

Signal Processing for Active Sonar Sensor used in Sub Marine Technology

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Abstract

This paper speaks about the sound navigation and ranging in the submarine and the propagation of signal for the communication process. This process is used to detect the objects under the water. This paper focuses the recording and processing systems for the sonar signal and also the hardware and software of sonar simulators. In this process both active and passive sonar system was used to detect the appropriate functioning of submarine. It is used to dissolve the left right ambiguity and incorporate the information in the processing chain. This paper will also pivot it capabilities of anti submarine warfare. It will exploit a greater advantage in the air defense system and it will fuse the tracking of data between the multiple radars.

KeyTerms: active sonar, passive sonar, transducers.

I. INTRODUCTION

In this emerging trend the signal propagation through the sub marine is the tedious task. The sonar signal system is used to identify the signal propagation in the submarine. In this it uses the two types of sonar system active sonar system and passive sonar system. In the active sonar system. The passive sonar is used to detect the sound which is radiated by the target of interest. The active sonar system is used to detect the target of interest and the pulse of acoustic. Most probably the active sonar system only used in the persistent way. The signals will be received in the form of array and it will be characterized by the direction of arrival and spatial processing. In this process it will say about the sub marine process and the signals.

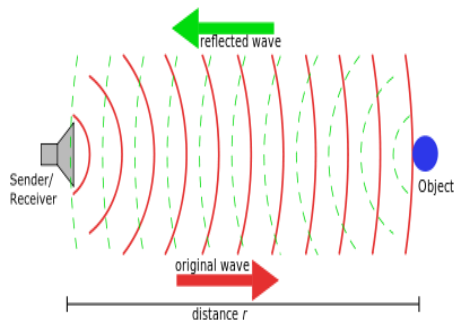


Fig 1: Active Sonar System In Signal Propagation Of Echo Target Information

II. EXISTING SYSTEM

In the existing system the processing of signal will only deals with the dimensional data and it does not give the proper targeted data in the sub marine signal propagation. Since the sub marines are used of diesel and the nuclear power it will not predict the appropriate object from the opponent path. Although the fewer subs will fleet with all the nuclear power it will give the greater proportion to their time and mission. In this they will use the passive sonar technology it will only predict the signals under the water through the targeted information it will not get the echo process. Therefore the object inside the water will not made clear to the sub marine.

III. PROPOSED METHODOLOGY

In this proposed system it will use the active sonar technology. This active sonar technology will also use the targeted information. In this the spatial spectral processing can be performed separately with no loss in the signal propagation. And the signal received from the such array will be categorized by the both direction of arrival rate. In this the beam forming technique of aggregated data will be collected by the all part of buoys. They use transducers for the signal propagation under the water in this the echo is received through the hydrophone array and it is processed to detect the track and classify the targeted information. This will also used in the obstacle detection system.

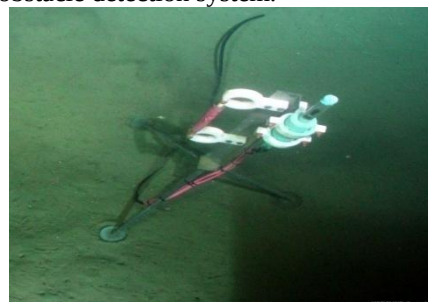


Fig 2: Hydrophone

This type of transducer will also use the hydro phone to receive the signal and will give the high ranking in the processing technology. The transducer is of different types each has propagated the signal in different frequency. It will also use the amplifier to modulate and demodulate the signal because each signal produced by the object and the submarine will be convictional in an efficient way.

HARDWARE AND SOFTWARES USED IN THE PROPOSED METHODOLOGY

In this proposed methodology to receive the passive data the front end simulator will be used it will generate the controlled simulated signal for the processor to provide the appropriate signal. It will also support for the processor test and calibration. It uses the individual process of bus to transfer the data from one end to the other end. Since the sonar was executed at different process rate the individual processor may also access to the memory buffer to smooth the flow of the result of data processing. The sonar system will follow the easy redirection of the signal and it will accommodate the new input sensor data. It will capture the output results by performing the simplest algorithms. And it will also expand the hardware expansion without the intervention of the software. The allocation of the processor and the data interprets between the processor will be depend upon the parameters of the all the interconnections in the well define system. This system will increase the speed of data driven which will not exceeds the real world constraint.

MATHEMATICAL IMPLEMENTATION USED IN THE TECHNOLOGY

The sonar equation will be formed based on the desired signal and the undesired back propagation of the received signal. In this equation the sonar system has the three parameters the equipment, the medium, and the target. In the active sonar equation the reverberation of the process will return the signal based on the increase in the source level and the target strength and the index will be reduced by the two way transmission loss and the noise level. The echo to noise in the active sonar system is determined by

$$DT = SL + DI_T + TS - 2TL - (NL - DI)$$

In this equation the SL is the process level of the signal or the source level where DI is the directive index and TS is the target strength and the TL is the transmission loss in the signal. The effect of reverberation will be put into the progress level of the signal propagation in this system

It will also uses to magnetic field for the response rate of the amplification and the acoustic signal and this will also reduces the ambient noise because it only detect the sound between the limited range. In this the pressure level will be calculated by

$$PL = SL - TL$$

The transmission loss will be calculated by

$$TL = 20 \log r$$

Where r is the transmission rate under the water.

