Under Water Acoustic Communication

G. Nigitha
Dept of ECE-PITS

K. Saranya
Dept of ECE-PITS

U. Sivaranjani
Assistant professor
Dept of ECE-PITS

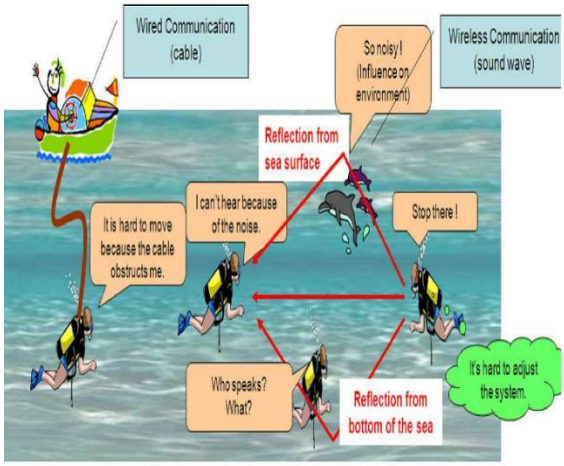
Abstract: **-In recent years, underwater acoustic (UWA) communications have received much attention as their applications are beginning to shift from military towards commercial. UWA communications are made difficult by the combined effect of multipath propagation and high temporal and spatial variability of the channel conditions. Until recently, the design of communication systems has mostly relied on the use of no coherent modulation techniques. However, to achieve high data rates on the severely band limited UWA channels, bandwidth-efficient modulation techniques must be considered, together with array processing for exploitation of spatial multipath diversity. The new generation of underwater communication systems employing phase-coherent modulation techniques will achieve at least a tenfold increase in data throughput. The communication scenario in which the modern UWA systems will operate is that of an underwater network consisting of stationary and mobile nodes. Current research focuses on the development of efficient signal processing algorithms, multiuser communications in the presence of interference, and design of efficient modulation and coding schemes.**

1.1 INTRODUCTION

- Technique of sending and receiving message below water.
- Most commonly employed using hydrophones.
- Difficult due to factors like multi-path propagation, time variations of the channel, small available bandwidth and strong signal attenuation.
- Underwater communication uses acoustic waves instead of electromagnetic waves.

1.2 DEFICIENCY IN CURRENT COMMUNICATION

- Future ocean environment will be increasingly complicated.
- Radio waves propagate under water at extremely low frequencies (30Hz-300Hz) & require large antennae and high transmission power.
- Optical waves do not suffer much attenuation but are affected by scattering.
- Acoustic waves are the single best solution for communicating Under water.



1.3 HISTORY

- The science of underwater acoustics began in 1490, when Leonardo Da Vinci, stated
- "If you cause your ship to stop and place the head of a long tube in the water and place the outer extremity to your ear, you will hear ships at a great distance from you.“
- In 1687 Isaac Newton wrote his Mathematical Principles of Natural Philosophy which included the first mathematical treatment of sound.
- In 1912 sinking of TITANIC and start of World War I, systems for detecting icebergs and U-boats were developed.

1.5 ABOUT

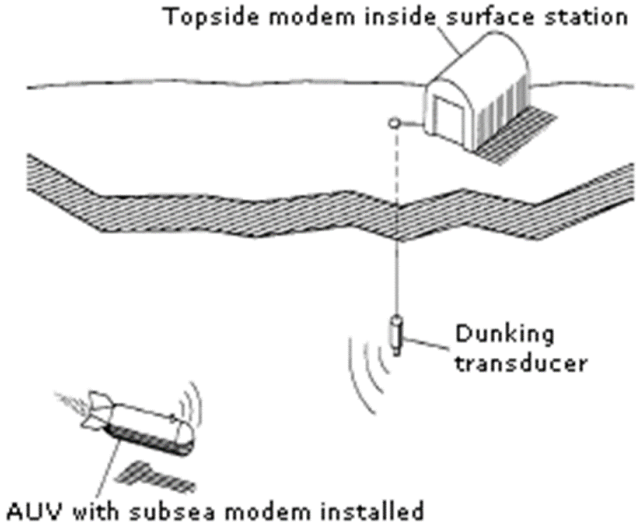
- Underwater Acoustics is the study of propagation of sound in water & interaction of mechanical waves that constitute with water & its boundaries.
- Typical frequencies associated with Underwater Acoustics are 10Hz to 1MHz
- The propagation of sound in the ocean at frequencies lower than 10 Hz is not possible.
- Frequencies above 1 MHz are rarely used because they are absorbed very quickly.
- Underwater Acoustics is also known as HYDROACOUSTICS.

