

Fisherman Auto Safety Boating And Boundary Information System

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Abstract - Illegal maritime border crossings and delayed distress communication pose serious risks to fishermen operating near international sea boundaries. To address this issue, this project proposes a GPS-based Maritime Border Alert and Safety System designed to continuously monitor a vessel's real-time location and ensure safety through automated alerts and control actions.

The system uses a GPS module to obtain live latitude and longitude coordinates of the vessel. Predefined Indian maritime boundary coordinates are stored internally and compared continuously with real-time GPS data to determine proximity to national borders. Based on this distance, a multi-level alert mechanism is implemented: a low-level alert at 15 km, a medium-level alert at 10 km, and a high-level alert at 5 km.

If the vessel crosses the maritime boundary, the system automatically disconnects the motor using a relay module to prevent further movement. Simultaneously, a GSM module (SIM800L) sends an SMS alert containing a Google Maps link to predefined contacts such as Coastal Guard authorities and family members.

Keywords - GPS, GSM, Maritime Safety, Border Alert System, Arduino, Fishermen Safety, SOS Communication

I. INTRODUCTION

Fishermen operating near coastal regions are often at risk of inadvertently crossing international maritime boundaries due to a lack of precise navigation tools. Such crossings can result in legal complications, accidents, or conflicts with neighbouring countries. Additionally, emergencies such as mechanical failure, adverse weather, or medical issues require immediate communication for timely assistance.

To address these challenges, modern GPS and GSM technologies are integrated to provide real-time monitoring and emergency communication. The GPS module continuously tracks the vessel's latitude and longitude, which are compared with predefined maritime boundary coordinates.

A multi-level alert system provides warnings through buzzer alerts, enabling operators to take corrective action. If the vessel crosses the boundary, a relay mechanism cuts off the motor, and the GSM module sends location alerts to authorities and family members.

Furthermore, an SOS button allows fishermen to manually trigger emergency alerts. This integrated system ensures improved safety, security, and rapid response in maritime environments.

II. RELATED WORK

Existing maritime safety systems for small-scale fishermen are largely manual and lack automation. Common methods include:

1. Manual Communication Devices

Use of radios or mobile phones, which depend on network availability and lack automation.

2. Basic GPS Systems

Provide location data but do not include alert or safety mechanisms.

3. Visual Alerts

Limited effectiveness due to range and weather conditions.

4. Manual Emergency Signals

Delayed communication in critical situations.

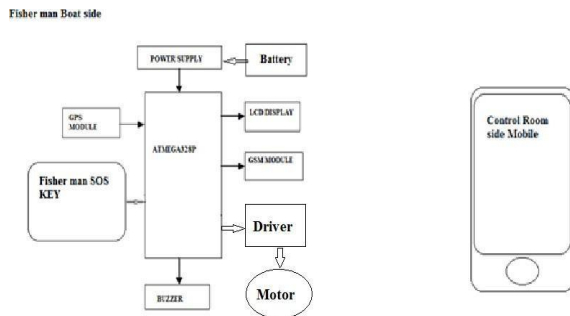
Limitations

- No real-time automated alerts
- No motor control mechanism
- Dependence on manual intervention
- No multi-level warning system

These limitations highlight the need for an intelligent and automated maritime safety system.

III. SYSTEM ARCHITECTURE

Conceptual Framework



The system consists of the following key components:

1. GPS Module (NEO-7M)

- Provides real-time latitude and longitude
- Enables accurate vessel tracking

2. Microcontroller (Arduino UNO)

- Central processing unit
- Handles data processing and decision-making

3. Buzzer Module

- Provides multi-level audible alerts

4. Relay Module (Motor Control)

- Disconnects motor when boundary is crossed

5. GSM Module (SIM800L)

- Sends SMS alerts with location

6. SOS Button

- Manual emergency trigger

7. LCD Display

- Displays real-time GPS data

B. Operational Workflow

- GPS continuously sends location data to the microcontroller
- Microcontroller calculates distance from

stored border coordinates

- Buzzer alerts activate based on proximity:
 - 15 km → Low alert
 - 10 km → Medium alert
 - 5 km → High alert
- If border is crossed:
 - Relay stops the motor
 - GSM sends SMS alerts
- SOS button sends emergency SMS anytime
- LCD displays live coordinates

