberry Pi, GPS, and GSM modules to effectively detect traffic accidents.

Location Based System Using GPS-Fishermen SMS Alert System is a novel wireless ad hoc network based on GPS technology is proposed for marine monitoring, search, and rescue applications in Vietnam. The network's routing protocol and algorithm were evaluated using the Network Simulator 2 software. The results demonstrate a package transmission success rate exceeding 85%, showcasing the significant potential of the proposed concept. The key terms associated with this research include ad hoc network, marine monitoring and searching, and Global Positioning System (GPS). The GPS receiver installed on the boat captures signals from satellites, enabling the determination of the boat's current position. The proposed system [6] aims to identify the country's borders by using specified longitude and latitude coordinates, not only in the case of Sri Lanka and India but globally. The border, represented at the layer level, can be pre-defined and stored in the memory of a PIC microcontroller. The current position is compared to the predefined values, and if they match, the PIC microcontroller triggers an alarm or buzzer. Additionally, a message transmitter is utilized to send alerts to the base station responsible for monitoring boats at sea. This system provides a warning to both fishermen and the coastal guard, ultimately saving lives and facilitating prompt assistance from the base station.

Design of Border Alert System for Fishermen Using GPS is the system is primarily designed to assist fishermen in detecting maritime boundaries between two countries, particularly when they unintentionally cross into the territorial waters of a neighbouring nation due to their lack of awareness regarding sea limits. The proposed system [7] utilizes GPS technology to receive signals from satellites and determine the boat's current position, as well as the latitude and longitude coordinates of the maritime boundary. By storing the boundary positions and comparing them with the current position, the system can alert the fisherman of crossing the boundary through various means such

as alarms, vibrations, and notifications. These alerts are transmitted to the server section, ensuring that the fisherman receives visual notifications. This user-friendly approach proves particularly beneficial for fishermen operating in border areas.

Android app-based vehicle tracking using GPS and GSM presents an embedded system is employed to determine the location of a vehicle, utilizing technologies such as GSM and GPS. The proposed system [8] requires a closely integrated GPS and GSM module with a microcontroller. Initially, the GPS module installed in the device receives the vehicle's location data from satellites and stores it in the buffer of the microcontroller. To track the location, a request must be sent from a registered mobile number, and once the number is authenticated, the system sends the location information to the mobile number via SMS. Following this, the GSM module is deactivated, while the GPS module is reactivated for subsequent location updates. The SMS sent to the mobile number contains the latitude and longitude values of the vehicle's location. This received value in the SMS can be conveniently viewed through an Android app, which automatically plots the coordinates on a map within the app.

Based on the existing system studied in the sections, the following objectives have been considered to design the proposed system.

1. The primary goal of this system is to monitor and track the location of fishermen.
2. It is designed to send SMS alerts and trigger a call alarm to the coastal guards and their emergency contacts when a specific push button is pressed.
3. Additionally, if the water level exceeds a predetermined threshold due to high tides, the system will automatically activate and send SMS alerts, voice calls, and the current location information. This system effectively addresses both location tracking and security concerns.

4. PROPOSED METHOD OF FISHERMAN TRACKING SYSTEM

The proposed system offers a solution to address the safety concerns of fishermen impacted by wave crashes. By utilizing GPS and GSM technologies, the system enables communication with coastal guards by transmitting location information and alert messages. This implementation aims to enhance the safety and well-being of fishermen.

4.1 Design

The implemented system incorporates various components including NodeMCU, GSM module, GPS receiver, push button, water sensor, float sensor, and an LDR sensor. NodeMCU is utilized as the microcontroller to interface these components. The GPS receiver receives satellite data to determine latitude and longitude coordinates. These coordinates are then stored in cloud storage using GSM and IoT technologies, enabling real-time monitoring of the current position from anywhere in the world. The float jacket is equipped with a push button, which the fisherman can press in case of a dangerous situation. Upon pressing the push button, the GPS receiver retrieves the coordinates and sends a distress message to the coastal guards, indicating the critical situation. Simultaneously, the float sensor continuously measures the water flow rate, providing additional information about the condition of the fisherman. In situations where the fisherman fails to press the push button, an alert message along with the location is automatically sent to the coastal guards. This information, obtained through GSM, enables the coastal guards to locate and rescue the fisherman even if they are unable to trigger the distress signal manually.Furthermore, an LDR sensor is incorporated into the system to automatically control the boat's lights. The LDR sensor detects the ambient light levels, allowing the lights to turn on when it becomes dark and turn off when sufficient light is present.Overall, the combination of the GPS, GSM, and IoT technologies, along with the water flow rate measurement and automatic light control, enhances the safety and monitoring capabilities for fishermen at sea.