ARCHITECTURAL FRAMEWORK OF ACTIVE SONAR SYSTEM

The architecture framework was used by the middleware technology. The middleware will lies between the Linux os and the application program. It will provide the set of services which can give the access to the application program using an interface. It will use the multiple threads to communicate with the different signals and to transfer the propagation of echo signals. The background normalization is used to detect the signal propagated in the sonar system. It will use various communication protocols such as TCP and UDP whereas it will work both in connection oriented and connection less oriented.

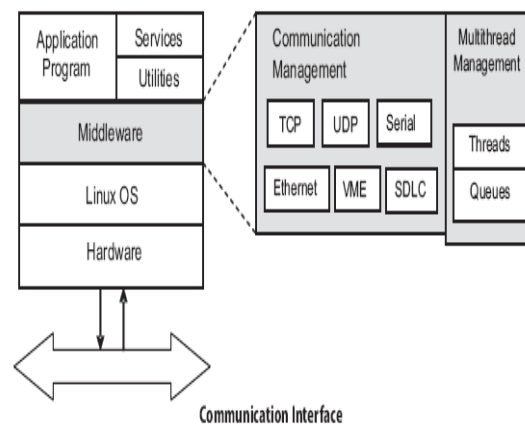


Fig 3: Architecture of Active Sonar System.

SONAR SIGNAL PROCESSING DISPLAY SYSTEM

The Solar signal processing display system were extracts the information from the data that is sensed by the sensor and it will be predict the information extracted from the arrival direction, speed of contact, bearing rate and the total frequency. The data coming from the various signals will be subjected to the variety of signal processing techniques. This process will be done using the high performance signal processing display techniques. It also uses the high speed interface for the data processor. It will also cluster the data as per the performance of the data processor. It will give the consistent frequency range and the process of utilizing the effort effectively and it will produce the result as such in the sonar transducers.

IV. CONCLUSION

This paper suggests a solution for the propagation of data under the water in the submarine using a system called sonar system. It will also use the recording system to process the original data as well as the echo data propagated under the water to find the object. Since this paper follow the active sonar system for the signal propagation it will give the accurate data to the submarine which will direct it into a right way.

REFERENCES

- [1] South, H. M., "Digital Recording and Signal Processing Systems for Hydrophone Arrays," Johns Hopkins APL Tech. Dig. 4(3), 212–218 (1983).
- [2] Microchip Data Sheet, "DsPIC30F4011/4012: High-Performance, 16-bit Digital Signal Controllers." Microchip[Online]. [Accessed February 3, 2009]. Available: <http://ww1.microchip.com/downloads/en/DeviceDoc/70135F.pdf>
- [3] Anderson, V. C., "Digital Array Phasing," J. Acoust. Soc. Am. 32, 867(1960).
- [4] South, H. M., "High Data Rate Recording and Processing Systems for Hydrophone Arrays," in Oceans '80: An International Forum on Ocean Engineering in the '80's, IEEE 80CH15727, Piscataway, NJ, pp. 263–266
- [5] Costley, E. Amana, F. Ealick and N. Rennalls, "Sonar Acquisition Module for autonomous Submarine System" Georgia Institute of Technology, Atlanta, GA, Dec. 2008.
- [6] Shar and X. R. Li, "Some Considerations of Submarine Sensor Fusion," Proc. of 1998 Int. Conf. on Information Fusion (FUSION'98), Vol.II, Las Vegas, Nevada. July 1998.
- [7] Analog Devices Datasheet. "Micropower, Single-Supply, Rail-to-rail input/output Op Amps: OP191/OP291/OP491." Analog Devices. [Online] [Accessed January 19, 2009]. Available: http://www.analog.com/static/imported-files/data_sheets/OP191_291_491.pdf
- [8] "Moore's Law: Made real by Intel Innovation" [Online]. [Accessed January 18, 2009]. Available: <http://www.intel.com/technology/mooreslaw/index.html>.
- [9] NXP Semiconductors. "Cortex-M3 based microcontrollers with Ethernet, USB, CAN and 12-bit ADC." NXP Semiconductors. [Online]. Available: <http://www.standardics.nxp.com/literature/leaflets/microcontrollers/pdf/lpc17xx.pdf>.
- [10] T. Capon, N. Davidge, A. Dupree, P. Enns, J. Gland, P. Goldin, D. Hakim, A. Janas, M. Levashov, N. Limparis, J. Lisee, S. Moskovchenko, J. Patel, L. Singer, and S. Watson, "Tortuga II Autonomous Underwater Vehicle," The University of Maryland, College Park, MD, 2008. Available: <http://www.auvsi.org/competitions/2008/journalpapers/UMD08.pdf>
- [11] Carlin, S. Choi, R. Gentry, M. Joo, M. Plante, D. Schlieter K. Weekly, and S. Young, "AUV 2008," The University of Texas at Dallas, Richardson, TX, 2008. Available: <http://www.auvsi.org/competitions/2008/journalpapers/utd.pdf>
- [12] T. C. Veilleux, M. Morissette, D. Robinson, and J. F. Im, "SONIA 2008: All In!," École de Technologie Supérieure, Montréal, QC, 2008. Available: <http://www.auvsi.org/competitions/2008/journalpapers/ETS.pdf>
- [13] South, H. M., "High-Speed Processors for Sonar," Johns Hopkins APL Tech. Dig. 11(1–2), 105–113 (1990).
- [14] "Operational Amplifier Variable Gain Circuit," [Online]. [Accessed January 19, 2009]. Available: http://www.radio-electronics.com/info/circuits/opamp_variable_gain_amp/op_amp_variable_gain_amp.php