UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE DEVELOPMENT OF NOISE ANALYZER SYSTEM AND DATA RELIABILITY USING ARDUINO

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Mechanical Engineering Technology (Automotive Technology) (Hons.)

By

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the Degree of Bachelor's in Mechanical Engineering Technology (Automotive Technology) (Hons). The member of the supervisory is as follow:

……

Muhammad Nur Bin Othman

(Project supervisor)

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ABSTRAK

Di mana-mana sahaja, masalah bunyi biasanya berlaku yang mengganggu kita. Pengukuran bunyi perlu dilakukan untuk mengukur tahap bunyi untuk mengenal pasti tempat-tempat itu selamat atau tidak dan kemudian untuk meningkatkan keselesaan manusia. Objektif kajian ini adalah untuk membangunkan perkakasan kos rendah yang mengukur tahap bunyi dan mengkaji kebolehpercayaan data. Tujuan lain kajian ini adalah untuk mengukur tahap bunyi pada makmal, dewan, perpustakaan, bilik darjah, dan bilik pensyarah / pejabat. Matlamat Tujuan kajian ini adalah untuk mengukur tahap bunyi di beberapa tempat dan membuat perbandingan antara meter paras bunyi dan mengira peratusan data yang berbeza. Dalam kajian ini, bunyi sensor / mikrofon digunakan untuk mengukur isyarat bunyi. perkakasan telah diletakkan di dalam tempat-tempat untuk mengukur bunyi. Kemudian isyarat tertakluk kepada keadaan operasi pemantauan dengan menggunakan penapisan. Hasil Graf isyarat bunyi dianalisis dengan menggunakan Microsoft excel. Keputusan keseluruhan menunjukkan berdasarkan purata data semasa diukur. Kemudian mendapatkan data dan mengira perbezaan peratusan perbezaan selepas membandingkan kedua-dua data.

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ABSTRACT

In anywhere, the noise problem normally occurred that disturbing for us. The noise measurement must be done to measure the level of noise to identify the places is safety or not and then to improve the human comfortable. The objective of this study is to develop the low cost hardware that measure noise level and study the data reliability. The other purpose of this study is to measure the noise level on, laboratory, library, classroom, hall and lecturer room/office. The aim goal of this study is to measures noise level in several place and can be used for making comparison between sound level meter and calculate the percentage different of data. In this study, the sound sensor/microphone was used to measure the noise signal. The hardware were put inside the places to measure the noise. Then the signal were subjected to condition monitoring operation by using filtering. The noise signal graph result were analysed by using Microsoft Excel software. The overall results indicated that the average on each data. Then get the data and calculate the percentage difference after compare both of data.

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DEDICATION

Work hard is important to getting knowledge and efforts as well as the guidance from the elders. I dedicate this final year project to our parents and lecturers, who taught us to think, understand and express, and not forget to my friends that helping to get knowledge to develop this project. I earnestly feel that without their inspiration, able guidance and dedication, I would not to be able to pass through the tiring process of this project

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LIST OF ABBREVIATIONS AND SYMBOLS

FFT	-	Fast Fourier Transform
AC	-	Alternating current
DC	-	Direct current
Hz	-	Hertz
kHz	-	kilo Hertz

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CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter explained the background, problem statements, objectives and scope of the study. The background states about the noise level and reliability based in several place measured.

1.1 Background of study

Noise is defined as unwanted sound and is present in any places (Fidêncio, Moret, & Jacob, 2014). This project is aimed at develop arduino analyzer and find its reliability. That it need to detect the noise from vehicle cabin, laboratory, classroom, library, lecturer room/office and hall. This device have a microphone that detect the noise and arduino as a microcontroller that measure to get the data. The arduino noise analyzer measures noise level in several place and can be used for making comparison between sound level meter type 2 devices. In this task I am going to show its reliability after compared both of result data and how to develop of product in processing that analyzes noise on several places and sends data to an arduino that show the data gets. I will be explaining where to find the materials, explaining the coding and wiring needed and making a comparison between sound level meter type 2 devices.

