WaveTracker - Affordable Wave Monitoring for Coastal Safety

Executive Summary

Overview

WaveTracker is a simple, durable, and low-cost solution for measuring wave height and frequency in coastal areas. Designed with accessibility in mind, it offers reliable data collection using underwater pressure sensors-perfect for researchers, local authorities, and communities facing climate challenges.

The Challenge

Current wave monitoring systems are often too expensive or complex, limiting their use in smaller-scale projects or in developing regions. There's a clear need for a cost-effective alternative that delivers accurate data without complicated setups.

Our Solution

WaveTracker features a sealed underwater device with a pressure sensor, microcontroller, and SD card for data storage. It tracks pressure changes caused by waves, and the data is later analyzed using MATLAB to reconstruct wave patterns.

Key features include:
- Accurate pressure-based sensing
- Local data logging (no need for unreliable underwater Wi-Fi)
- Compact, energy-efficient hardware
- Proven reliability in controlled pool testing

Results

In initial testing, WaveTracker captured clean sinusoidal wave patterns, confirming the system's accuracy and validating its core design. While Wi-Fi transmission was ruled out due to underwater signal loss, offline logging proved reliable and effective.

What's Next

To move from prototype to real-world use, the next steps include:
- Field testing in coastal environments
- Improving waterproofing and structural durability
- Automating waveform analysis
- Exploring remote data access via surface buoys or LoRaWAN

Final Thought

WaveTracker proves that effective wave monitoring doesn't have to be expensive. It offers a practical, scalable solution that can enhance coastal research, safety systems, and our broader understanding of the ocean-one wave at a time.