



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**(INCIPIENT OF E-BRAINY KIT) DEVELOPMENT OF
AN ELECTRONIC SYSTEM IN EDUCATIONAL KIT
USING ARDUINO TO SIMULATE TRANSIENT
RESPONSE IN CONTROL PRINCIPLE SUBJECT BY
USING DC MOTOR AS APPLICATION**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Di Universiti Teknikal Malaysia Melaka (UTeM), keperluan untuk pelajar tamat pengajian adalah lulus keseluruhan mata pelajaran terutamanya untuk subjek prinsip kawalan. Seperti yang diketahui, subjek prinsip kawalan adalah subjek teras untuk dipelajari oleh pelajar yang mengambil kursus elektrik dan elektronik. Oleh itu, dari masalah ini, ia mencetuskan projek yang membantu fokus pelajar dan tertarik dengan subjek ini. Objektif projek ini adalah untuk merancang kit pendidikan menggunakan Fritzing untuk litar dan Auto Cad untuk susun atur projek untuk menguji pengetahuan pelajar mengenai prinsip kawalan. Kedua, untuk membina kit pendidikan mudah alih dan kos efektif dengan Arduino Mega dengan program ini ditulis oleh Arduino IDE. Ketiga, untuk mengesahkan fungsi kit pendidikan dengan melakukan perkakasan dan ujian perisian. Akhir sekali, untuk mengesahkan fungsi sistem yang berkaitan dengan pernyataan masalah yang disebutkan dengan membuat tinjauan. Kaedah yang digunakan dalam projek ini adalah dengan menggunakan gambarajah blok untuk sistem menggunakan Fritzing, susunan litar menggunakan sistem Fritzing dan program yang menunjukkan bagaimana projek ini berfungsi. Kaji selidik juga telah diambil untuk menganalisis keberkesanan kit pendidikan ini. Faktor penting untuk membina kit pendidikan ini adalah untuk menjadikannya menarik bagi pelajar dalam konsep pembelajaran, mudah alih dan kos efektif. Hasilnya selepas analisis tinjauan, menunjukkan bahawa kit pendidikan ini membantu pelajar memahami konsep subjek tersebut

ABSTRACT

In Universiti Teknikal Malaysia Melaka, the requirement for a student to be graduated is to pass the entire subject, especially for the control principle subject. As known, control principle subject is the hard-core subject to be learned by a student that takes the electric and electronic course. So, from this problem, it triggered to do a project that helps student focus and interested in this subject. The objective of this project is first to design educational kit using Fritzing for circuit and Auto Cad for project layout for testing student knowledge on control principle. Secondly, to build a portable and cost-effective educational kit with Arduino Mega with the program is written by Arduino IDE. Thirdly, to verify the function of educational kit by performing hardware and software testing. Lastly, to validate the function of the system related to the problem statement mentioned by performing a survey. The method used in this project is by using block diagram for the system using Fritzing, circuit layout using Fritzing and program system that show how this project work. Survey also have taken to analyse the effectiveness of this educational kit. An important factor to build this educational kit is to make it interesting for a student in learning concept, portable and cost-effective. The result after analysis the survey, presented that this educational kit help student to understand the concept of the subject, easy to carry and make them more interested in using this kit compare to normal teaching concept.

DEDICATION

This thesis work is dedicated to my parent who has been a constant source of support and encouragement during the challenges of graduate and life. I am truly thankful for having my supportive supervisor and friend. Lastly to my beloved car PLQ 6438.

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LIST OF SYMBOLS

V - Voltage

LIST OF ABBREVIATIONS

CLK	Clock
FYP	Final Year Project
GND	Ground
IDE	Integrated Development Environment
I/O	Input Output
LED	Light Emitting Diode
LCD	Liquid Crystal Display
IR	Infrared
PWM	Pulse Width Modulation USB Universal Serial bus
RPM	Rotation per minutes
TFT	Thin-film transistor

CHAPTER 1

INTRODUCTION

1.1 Introduction

The purpose of this chapter is to create structure of this project on how this project work from beginning until this project finished. It consists of detail of the project requirement need in the building of this project that using hardware and software. The background of this project might be explained in briefly. This chapter will be covering the topic of problem statement, objective, scope of work and project contribution.

1.2 Background of study

Ashaari (1999), stated that, educational kit is another alternative that used by lecture to educate student. Educational kit also defines as a system that used in teaching that act as a creation of the hands on for the student in their studying session. Simulation it refers to the real-world experience and processes in the safe environment. The aim of the simulation is to prove and experience in the real thing by apply the learning and knowledge in class Ian Glover (2014). Based on the statistic of the effectiveness using education kit for teaching method, done by Muhamad Sobri (2000), concludes that student need the other alternative teaching method to gain their knowledge and make more understanding by using educational kits tools. This can also be proved by the survey done at Universities in Malaysia that educational kit can help student improve their skill of knowledge and it make student more interesting to learn during the

teaching session. According to N.Hikosaka (2012), educational kit are enjoying a remarkable market success today. In 2008 about 9000 educational system were shipped and 2010 shipment exceed 100000 which is most of these is educational kit. So, based on the research by using key word of educational kit, this project is done for student in Universiti Teknikal Malaysia Melaka. The scope subject for this educational kit is Control Principle subject that well known as one of the killer subjects in this course. This educational kit in control principle still relevant where based on the literature review done only five educational kit are related to this subject. This show the potential of this educational kit are in the market demand.