1.6ACOUSTIC MODEM

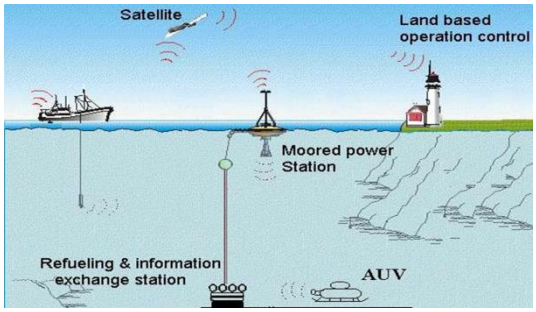
- Is used to transmit data underwater, much as telephone modems are used to transmit data over phone lines.
- Converts digital data into special underwater sound signals.
- These signals are then received by a second acoustic modem and converted back into digital data.
- Can be used for underwater telemetry, ROV and AUV command and control, diver communications, underwater monitoring.

1.7 AUTONOMOUS UNDERWATER VEHICLE

Autonomous vehicles working under the ice can be controlled and their data can be transmitted to a topside station using underwater acoustic links



1.8 ACOUSTIC LINK BLOCK DIAGRAM

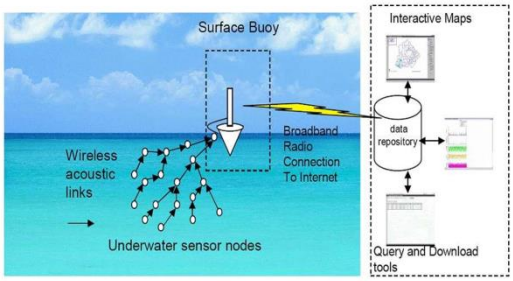


1.9FLOATING ANTENNA

- Existing system will transfer the information 1st to the GROUND STATION and to the ship But our new system will directly transfer the information.
- For floating antenna power will be given by the solar and wave in the sea
- The temperature sensor is used to sense the Temperature.
- Driver and Speaker used to pass the information

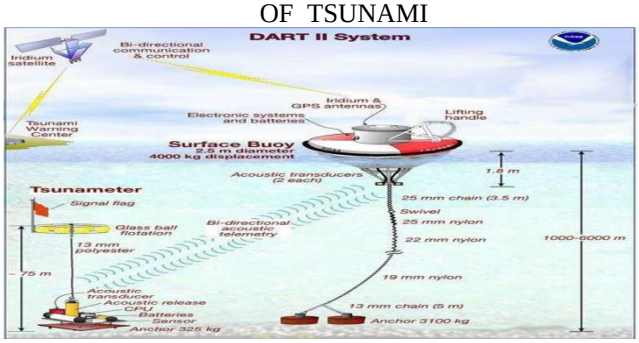
1.10APPLICATIONS

- Underwater data links can be combined with satellite data linksto provide data in real-time from instruments on the seafloor to scientistsashore.
- Can be used to provide early warnings of tsunamis generatedby underseaearthquakes.
- Pressure sensors that are deployed on the seafloor candetect tsunamis.
- U.S. National Oceanic and Atmospheric Administration (NOAA) Deep-ocean Assessment and Reporting of Tsunamis (DART) program has installed bottom pressure sensors near regions witha history of tsunami generation, to measure waves as theyspread.



1.11 UNDERWATER ACOUSTICS

1.12DEEP OCEAN ASSESSMENT & REPORTING OF TSUNAMI



1.13 DEEP-OCEAN ASSESSMENT AND REPORTING OF TSUNAMIS (DART)

- NOAA has created an expansive network of 39 DART buoy stations, with 32 located in the Pacific and 7 in the Atlantic Basin.
- Pressure data are transmitted to a near-by surface buoy via an acoustic data link using underwater modems.
- The data are then relayed to researchers on land in real-time via satellite.
- Researchers can also request real-time data independent of the automatic detection system. The data are used to provide early warnings of a tsunami before it comes ashor

DETECTING UNDER WATER OBJECTS

It mainly used to detect the under water object A robot crawler carries a modem, a camera is fixed on the top When object found, sends an acoustic signal to a ship or shore based station It used to detect the BLACK BOX,Human can able to go only certain distance,this device can easily moves very deep to the sea

1.14 CONCLUSION

- This topic gives the overall view of necessity of underwater communication and its applications.
- Despite much development in this area of the underwater communication,there is still an immense scope so more research as major part of the ocean bottom yet remains unexploded.
- Advanced versions of the existing applications.Therefore, the main objective is to implementation of advanced technology to overcome the present limitations such as the environmental effects on the noise performance of acoustic system.

1.16 REFERENCE

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