UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF MILK DISPENSER USING ARDUINO MICROCONTROLLER

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

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of **Bachelor of Electrical Engineering Technology (Industrial Power) with Honours**. The member of the supervisory is as follow:

……

(INTAN MASTURA BINTI SAADON)

……

(DR MOHD BADRIL BIN NOR SHAH)

ABSTRAK

Tujuan projek ini ialah untuk merekabentuk satu protaip dispenser susu yang mempunyai dulang botol dengan mengaplikasikan sistem terbenam yang boleh mencampurkan susu formula dengan air suam mengikut kuantiti susu formula yang dipilih. Selain itu, suhu air dalam periuk termos perlu mengekalkan suhu yang sesuai. Tambahan pula, projek ini mempunyai dua bahagian iaitu perisian dan perkakasan. Bagi pembangunan perisian, projek ini menggunakan perisian Proteus yang digunakan untuk mensimulasikan litar dan pemgawal mikro Arduino untuk mengawal perkaksasan. Manakala, pembangunan perkakasan pula dibahagikan kepada tiga bahagaian iaitu bahagian susu formula, bahagian mencampurkan dan periuk thermos. Pada akhir projek ini, peranti yang dibangunkan boleh memendekkan proses menyediakan formula susu berbanding dengan kaedah manual. Oleh itu, peranti ini sesuai untuk menyediakan susu kepada bayi dengan kadar segera.

ABSTRACT

The aim of this project is to design a prototype of milk dispenser with bottle tray by applying embedded system that can mix milk formula and warm water based on the chosen the amount of milk formula. Besides, the temperature of the water in thermos pot has to be maintaining at appropriate temperature. In addition, this project contain of two parts, namely software development and hardware development. For software development, the project uses Proteus Software to simulate the circuit and Arduino microcontroller to control the equipment. Whereas, the hardware development divided by three parts specifically milk powder storage, mixing bowl and thermos pot. In the end of this project, the the developed device can shorten the milk preparation shortening as compared to manual method. Thus, this device is suitable for preparing milk for baby instantly.

DEDICATION

To my beloved parents and family,

To my supervisor and co-supervisor,
Puan Intan Mastura binti Saadon and Dr. Mohd Badril bin Nor Shah,

To all my friends,
who support and help me.

ACKNOWLEDGEMENT

First and foremost, I would like to thanks to ALLAH S.W.T for his blessing to me and a very thanks to my parents and family for support me to finish my study. Then, I would extend to thanks my supervisor, Madam Intan Mastura binti Saadon as my supervisor and Dr. Mohd Badril bin Nor Shah as my co-supervisor for all the information and guidance to me to finish this project. Lastly, I also would to extend my appreciation to my entire friend who gave support and help.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

IDE	-	Integrated Development Environment
ISIS	-	Intelligent Schematic Input System
AC	-	Alternating Current
DC	-	Direct Current
I/O	-	Analysis of Variance
LCD	-	Liquid-Crystal Display

CHAPTER 1
INTRODUCTION

1.1 Introduction

This chapter briefly discussed on the general idea of this project, including of project background, problem statement, objectives and work scope.

1.2 Project Background

Milk Dispenser is fully automated milk maker that using Arduino microcontroller. It is a system for how to prepare milk for baby immediately. A baby crying about 2 a.m in the morning is the most difficult matter especially for first time parents. A parent with sleepy eyes tends to pour milk into the feeding bottle carelessly. This will cause the bottle to slip away from hand and can cause unfortunate incident such as the hot water burn. It is also time consuming for the parent to prepare the milk. Therefore, this project is designed using embedded system that can mix the water with the desired amount of formula milk. In addition, this project also designed a prototype of milk dispenser that can put the bottle tray. This process of milk preparation can protect the safety of parent when preparing the milk with sleepy eyes and it can shorten the milk preparation time.

1.3 Problem Statement

A milk dispenser is designed to mix formula milk with warm water automatically with shortening time of preparation of milk. This is because the preparation of milk manually is time consuming. In order to make milk manually, the water has to be heated and to be cooled at an appropriate temperature, the quantity of baby formula has to be measured by using a spoon, the warm water and milk formula have to place in a bottle and have to shake each other. It is most difficult part for parents to wake up and to pour in the feeding bottle with a sleepy eye, especially at around 2 a.m. In addition to shorten the time for milk preparation, it is also to protect the safety of parents during midnight. This is because many possibilities will occur, such as hot water burn, milk spill, hot water spill or anything-unexpected accident due to sleepy parents. The other problem view, parents might not give the right recipe per bottle toward the desired amount of formula milk and water. Thus, by this system, the amount of formula milk and water was measured due the right recipe.