4.2 Flow diagram of proposed method

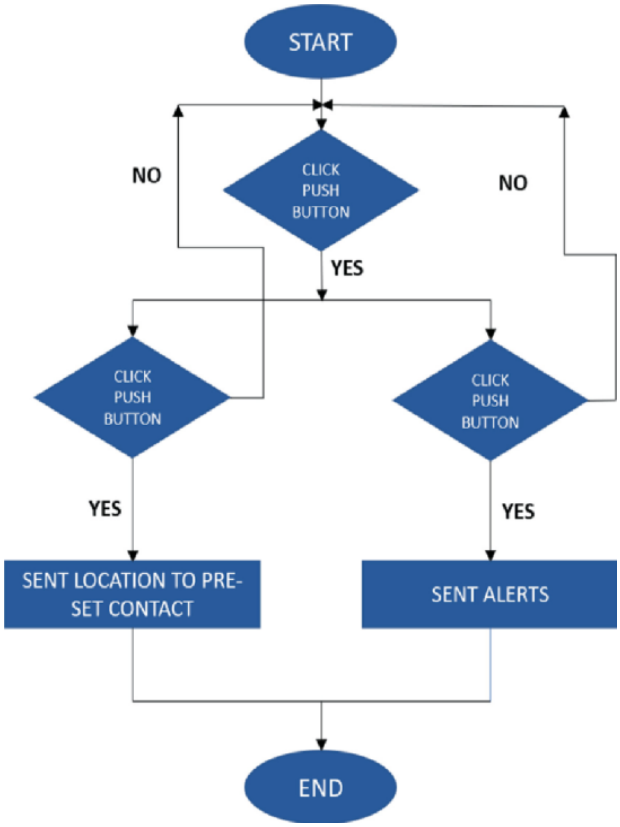

Figure 4.1 Flow diagram

4.3 Block diagram of proposed method

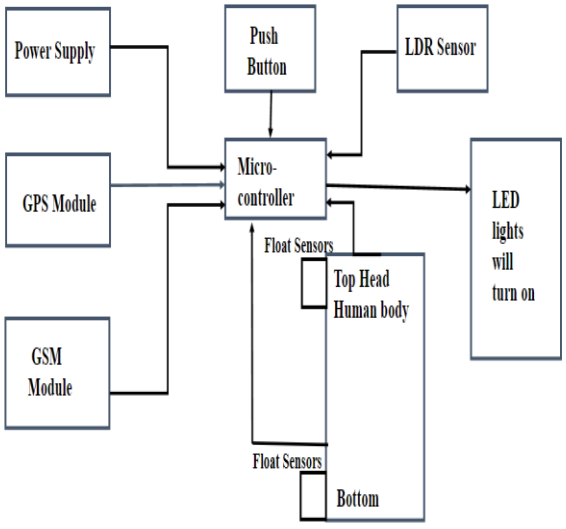

Figure 4.2 Block diagram

Working Mechanism

Fig.4.2 is designed with the primary objective of safeguarding the lives of fishermen. Each fisherman on board wears a specially designed Float jacket equipped with a device that incorporates various components. Among these components, a GPS receiver is employed to continuously acquire the fisherman's location. Additionally, a float sensor is integrated into the device to monitor the water flow rate. If the water flow exceeds a predetermined threshold, an alert message, along with the current location, is transmitted.The GPS location data is securely stored in cloud storage and actively monitored by the coastal guards. In the event of a dangerous situation, a warning message containing the fisherman's location is sent to the coastal guards via Telegram. This location information can be conveniently accessed and viewed on Google Maps. This method greatly assists in promptly rescuing fishermen in critical conditions by providing real-time information to the coastal guards.

Furthermore, an LDR sensor is incorporated into the system, ensuring the boat's lights are automatically turned on in low-light conditions and switched off when sufficient light is detected.

a) NodeMCU:

Figure 4.3 NodeMCU

NodeMCU, also known as Node Micro Controller Unit, *fig.4.3*, is a cost-effective System-on-a-Chip (SoC) that forms the core of an open-source hardware and software development platform. Developed by Espress if Systems, the ESP8266 is an affordable yet powerful chip that integrates key components essential for computing, such as CPU, RAM, networking capabilities (WiFi), and an advanced operating system with a software development kit (SDK). This feature set makes it an ideal solution for a wide range of Internet of Things (IoT) applications and papers.

b) GPS:

Figure 4.4 GPS Module

The Global Positioning System (GPS) *fig.4.4* is a navigation system that relies on satellite signals to determine precise location and time information. Accessible to individuals equipped with a GPS receiver and clear visibility of at least four GPS satellites, this technology enables accurate positioning. By precisely measuring the timing of signals transmitted by GPS satellites, a GPS receiver can calculate its own coordinates. In contemporary times, GPS has gained significant popularity and is now an essential component integrated into smartphones and various other devices.

c) GSM:

Figure 4.5 GSM Module

A GSM modem, also referred to as a GSM module, *fig.4.5* is a communication device that utilizes GSM mobile telephone technology to establish a wireless data connection with a network. These modems are commonly employed in mobile telephones and other devices that interact with mobile telephone networks. To establish device identification with the network, GSM modems make use of Subscriber Identity Modules (SIMs).

d) Push button:

Figure 4.6 Push button

A push-button, *fig.4.6* also spelled pushbutton, is a basic switch mechanism utilized to regulate various functions of a machine or process. These buttons are commonly crafted from durable materials like plastic or metal.

e) Float Sensor:

Figure 4.7 Float sensor

A float switch functions as a level sensor, specifically designed to detect the liquid level within a tank. *Fig.4.7* This device has versatile applications, including pump control, serving as an indicator, triggering alarms, or controlling other interconnected devices.

f) LDR sensor:

Figure 4.8 LDR Sensor

Fig.4.8 Photo resistors, commonly referred to as light dependent resistors (LDR), are electronic components sensitive to light, primarily employed to detect the presence or absence of light and measure its intensity.

5. RESULTS AND DISCUSSION

After the effective deployment of the Fisherman Tracking System, the following outcomes were observed:

1) Upon pressing the button, real-time location updates of the fisherman are transmitted via telegram and accompanied by an alert message. In addition, designated contacts receive a voice call to ensure immediate attention.

2) In situations where the fisherman neglects to activate the button, the float sensor triggers an alert mechanism. This prompts the system to transmit an alert message, location details, and initiate a voice call, ensuring that assistance can be provided promptly.

3) The implementation of an LDR sensor enables the automatic control of boat lights. The sensor detects the ambient light conditions and effectively switches the lights on during dark periods, while ensuring they are turned off when ample light is available.

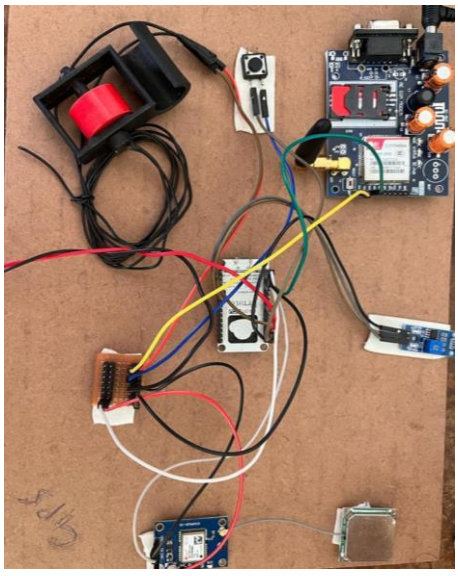

Figure 5.1 Output

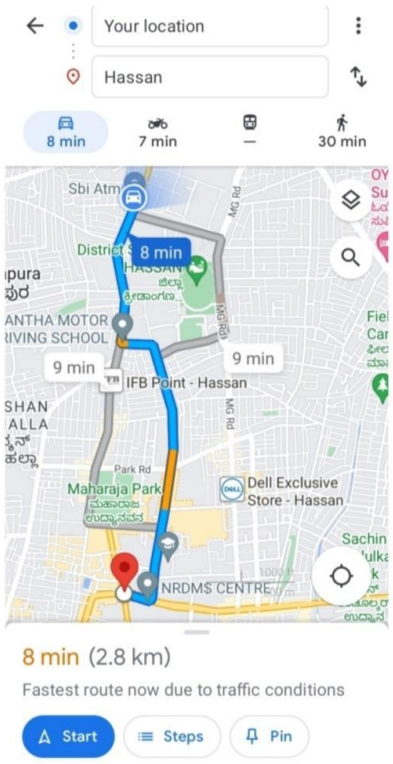

Figure 5.2 Location

6. CONCLUSION AND FUTURE SCOPE

In this paper, the significant challenges faced by fishermen in their livelihoods, primarily focusing on the crucial problem they encounter. The system revolves around the concept of automating the acquisition of precise location data, monitoring water flow rates, and ensuring the safety of fishermen. Utilizing GPS technology, this system offers a reliable and secure solution for alerting fishermen in critical maritime situations.

The integration of various modules, such as GPS for navigation purposes and GSM for monitoring, enables comprehensive control over maritime navigation and ensures the safety of fishermen during their fishing activities. The GPS module provides accurate location information, allowing users to determine the fisherman's precise position and obtain distance data from the intended destination point. Moreover, this system offers flexibility for future enhancements and upgrades by incorporating additional modules to enhance its overall efficiency.

In conclusion, the Fisherman tracking system plays a vital role in safeguarding the lives of fishermen,

protecting them from hazards like wave crashes and other critical situations. It serves as a reliable tool in maritime navigation and offers a comprehensive solution to ensure the safety of fishermen during their fishing endeavors.

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