IV. HARDWARE IMPLEMENTATION

A. Controller Selection

Arduino UNO

- Based on ATmega328P
- 14 digital I/O pins, 6 analog inputs
- Supports UART, SPI, I2C
- Easy programming and low cost
- Ideal for embedded applications

B. Key Component Innovations

GPS Integration

- Real-time location tracking
- Accurate boundary detection

Multi-Level Alert System

- Progressive warning mechanism
- Improves decision-making time

Relay-Based Motor Control

- Prevents illegal border crossing
- Ensures automatic safety enforcement

GSM Communication

- Sends real-time SMS alerts
- Includes Google Maps link

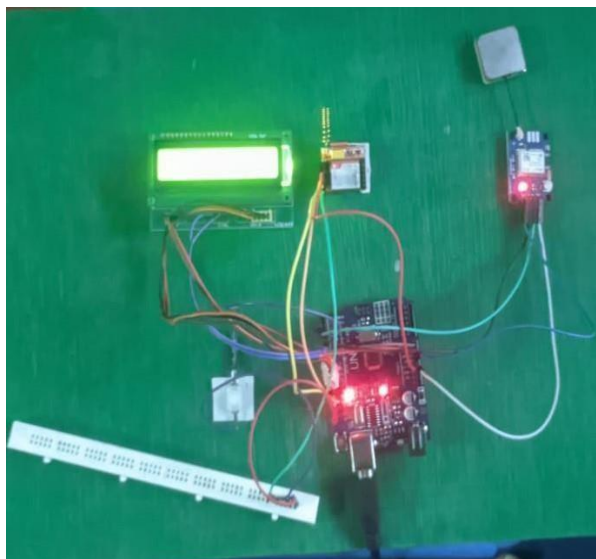
SOS Emergency Feature

- Independent emergency communication
- Works in all conditions

LCD Monitoring

- Displays real-time data for user awareness

V. EXPERIMENTAL RESULTS



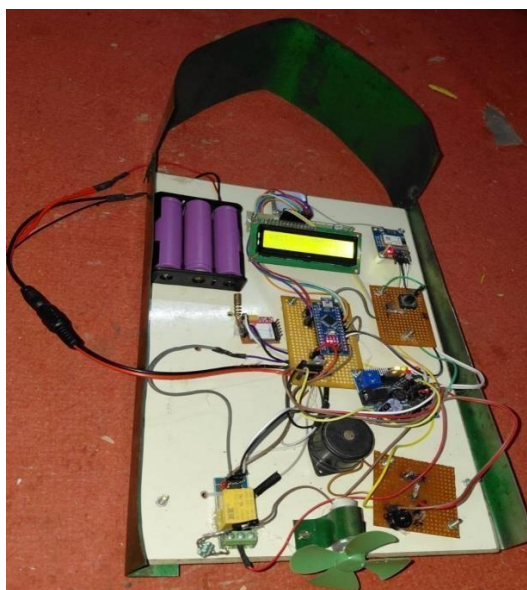
provides timely alerts, and prevents unauthorized border crossing through automatic motor control. GSM-based communication ensures immediate notification to authorities and family members.

This project demonstrates a reliable, cost-effective, and practical solution for improving maritime safety.

Future Work

- Integration with mobile applications
- Use of satellite communication for remote areas
- Solar-powered system for sustainability
- AI-based navigation assistance
- Waterproof and rugged industrial design

HARDWARE ARCHITECTURE



A. Core Security Workflow Validation

- GPS provided accurate real-time location
- Distance calculation was reliable
- Alerts triggered correctly at defined distances
- Relay successfully stopped the motor upon border crossing
- GSM module sent SMS alerts without delay
- SOS feature worked independently
- LCD displayed continuous location updates

B. Comparative Analysis

Feature	Existing System	Proposed System
Navigation	Manual	Automated GPS
Alerts	None	Multi-level alerts
Motor Control	No	Yes
Emergency Communication	Manual	Automatic SMS
Safety Level	Low	High

SMS ALERT WITH LOCATION

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VI. CONCLUSION AND FUTURE WORK

Conclusion

The GPS-based Maritime Border Alert and Safety System was successfully developed and tested. The system effectively monitors vessel location,

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