

Reliable and Uninterrupted Communication for Armed Unmanned Surface Vehicles (AUSVs)

Problem

In modern military operations, reliable and uninterrupted communication between Armed Unmanned Surface Vehicles (AUSVs) and the headquarters is crucial for mission success. Continuous data and video transmission from AUSVs ensures that operators can monitor and control the vehicles effectively, executing commands as needed. However, AUSVs that rely on a single communication system often face a significant loss of capability when they move beyond the range of direct communication with the control center, resulting in operational limitations.

Key challenges include:

Line-of-Sight (LOS) Limitations: Direct communication channels are susceptible to interruptions when physical obstacles block the line of sight.

Beyond-Line-of-Sight (BLOS) Restrictions: When AUSVs operate beyond LOS, traditional single-system communications face stability issues, reducing the reliability of data transmission.

To maintain seamless communication, even in complex and obstructed environments, the system must incorporate a multi-channel approach, utilizing multiple frequency bands and satellite communication to ensure robust, continuous connectivity.

Solution

Utilizing a multi-channel communication system with satellite integration ensures lossless, uninterrupted, and secure data transmission for AUSVs. By combining the capabilities of Ku Band, L Band, RF LOS, and GSM channels, the system provides dependable communication with packet-level control, eliminating the need for reconnection scenarios.

EXECUTIVE SUMMARY

Short Summary

Sector : Military & Defense

Glance

1. Reliable, continuous and uninterrupted communication at Armed Unmanned Surface Vehicle
2. Uninterrupted, reliable military communications

Solution

Uninterrupted and continuous communication over Ku Band, GSM, L Band, RF LOS channels is provided by adaptive bit rate and bonding algorithm in Armed Unmanned Surface Vehicles.

Core Components of the Multi-Channel Solution

Channel Prioritization and Automatic Switching:

The system prioritizes channels based on operational criteria, automatically switching to the most optimal channel without manual intervention:

Priority 1: RF LOS – when in range with unobstructed line of sight.

Priority 2: GSM – if cellular signal strength and bandwidth are adequate.

Priority 3: Ku Band – ideal for extending communication range beyond LOS, especially in areas with limited GSM coverage.

Priority 4: L Band – enables global, reliable communication for AUSVs regardless of location.

Data Management at the Packet Level:

By fragmenting data and managing it at the packet level, communication remains stable even during channel transitions. This approach provides uninterrupted service, reducing operational delays and eliminating the need for reconnection protocols.

Enhanced Security via Adaptive Algorithms:

Adaptive algorithms adjust the bit rate and resolution based on line conditions, adding an extra layer of security and data obfuscation. This ensures that sensitive information remains protected throughout the transmission process.

Simultaneous Data and Video Transfer:

The system enables AUSVs to transmit video, audio, and data concurrently, enhancing real-time operational effectiveness without compromising quality.

Case Study: AUSV Communication Workflow

In a mission scenario, an AUSV deployed for reconnaissance, surveillance, or engagement relies on a seamless flow of commands and data to maintain operational effectiveness. Communication with the Ground Control Station (GCS) is managed through multiple channels to ensure continuity:

- **Initial Connection:** The AUSV first connects via RF LOS if within range and unobstructed.
- **Extended Range and Global Communication:** When operating in remote or highly obstructed areas, Ku Band and L Band ensures continuous data flow, allowing the GCS to maintain control and receive real-time information from the AUSV.

Conclusion

For AUSVs, a multi-channel and satellite-based communication solution offers a significant operational advantage, ensuring reliable connectivity across various mission conditions. By addressing both LOS and BLOS requirements, this system allows for uninterrupted and secure communication, maximizing the AUSVs' operational effectiveness in dynamic and challenging military environments.