Control principle subject is the main subject that compulsory to be taken by student to be graduates on time. Mostly, student in faculty of Electrical And Electronic Engineering Technology (FTKEE) that takes this subject. There are a lot of topic to be cover for this subject but for this project it just takes one of the subtopics in this subject which is transient response. Transient response is chosen because transient response is the famous question ask in examination. This subject has theory and practical to test student knowledge about control principle. Based on survey that have done, as known, control principle subject is the hard subject this can prove by 62% respondent give feedback that this subject is the hardest subject in the faculty so student unconcern about this subject because they cannot understand in the short time. The teaching method that use chalk and talk make them feel bored in class and not focused while lecture. Student need other method learning that can make them interested in learning this subject this can be prove by 70% strongly agree that they need other teaching method in order to make them interested in this subject.

1.3 Problem Statement

To be graduated, control principle subject is the compulsory subject that has to be taken by student of engineering in university. Student has to pass in this subject before they graduate. In Universiti Teknikal Melaka Malaysia (UTeM), control principle subject will focus on student that taken electric, electronic and mechanical engineering. Memes (2012) stated that Control System is the hardest subject for Engineering courses because it involves a lot of math. Kent Aldershof (2016) stated that for Electrical Engineering Control System may be the toughest subject to be learn because without proper knowledge of control systems student cannot be an electrical engineer. Based on survey that have done, student unconcern about this subject because they cannot understand in the short time. Student need more time to generate and understand the concept of control principle. If just learn in theory class for the 2 hours student will not see the concept of control principle. So, it will take some time for understanding. Moreover, in lecture, it will be held in the class with crowded student. Student might be not focus on the lecture in front because the condition of the class with crowded student and sometime student feel not comfortable in class. In laboratory it has challenges that differ from those in a standard classroom environment, it becomes tough for students to catch-up the lesson due to the laboratory session. According to Babadogan and Olkun (2016) one of the most important barrier to reform program was a shortage of learning activities that support hands-on learning and visible modelling to represent abstract concepts. Therefore, one of the solution might be using educational kit to provide student opportunities to actively engage and conduct experiments involving abstract theoretical concepts by using product.

1.4 Objective

The main objective of this project is to make an improvement from the previous Transient response quiz box. In order to achieve the main objective, there are several objectives as follows:

1. To design educational kit using Fritzing for the circuit layout, drawing 3D prototype using Auto Cad and build educational kit using Arduino Mega 2560 as controller. The program is written using Arduino IDE.
2. To build a portable and cost-effective educational kit for universities and Technical School. This educational kit is built with portable size 20x25x10cm, 500 gram in weight for easy carrying and total amount for this kit are rm 200.
3. To verify the functionality of the educational kit by performing testing of hardware and software. This will be done by testing one by one of the connection port on the kit and see the results either it produces the expected output or not.
4. To validate the functionality of the system related to the problem statement mention by performing survey consist of 15 survey question and 50 respondents of UTeM FTK student. 15 question of survey is been distribute to 50 respondents on UTeM FTK to be answer based on the demonstrating the educational kit to the respondent.

1.5 Scope of Work

Incipient of e-brainy KIT are design with portable and easy carrying kit. Portable mean that this kit can be bring every ware at any time and condition with the minimal size 20x25x10cm and light weight about 500g only. The cost for this project also affordable for student which is RM 200 with all the component and also casing. The case for this kit is buy from hardware shop and not using 3D printing because the cost if using 3D printing may be high. The component use in this project involve Arduino Mega which have more port compared to Arduino Uno, Motor driver as drive the DC motor speed, LM393 for speed sensor, Liquid crystal display (LCD) and Thin film transistor (TFT) as display indicator lastly keypad as input for this kit. This kit is educational kit that use simulation concept to test the effectiveness for the educational kits. Survey also been done to analysis the effectiveness of this kit. The survey consists of 15 question with 50 respondents in UTeM for FTK student. Nigel et.al (2007) state that the ideal situation to test the questionnaire on a small number of respondents who are the same type as those in the sampling frame is between 5-50 respondents depending upon the final sample size. Demonstrated will demo first for the respondent before they answer the survey question. This is to make sure the respondent can respond and understand the survey question. After collect 50 respondent, the survey question is close, and the analysis will be made to know the effectiveness of this kit.

1.6 Project contribution

The aim for this project is to help student especially for student in UTeM faculty of technology that take control principle subject and build a portable and low-cost kit.