1.4 Project Objectives

The objectives evaluated to assist and completing this project;

(i) To design a prototype of milk dispenser that can put the bottle tray by apply an embedded system that can mix formula milk and water.

(ii) To analyse the performance of time for milk preparation.

(iii) To develop thermos pot that can maintain the temperature of water for milk production

1.5 Project Work Scope

This project that design with embedded system is process of milk preparation will be quick where can mix the recipe and milk immediately;

(i) Software development is using Arduino and Proteus that can simulate the circuit and link with the hardware.

(ii) The hardware development is designed mechanical part of the dispenser by sketch up and develops the prototype to be implemented with the electronic parts and it also includes the DC motor, water heater coil and relay.

(iii) By detecting the temperature of water using temperature sensor and the Arduino microcontroller as a controller which can control the fluctuate temperature of water at 40^0C. In addition, on off controller is chosen in this system.

1.6 Thesis Outline

This thesis outline consists of five chapters and is organized as follows.

(i) Chapter 1: This part briefly describes on the general knowledge of this project, including of introduction, problem statement, objective and scope of this project.

(ii) Chapter 2: This chapter has been explained about the literature review regarding and related to this project. It is important in order to obtain the some knowledge or concept of this system. Then, explanation in general of software and hardware development also included in this part.

(iii) Chapter 3: This part focuses more about the process of constructing and define the methodology that to conduct this project with theory and practical.

(iv) Chapter 4: This part will be discussed about the result regarding the experiment that's been done and the analysis of the result is also explained.

(v) Chapter 5: This section will present the conclusion of this project and recommendation for future upgrading

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature review covers the information and idea for finishing this project being discussed. There are many resources had been taken for this project such as books, journal and website. Besides that, this chapter will also discuss on detailed description about the circuit, software and hardware, which used in the project. This chapter also refers from previous project in order to make some modification to improve or take some idea for this project. This kind of thing being very significant and useful to complete the project that created.

2.2 Arduino Microcontroller

Arduino is common term for a software company, project and user community that design manufactures computer open-source hardware, open-source software and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices.

2.2.1 Introduction to Arduino

Arduino is an open-source electronics prototyping platform based on easy-to use hardware and software.

Arduino boards are able to read input and turn it into an output. For example, light on a device or a finger on a key as an input, then turn it by triggering a motor, turn on an LED or publishing something online that act as output.

By transferring a set of commands to the microcontroller on the board, the board can function. Figure 2.1 shows the definition of Arduino and Figure 2.2 shows the example of a basic Arduino project.

OPEN SOURCE	**Resources that can be used, redistributed or rewritten free of charge often software or hardware**

ELECTRONIC	A technology which makes use of the controlled motion of electrons through different media
PROTOTYPE	An original form that can serve as a basic or standard for other things
PLATFORM	Hardware architecture with a software framework on which other software can run

Figure 2.1: Arduino definition

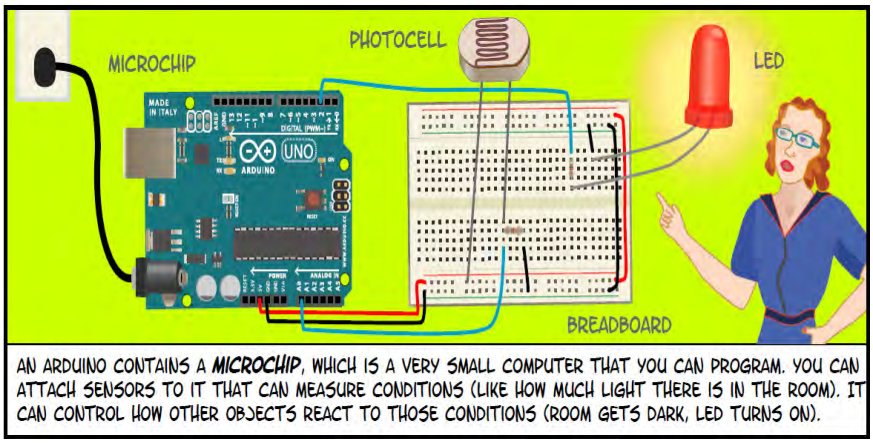

Figure 2.2: An example of basic Arduino project

Arduino was born at the Ivrea Interaction Design Institute, Italy as an easy device for fast prototyping, an aimed at learners without a background in electronics and programming. As soon as it reached a wider public, the Arduino board started changing to familiarize to needs and challenges, differentiating its offer from simple 8-bit boards for products for late applications, wearable, 3D printing and embedded environment. Totally Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source and it is growing through the contributions of users worldwide.

