



DESIGN AND CONSTRUCTION OF A SMART MULTI-DIRECTIONAL ULTRASOUND DETECTOR

Ibrahim, A.G and Subair, F.

Department of Physics

Federal University of Technology, Minna, Nigeria

Corresponding author email: ibrahimaku@futminna.edu.ng

ABSTRACT

Ultrasound is inaudible to the human ear; hence a means of effective and accurate detection is necessary. In this work, an electronic device that is capable of searching, identifying and recording the instantaneous status and direction of ultrasound within the vicinity was developed. The device is made up of the following sections: power, sensing, amplification, comparison, control and output. These sections work in synergy to give precise detection and direction of ultrasound. The device is also equipped with a 360° scanning mechanism which enables it pick faint ultrasonic signal, amplifies it via a series of op-amps, calibrate its readings and display the result.

Keywords: Design, detection, SONAR, ultrasound.

1. INTRODUCTION

The use of ultrasound has grown, causing it to be in the spot light of many technological application through the years. Modern day applications such as SONAR (Sound Navigation and Ranging), 3D ultrasound imaging, ultrasonic monitoring of aircraft, crack detection in machines, etc. have gone a long way in providing abundant opportunities for more research in ultrasound and its applications. Ultrasound refers to sound frequency above 20 kHz (Novelline, 1997). But in reality, the foremost description which distinguishes it from normal sound wave is that it is inaudible to the human ear (Eric, 2013), its frequency being above the range of hearing for humans. Therefore, there is a challenge of detecting its presence in an environment and solution to such challenge can be proffered by ultrasound detectors. An ultrasound detector is an electronic device which contains a circuit employing a transducer that sends an electronic indication when ultrasound is sensed in the

vicinity (Seriki, 2015). Ultrasound detectors are widely used in various fields of

engineering and basic science (Adamu, 2009). But reports have it that existing detectors are short ranged, unidirectional, highly susceptible to false alarm (trigger) and expensive (Graham, 2016). It therefore becomes necessary to have a means of ultrasound detection that surmounts existing challenges at low cost. The aim of this research was to design and construct an ultrasound detector for sensing the presence and direction of ultrasound in a vicinity. This aim was achieved through the following objectives: to design an ultrasound detecting circuit equipped with highly sensitive and multidirectional capabilities, to construct the circuit designed using low cost materials and to evaluate the success of the constructed device.