

OCEAN RANGER

**Internal Signal-Based Navigation System for Ocean Fishermen**

TEAM

FANTASTIC FOUR

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***Objective:***

To develop a navigation system that helps ocean fishermen identify country borders and navigate safely without relying on radar or satellite connections. This system will use onboard transmitters and receivers to calculate the boat's position based on frequency shifts, speed, and heading changes.

**BORDER** **DETECTION:**

Implement a system to detect and alert fishermen when they approach or cross maritime borders.

**RANGE – POSITIONING:**

Develop a method to determine the boat's position and movement using transmitters and receivers. Focus on cost-effective technologies that can provide reliable distance measurements.

**USER FRIENDLY:**

Create an intuitive interface for fishermen to receive alerts & navigation guidance. Ensure the system is easy to use and understand, even for those with limited knowledge

**Existing Methodology AIS:** He Automatic Identification System (AIS) transmits a ship’s position to enhance maritime safety by avoiding collisions. Large ships, including many commercial fishing vessels, are mandated to use AIS by international bodies. Over 400,000 AIS devices broadcast information like vessel location, identity, course, and speed annually.

**REASON WHY OUR RANGER IS BETTER THAN THE EXISTING ONE**

**1.** Our Ranger Cost is low than the existing

**2.** Our Ranger don’t require any Wireless

**3.** Existing’s are available only in foreign

**Key Components:**

**Transmitters:**

Two transmitters installed on either side of the boat.

Emit signals at a known frequency.

**Receiver:**

Placed at the back end of the boat.

Receives the signals from both transmitters and measures frequency shifts.

**Data Collection and Analysis:**

Measure the frequency shift (Doppler effect) to calculate the boat's speed.

Use the difference in frequencies from the two transmitters to determine the heading change.

Continuously update the boat's position using the calculated speed and heading.

**Mathematical Methods:**

***1.Doppler Effect for speed calculation:***

\* Use v = to find the speed based on frequency shifts.

\* v1= for the left transmitter.

\* v2= for the right transmitter.

\* Average speed v=.

***2.Heading change calculation:***

\* Calculate the heading change (Δθ) using the frequency differences :

* Δθ=

***3. Position Update***

distance travelled d=v.Δt.

Update latitude and longitude using trigonometry relationships

for latitude

for longitude

**Implementation Steps:**

**Initialization**:

Define the initial latitude and longitude.

Set the initial heading of the boat.

**calculation**:

Continuously measure the frequency shifts from the two transmitters.

Calculate speed and heading variation using Doppler effect and heading change formula.

find the direction change by variations in frequency

Update the boat's position at regular intervals.

**Display and Alerts**:

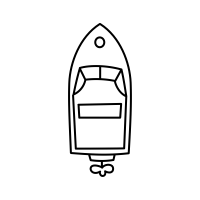
Display the current position and heading on a user-friendly interface.

Provide alerts if the boat is approaching the country border or other predefined danger zones.

**Benefits:**

Enables safe navigation without relying on external signals.

Provides real-time updates on the boat's position. Helps fishermen avoid crossing international boundaries inadvertently.



transmitter

Receiver

**Potential Authors and Sources:**

1. **Scientific Papers on Doppler Effect and Acoustics:**
   * **Christian Doppler:** Original works on the Doppler effect.
   * **Rayleigh (John William Strutt):** His work on acoustics and waves in the "Theory of Sound" is foundational.
2. **Books on Navigation and Maritime Techniques:**
   * **Dutton's Navigation and Piloting:** A comprehensive guide on modern navigation techniques.
   * **David Burch:** Known for his books on marine navigation, such as "The Navigation Handbook."
3. **Research Papers on Inertial Navigation Systems:**
   * **David Titterton and John Weston:** "Strapdown Inertial Navigation Technology" is a key resource.

THANK YOU