2.2.2 Arduino Board

Arduino senses the environment by receiving inputs from many sensors and affects its surroundings by monitoring lights, motors and other actuators. Figure 2.3 shows the complete Arduino-based system overview and Figure 2.4 shows the Arduino Products.

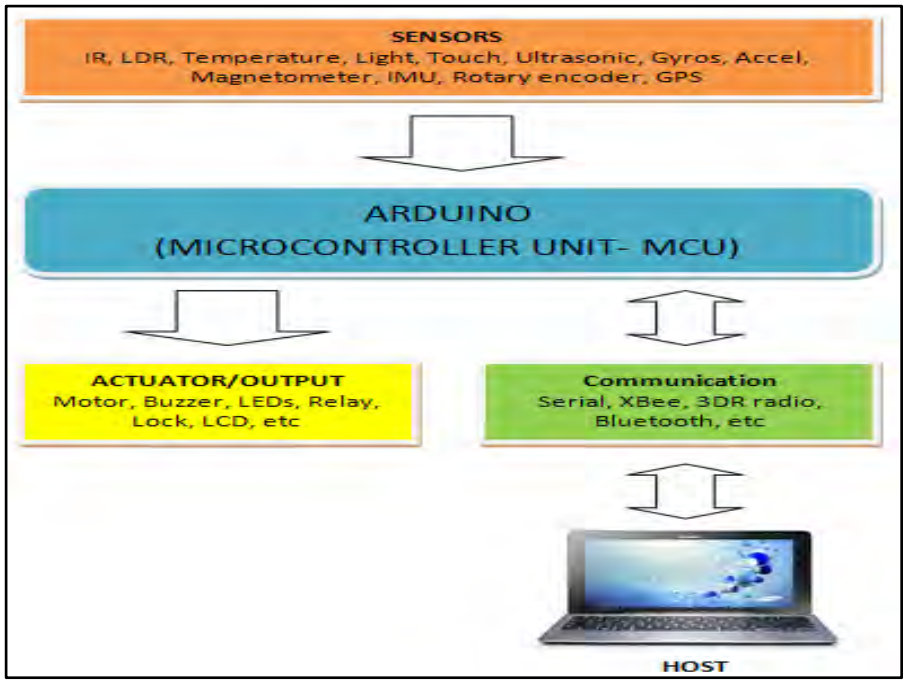

Figure 2.3: Complete Arduino-based system overview

Figure 2.4: Arduino products

2.2.3 Arduino UNO

Arduino is an open-source microcontroller platform with a development environment that implements the Processing / Wiring language. The Arduino UNO board is a microcontroller in light of the ATmega328. It comprises of 14 computerized input/output pins out of which there are 6 pins that be able to utilized as PWM yield, a 16 MHz artistic resonator, an ICSP header, a USB association, they're 6 analog input pins, a power jack and a reset button. This contains the whole that needed help required for microcontroller as shown in Figure 2.5 and Figure 2.6 shows clearly the specification of Arduino.

