UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND IMPLEMENTATION OF KNOCKING MECHANISM USING NdFeb MAGNET FOR TRADITIONAL GENDANG INSTRUMENT PLAYER

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

By

MUHAMMAD FARIZ BIN AZLAN

B071710621

961213045337

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

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Yang benar,

Fariz

Muhammad Fariz bin Azlan

Alamat Tetap:

NO 13 LOT 2069

KAMPUNG PERMATANG PASIR

75460 MELAKA

Tarikh : 6 JANUARI 2021

Disahkan oleh penyelia:

MOHAMED AZMI SAID

Encik Mohamed Azmi bin Said

Cop Rasmi Penyelia

TS. MOHAMED AZMI BIN SAID
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

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Signature: MOHAMED AZMI SAID .....

Supervisor: **EN. MOHAMED AZMI BIN SAID**

TS. MOHAMED AZMI BIN SAID
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

23 FEB. 2021

ABSTRAK

Pada masa kini, lagu tradisional semakin dilupakan oleh golongan belia. Untuk meneraik minat golongan tersebut projek ini adalah untuk mereka suatu alat yang boleh membuat ketukan. Berharap mereka akan tertarik dengan lagu tidak akan dilupakan. Selain itu, ketukan yang dihasilkan daripada pergerakan penggerak itu akan dijana dengan menggunakan neodymium iron boron magnet dan gegelung eletromagnetik. Lilitan yang menggunakan tembaga dan kedudukan magnet akan dikaji dan dianalisa bagi mendapatkan ketukan yang kuat. Projek ini juga dapat digunakan bukan sahaja untuk mengetuk alatan gendang. Malah ia juga dapat dilaksanakan untuk kegunaan proses ain. Sebagai contoh untuk membuat daging lembut dan membuat kuih tradisional Jepun iaitu kuih mochi. Teknik PWM dari L298N module untuk mengawal arus yang mengalir bagi pergerakan projek.

ABSTRACT

Now's a day, youth have been forgetting the traditional songs. To attract the interest of the group this project is for them a tool that can make a beat. Hoping they will be interested in a song that will not be forgotten. In addition, the beats generated from the actuator will be generated using neodymium iron boron magnet and electromagnetics coil. Brackets using copper and magnetic positions will be studied and analyzed for strong beats. This project can also be used not only to tap drums. It can also be implemented for other processes. An example of making soft meat and making traditional Japanese cake is mochi cake. The project utilizes the force field to control the flow of current for movement.

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TABLE OF CONTENTS

CHAPTER 3 - METHODOLOGYS

CHAPTER 4 - RESULT AND DISCUSSION

CHAPTER 5 - CONCLUSION AND FUTURE WORK

LIST OF FIGURE

LIST OF TABLE

LIST OF APPENDICE

LIST OF ABBREVIATIONS

ABBREVIATION

3D	3-Dimension
CAD	Computer Aided Design
NdFeB	Neodymium Iron Boron

CHAPTER 1

INTRODUCTIONS

1.0 Introductions

Java and Bali music is in popular music Indonesia's in Gamelan and has evolved around the world in Southeast Asia. The musicians prefer the modern musical instruments because of the modernization and make the name of the Gamelan less known to the young generations. So, this project is to offer a chance to create an Automatic Gamelan. This chapter introduces this project, which includes the background statement of the problems, objective, and scope of work of this project.

1.1 Project Backgrounds

This project, automated mechanical knocking mechanism from Gamelan, is designing, stimulating, manufacturing, and testing the Gamelan automated for playing the Gamelan. This system uses the electromagnetic function as the mechanism of knocking with the combination of permanent magnet (NdFeB) and solenoid coil. The Arduino will be used as the brain for this project. It will be giving instructor to the L298N and it be generated coil module then the mallet will be having force to hit the bonang.

The knocking mechanism is an example of a product that can be applied to the instrument player in gamelan. In addition, the electromagnetism coil will be reacted to knocking on the gendang instrument. In addition, the position of the magnet and the

copper that is used will be evaluated and examined to ensure optimum knocking force is achieved. By control current to generated force with the L298N module and PWM.

