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MAKE DEVICE TO MEASURE ICE THICKNESS USING SONAR

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Abstract— **SONAR ice thickness measurement comprises basic principle of ultrasonic wave reflection on interface of two different media ice water and ice air and to measure the thickness of ice by calculating time difference of reception and give indication to take appropriate step .Also to create and design handy tool which is reliable and easy to use which can be use for this application in order give safety indication for person who going to walk on ice surface***Index terms-* **Chaotic, Time Series, Earthquake,**

Keywords: SONAR

I. Introduction

The basic need of person whose work is carried on ice river, ocean is to know the strength of ice by means of thickness of ice on which his standing for safe condition. Presently, no technology is available which is more easy and reliable for measure thickness of ice, drilling the hole and measure thickness is very time-consuming and hectic phenomena. And cannot be implemented many times to analyze large area.

In modern technology, to measure thickness or the distance between two interfaces of two media, sonar is popular technology currently in use. So in this case, we are going to use sonar technology to calculate thickness of ice and decide the safety of working environment.

HISTORY

The conventional method which are presently used to measure thickness of ice are by drilling hole and insert measuring tape or insert string with pendulum. But all this method cannot be implemented on the large area with variable ice thickness. Unfortunately natural ice cover can be very inhomogeneous depending on the circumstances of formation. Bernard (1978) classifies ice cover into 12 types in three categories[2]. Many of the differences are related to the crystal size and orientation[]; other differences are related to the freezing process, such as slush ice formed from a mixture of snow and water or frazil ice in flowing water. This latter group has been found to have a much greater sound attenuation than clear ice. Hence it is necessary to design tool which gives instantaneous reading of present thickness of ice with shortest time possible for the application where time ,safety are greatly concern.

PRINCIPAL

In this, experiment we going to use basic principal of sonar by means of echo. We transmit high frequency (ultrasonic wave) into the ice and by observing time duration of echo and determine the distance of water ice interface[1].

As Bernard(1978), there are 12 types in three categories. Because of density variation, there is variation in speed of sound. Hence, different time delays for same thickness of ice of different categories. So ,It is very essential to adjust frequency of ultra sonic waves.

To counter this problem, we transmit a series of different frequencies and discard echo's, we specify thickness above safe limit. And calculate the average of those thickness .i.e.

$$\frac{(T_1+T_2+T_3+T_4+\ldots\ldots+T_N)}{N} = T_s$$

Compare T_S with all thickness measured and choose closest frequency for which we get T_s. take 10 readings for corresponding frequency and take average which is our final reading.[4]

Block diagram

It consists

- Microcontroller
- Frequency generator
  - Oscillator(100kHz to 150kHz)
  - Logical circuit
  - Adjustable square wave generator
- Transmitter & receiver section
- Audio section
  - Frequency divider
  - Frequency modulation carrier 1kHz
  - Audio amplifier & speaker
- Display and control panel

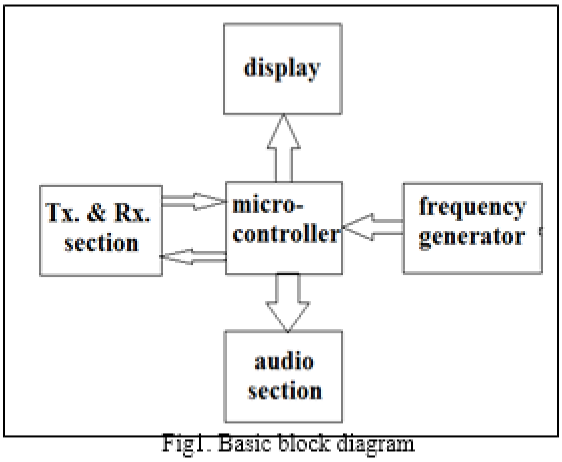

Fig1. Basic block diagram

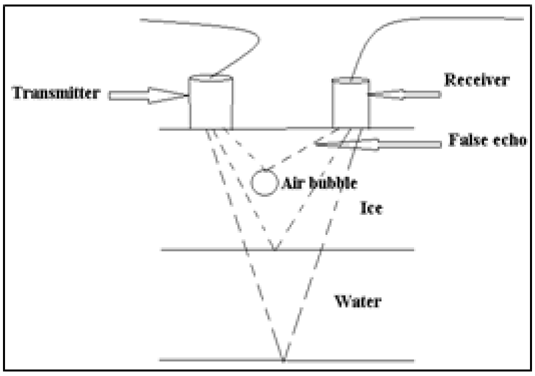

Fig2. Transmitter & Receiver section[3]

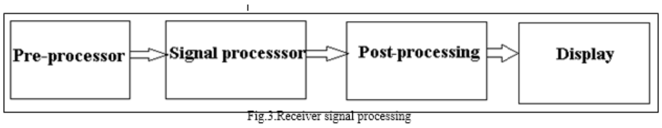

Fig.3.Receiver signal processing

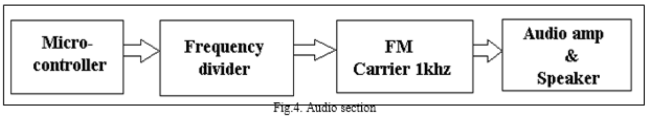

Fig.4. Audio section

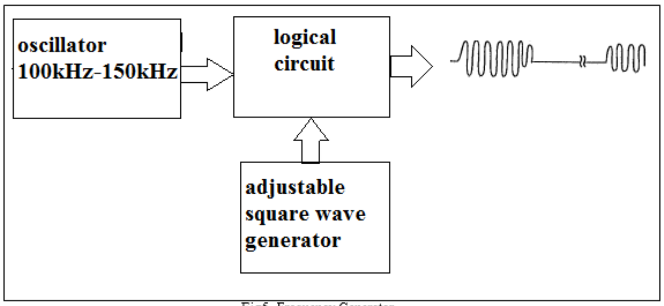

Fig5. Frequency Generator

CONCLUSION REMARKS

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It was found that the thickness of a layer of ice could be measured from the time required for an ultrasound pulse to propagate through a layer of ice and return as an echo from the ice liquid interface. The greatest difficulty arose from ice frozen from a slush from a mixture of snow and cold water[6]. This was due to the high attenuation of the sound in passing through the "slush ice." The sound velocity in The sample was found to be little different from clear ice and little reflection occurred at the "slush ice," clear ice interface. The observation that little reflection was observed at the slush-ice clear-ice interface implies good transmission of sound between the two regions. Since this region of slush-ice or "white ice" does not give a strong reflection of the sound wave, it should be possible to observe an echo from the ice-water surface below. Information on the structure of the water-ice interface with regard to the reflection was not attainable. Possibly only a field test will demonstrate the most common condition of the water-ice interface.

REFERENCES

- Kinsler, L. E. and Fry, A.R., (1950). *Fundamentals of Acoustics*, John Wiley New York.
- Bernard, M. (1978). *Ice Mechanics*, Les Presse De L'Universite' Laval Que'bec.
- Killen, J. (1959). "The Sonic Surface-Wave Transducer" University of Minnesota, St. Anthony Falls Hydraulic Laboratory, External Memorandum M-74.

- Gooberman, G.L. (1968). "Ultrasonics Theory and Application", Hart Publishing Co., New York.
- Hueter, T. F. and Bolt, R. H. (1955). *Sanies,* John Wiley & Sons, New York.
- John M. Killen & John S. Gullive, university of minnesotast. anthony falls hydraulic laboratory, Project Report No. 322