1.2 Problem statement

In the context of the human environment, noise is normally sound can make annoyance or disturbs activities such as in conversation, study and other. Interferes

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with concentration, disturbing an activities and affecting the health risk due to hearing damage.(Watkins et al. 2016). So, we need consider to control the noise level to improve the level of comfort and ergonomic. Besides that, in this project need to develop the hardware, coding and wiring needed in completing this product. To study the reliability data, calibration of a measurements must be consider after designing to get precise data to provide the good result. Alternatively, in this cases where the measurements or observations must be consider, by comparing both of data from arduino noise analyzer and sound level meter, we can find where our project reliability. Nowadays, to detect the noise level need to use special tools, all the tools are too expensive on market to assemble and analyze data.

1.3 Objectives

An objective is defined as the purposes or target that will be obtain after finishing the project.

1. To develop the low cost noise data logger.
2. To study the data reliability of device.

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1.4 Work scope

This project focus on analyzes the noise level on several place and sends data to an Arduino that show the result. This project starts with the measurement of the noise and providing comparison between sound level meter type 2 devices. From the result, the noise signal on different location at various place will be compared, then get the data reliability based on data get. Then the project continues with the signal processing using the Microsoft Excel to get the graph and to analyze the noise caused by various sources of noise with different place.

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CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

On this chapter discussed literatures on the Arduino noise analyzer and SoundPro SE/DL Series Sound Level Meters type 2. This study and research information are based on some major component and topics that related to this project. From that, every theory and information about is compared among it and summaries it as well as critically analyzed these documents to find its reliability. The best and related information will be chosen in this project. In addition, this chapter also will discuss about the result both of data based on graph produced , compare the data and software that use in our study that is C++ programming and QuestSuite Professional II.

2.1 Noise

Noise is commonly defined as unwanted sound happens for us. The noise also, happened from the human activities that come from home, urbanization, transportation and industry that disturbing surrounding. (Leeuwenhoeklaan, n.d.). The human hearing related with sound frequency and the sound pressure that measured in decibels (dB). Normally, the frequency that detected by human range from 20Hz to 20,000 Hz. Therefore the population on city have to faces noise problem, however, small town/villages near the roads and other places also as a victim of this problem.(Dhankar, Chhikara, & Lavanya, 2014). Moreover, by reducing noise

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pollution can improve human health and comfortable.(Safety, 2014) Nowadays, to detect the noise level need to use special tools such as noise dosimeters or sound level meters, all the tools are too expensive on market to assemble and analyze data. (Yartire, Hashemian, & Mohammadi, 2014). So, existing our project it give a lot advantages to handle this problem. Because the project saving cost, simple product and other.

2.2 Type of Noise

2.2.1 Internal noise

Internal noise is a type of sound that is generated internally. There are classification of internal noise. The first is shot noise. In modelling of passion process, shot noise also including on this process. The discrete nature of electric charge is sources of shot noise. In electronics shot noise come from the discrete nature of electric charge. The next is partition noise. The noise happened caused by random fluctuation in the division. Low-Frequency noise also one of classification of internal noise, the other name is flicker noise. This noise generally observed at frequency range below KHz. Then High-frequency noise usually observation in the semiconductor device. Lastly, is thermal noise or Johnson noise. Normally happen on the resistor or other sensitive resistive component on circuit that occur.(Noise et al. n.d.)

2.2.2 External noise

Noise generally including the external noise Because of communication system. There also including in classification of external noise which is Atmospheric Noise, Industrial Noise and other. The atmospheric noise, also known as static noise. The conflicts caused by natural disaster. For

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example lightning, discharge in thunderstorm and other. The next is Industrial noise. On vehicle, aircraft, and other are the sources of industrial noise. Lastly is extraterrestrial Noise are divided into solar noise and cosmic noise.(Noise et al. n.d.)