1.2 Problem Statement

This will become historical remains for young people and their fascinating and delighted voice, remembered only by the older generation in the absence of attempts to develop or enhance gamelan. Hence this project is built in the hope of solving the problem with the innovative combination of gamelan and maintaining the unique gamelan sounds.

The significance of positioning magnet and copper using coil for the gendang instrument player to get the knocking solid. The electromagnetism spindle and the neodymium iron boron magnet were tested and studied.

1.3 Objectives of Research

The objectives of this project as follow:

1. To studied the moving force of knocking
2. To run and analyze the automatic gamelan bonang knocking mechanism's capability.
3. To test and studied the technique of pwm to control current by L298N module

1.4 Work Scope of Projects

The scopes of this project are as follows:

1. The projects use solid work to design the actual project
2. The project uses electromagnetic coil and neodymium iron boron magnet for the actuator motion
3. The Bonang body part is conceived and manufactured using Solid work software and 3D Printer.

1.5 Report outline

The structure and layout of the thesis are as follow:

Chapter 1 – Introduction: This chapter will explain in a concise way the introduction for this project which includes the project's problem statement, goals and scopes.

Chapter 2 – Literature Review: This chapter will discuss the history of magnet neodymium and the software environment.

Chapter 3 – Methodology: This chapter will describe this project's methodology, which will explain the details of each method used to develop this project, and the procedure used to complete this project.

Chapter 4 – Result & Discussion: This chapter justifies the output data result and analyzes the data.

Chapter 5 – Conclusion & Recommendation: This chapter will conclude on the project as a whole, and will propose future projects.

CHAPTER 2

LITERATURE REVIEW

2.0 Electronic Bonang

Bonang Elektrika is a brand-new electronic gamelan designed and modelled by Alex Rigopulos after a Balinese Gong Kebyar consisting of seven instruments which act as MIDI controller. MIDI is basically a protocol that enables electronic instruments and other digital musical instruments to interact with one another. At least 11 or more performers will play the electronic gamelan at a time. Combined, the force-sensitive resistors (FSR), piezos, and capacitive sensing operate on this form of gamelan as three key percussive instruments. Although the gamelan design changes, the sound and contemporary of the music is still maintained as the original to maintain its authenticity. Gamelan Elektrika adopts a similar approach to Indonesia's very distinctive musical practices. MIDI allows for a massive new sound palette with new scales beyond traditional and non-traditional tuning. (Pardue, 2011).

The creation of music arts today allows traditional music culture to the younger generation, one of which is gamelan music. The gamelan has been started to give up. This is because of the younger generation more prefers in band entertainment, games and advanced technology. Attempts to return the younger generation to traditional gamelan music through the development of virtual music. (Dwi Lesmideyarti, Sarimuddin, Supria Jun 2018)

2.1 Neodymium Magnet

Sumitomo Special Metals and General Motor has belonged neodymium magnet's in 1982, following the formulation of the NdFeB alloy, which consists of neodymium as well as iron and boron. In response to the high price of samarium-cobalt magnets, neodymium magnets were first produced, giving the need to identify an economical, high-performance magnet. Although formulated jointly. General Motors and Sumitomo Special Metals followed different manufacturing processes with General Motors choosing to produce powdered bonded neodymium magnets while Sumitomo continued the sintering process, the same process used to manufacture our neodymium magnet range.

NdFeB or neodymium magnet remained as the world's strongest permanent magnet invented in 1983 by Mr. Masato Sagawa (Kozawa, 2011). This production of permanent neodymium magnet has increased rapidly due to its ability to reduce the power consumption and save energy compared to the ferrite magnet. Neodymium iron boron (NdFeB) compound are formed from the reaction between Neodymium (Nd), iron (Fe) and boron (B). This NdFeB however has many problems apart from its expensive price, such as restricted operating temperature and low corrosion resistance if this permanent neodymium is uncoated (Trout, 1999).

2.1.1 Specification of Neodymium Magnet

Super-Strong Super-Useful

They have cemented their place as the most common magnet since the development of the first neodymium magnet in endless applications. Industries such as the manufacture of electric motors, medical science, renewable energy, and technology all rely on the super-strength neodymium magnets, without which many of the advances over the last 30 years would have been impossible. They are also good for hobbies like art, modeling and jewelry making around the home. Due to their super-strength, incredible performance, and demagnetization resistance, they can be produced in many shapes and sizes, even as small as 1 mm in diameter, making their uses literally endless.