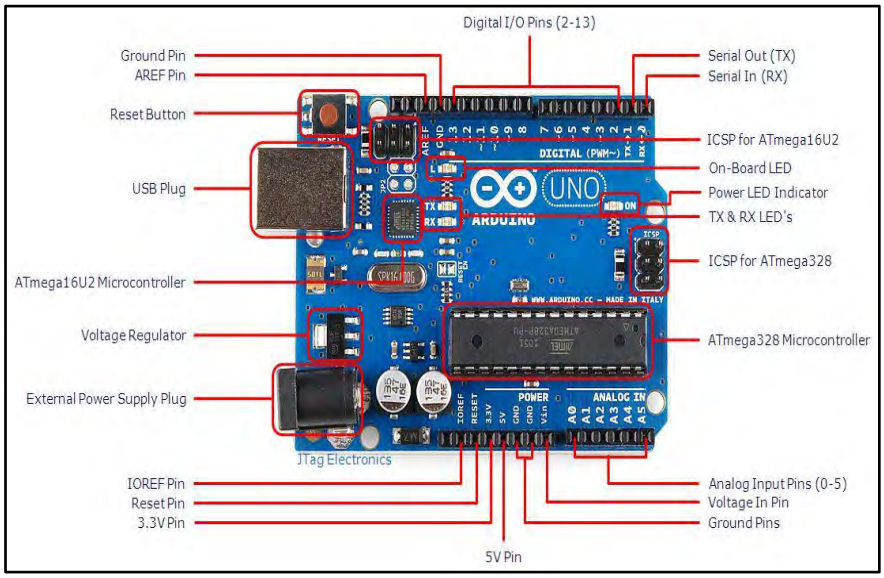

Figure 2.5: Arduino UNO diagram

Technical Specification	
Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Figure 2.6: Technical specification of Arduino UNO

2.3 Software Specification

This part is to review about software that will use on this project. There also with some knowledge with the regard of the software

(i) Proteus 7.8 Professional

(ii) Arduino Software (IDE)

2.3.1 Proteus 7.8 Professional

By using this software, the related circuit designer can be designed and simulate smoothly. It is also able to carry out an outline of the whole circuit for this milk preparation system. With this software, Intelligent Schematic Input System (ISIS) is used to obtain the output characteristic. It is widespread due to it is suitable with any types of microcontroller. Thus, it is easy for users to design and simulate the circuit. Figure 2.7 shows the simulation of ISIS.

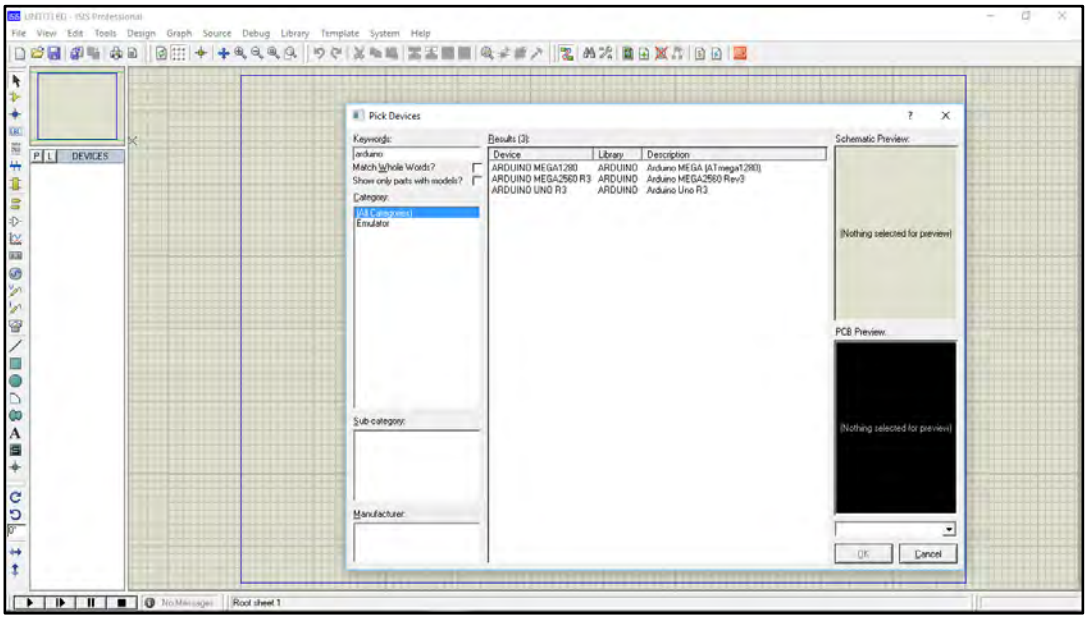

Figure 2.7: Proteus 7.8 Professional

2.3.2 Arduino Software

The open-source Arduino Software (IDE) makes it simple to create code and transfer it to the board. It keeps running on Windows, Mac OS X and Linux. The environment is composed in Java and in light of Processing and other open-source software. This programming can be applied with any Arduino board. The Figure 2.8 shows the Arduino Software.