2.3 Harmful Effects of Noise on Human beings

The environmental health was affecting by the noise problem that give a lot of problem. There are many effect of noise pollution occurred in daily life. One of effect is disturbing on human communication. For example difficult to communicate with people because existing the noise. Besides that, Noise can disturbing our mood and behavioural stress. A person can feel annoying or uncomfortable because of noise. Noise can damage human hearing system, and can give effect on hearing system for human. Moreover, Noise also as a sources of headache, blood pressure, heart failure and other. The Noise also tend to increased heartbeat, blood vessels diseases and others. The last effect is noise may cause disease of liver, brain and heart.(Subramani & Sivaraj 2012)

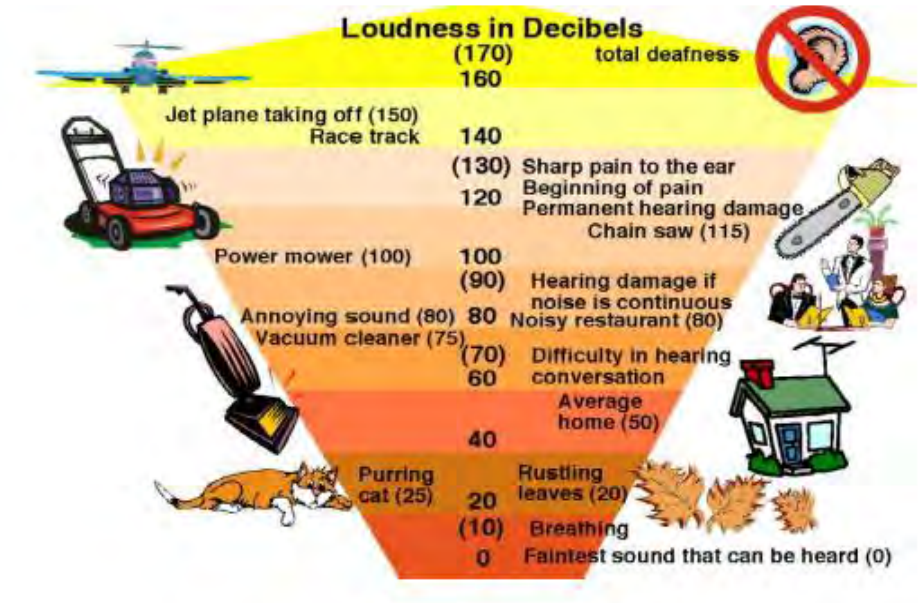

Figure 2. 1: Noise pollution sources and influence due to its levels in (dB)(Savale 2014)

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2.4 Noise Measurement

The noise measurement are measured by sound pressure level (SPL), the measurement involving the logarithm ratio of the sound pressure. The reference level is 0.0002 microbars, based on standard on human hearing.(Anon n.d.). The mechanisms of noise generate depend on the noisy operations and equipment.(Sehrndt & Parthey 1992)

2.4.1 The Decible

Decibel or known as "dB", on electronics devices it commonly related with noise measurements .The Decibel is unit for signals and communication, then represents as a relative quantity. When consume this units, a reference quantity is implied. For some purposes it is not required to know more detail about decibels, but when to change the decibels into another units, it required to know more detailed the meaning of it. Besides that, the decibels is important to give the results on calculations to get the data and the decibel also normally used in sound to express the sound level. The reference level is 20 micropascals, or 0.02 m. For sound intensity, (Surace 2003)

2.4.2 Frequency resolution

The sounds is hardly to hear with pure tones on single. For example, in range 20 Hz to 20,000 Hz, noise from whistle or horn. When investigating sound is a noise, we commonly are confuse with the sound signal. When separating a sound from other sounds, for example to detect the source of a sound or to measure how much specific for sound level, it require to look at the frequency components of the sound. (Division et al. n.d.)

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