Rare=Earth

Neodymium magnets are often identified as rare earth magnets, since neodymium is part of the element family of rare earths. The word rare earth doesn't mean they 're uncommon, neodymium is plentiful in the Earth's crust – in reality it's more common than other precious metals like gold – the term comes from their geochemical properties, rare earth elements are usually scattered and not always found concentrated in commercially exploitable deposits. 45-50 000 tons of neodymium magnets are produced globally each year.

2.2 Solid work

Solidwork is Dassault System's one popular product, produced during December 1993. Solidwork was rated as easy to use by designers, which was true with both 2D and 3D CAD adoptions (Kostic, 2012). Solidwork is friendly user and much usable on the PC browser, compared to other CAD applications. This CAD is famous for being used at most educational level because it provides 3D software tools that help to better, quicker, and more cost-effectively design goods. Solid research has been applied in various field types such as medical, industrial, educational, transportation and science fields. In addition, Solidwork may also accumulate the parts which were design and assembly into part.

Figures 2.2.1: Solid work logo

2.3 Power electronics

Current controlled switch which means Bipolar Junction Transistro (BJT) is a shared anode that can be considered as two diodes. The BJT is a layered semiconductor consisting of a sandwich of materials P-N-P or N-P-N. Because the BJT is current-controlled, it has a low voltage of saturation which is desirable (Sprite, 2004). BJT has three terminals that can be connected to the Common Base Configuration, Common Emitter Configuration and Common Collector Configuration three types of connections.

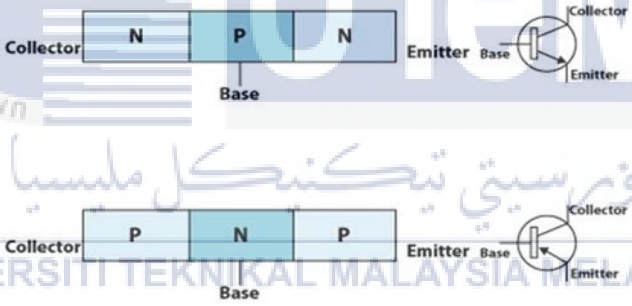

Figure 2.3.1.1: NPN Types and PNP Types Transistor

MOSFET stands for Field Effect Transistor of Metal Oxide Semiconductor. Like the BJT, MOSFET is a voltage-controlled switch that makes MOSFET attractive compared to BJT for its device switching (Sprite, 2004). MOSFET are mostly carrier devices that make them rise quickly and fall fast times. The MOSFET PN junction is formed on the main current carrying path made if either a material from the P-channel or the N-channel. The gate, drain and source terminal are the layered of the MOSFET due to the BJT layers.

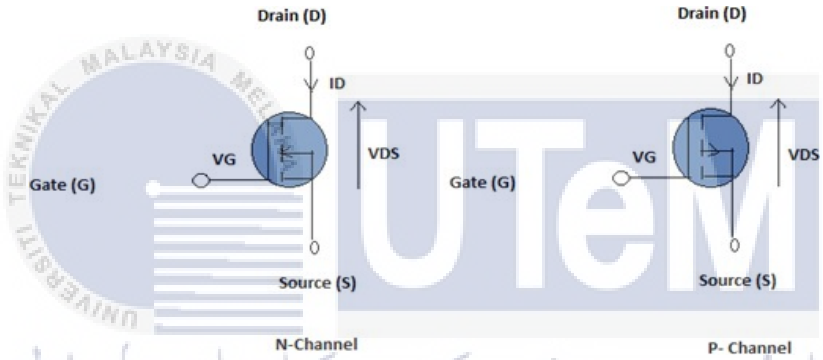

Figure 2.3.2.1 : N-Channels and P-channels

The Bipolar Transistor Insulated Gate (IGBT) has the more useful over the MOSFET and BJT transistors. IGBT is a voltage-controlled, current switch. That means this IGBT has the advantages of a bipolar's high-current handling capability with MOSFET control (Blake, 1970). IGBT has three terminals which are the collector, gate and emitter combined from BJT and MOSFET. The battery charging, welding and industril heating are the example of the industrial applications for IGBT and trend in the contruction of pwr supplies .