UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF PORTABLE STOVE OPERATING USING PELTIER EFFECT

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

by

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I hereby, declared this report entitled DEVELOPMENT OF PORTABLE STOVE OPERATING USING PELTIER EFFECT is the results of my own research except as cited in references.

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APPROVAL

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

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ABSTRAK

Portable stove operating using Peltier effect memberi tumpuan kepada pembangunan sebuah dapur mudah alih yang beroperasi dengan menggunakan Peltier untuk menyediakan haba. Dapur ini akan menjadi mudah alih kerana ia beroperasi menggunakan bekalan dari bateri Li-Po 3S. Voltan pengoperasian minimum untuk bateri menentukan 10.1V, dan maksimum ialah 12.6V, jadi jika bekalan lebih rendah daripada ambang minimum, Peltier akan ditutup secara automatik. Algoritma pengawal yang dipilih adalah pengawal Derivative Integral Proportional (PID) untuk mengawal suhu pemanasan atau penyejukan ketika suhu disesuaikan ke titik set. Mikrokontroler, Arduino Uno R3, akan menjadi papan utama untuk mengendalikan program ini untuk menjalankan pengaturcara.

ABSTRACT

Portable stove operating using Peltier effect focuses on the development of a portable stove that operates by using a Peltier to provide heat. The stove will be portable because it operates using the supply from a Li-Po 3S battery. The minimum operating voltage for the battery is specify to be 10.1V, and the maximum is 12.6V , therefore if the supply is lower than the minimum threshold the Peltier will auto shut down. The controller algorithm that is chosen is the Proportional Integral Derivative (PID) controller to control the temperature of heating or cooling when the temperature is being adjusted to its set point. A microcontroller, Arduino Uno R3, will be the main board for operating the program to run the programmers.

DEDICATION

To my beloved parents, my family and my friends that I acknowledge my sincere indebtedness and gratitude to them for their love, dream and sacrifice throughout my life. Their sacrifice had inspired me from the day I learned how to read and write until I have become now. I cannot find the appreciate words that could find the appropriate words that could properly describe my appreciation for their devotion, support and faith in my ability to achieve my dreams.

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LIST OF SYMBOLS

Kp	-	Proportional Gain
Ki	-	Integral Gain
Kd	-	Derivative Gain
T	-	Instantaneous Time

LIST OF ABBREVIATIONS

PID	Proportional Integral Derivative
LCD	Liquid Crystal Display
TEC	Thermoelectric Cooling

LIST OF PUBLICATIONS

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will clarify about the background of the project, problem statement, objective, scope and thesis organization of this project which is the highlight of the project.

1.2 Background of Project

Nowadays, outdoor activities and outdoor recreation are the most activities people are involving. It is refers to leisure time in the outdoors, often in rural or town. Figure 1.1 shows the data for outdoor participation from 2006 to 2016. Numerous movement can be done alone or in a bunch like experience hustling, hiking, cycling, camping, canoeing, crayoning, angling, climbing, horseback riding, chasing, kayaking, shake climbing, running, cruising, skiing, surfing, ATV riding, and sports (Recreation, 2017).

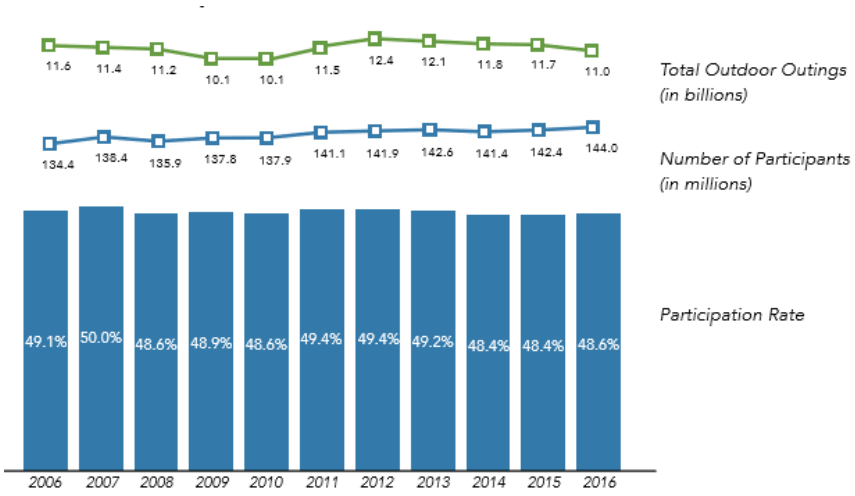

Figure 1.1: Camp stove using wood burning (Recreation, 2017)

When go outdoor activities, all the equipment should be prepared well. More preparation should be considered such as food and beverage for those who take a long journey to do outdoor activities. People will plan their meals before the journey. People will bring along a stove as it is more convenient to cook. The stove should be ultralight and easy for people to carry during explorations. Figure 1.2 shows the example of traditional camp stove using wood burning.

Figure 1.2: Camp stove using wood burning (Recreation, 2017)

A few decades ago, people would gather firewood to cook. This traditional camp stove is not practical if the wood was wet caused by bad weather, people could not light up the fire. This method does not guarantee if the food is safe and clean to eat. All this things may be harmful to people and environment because of the occurring open burning. Wood burning contributes pollution to environment in the form of smoke when the wood was burned.

Nowadays there are many variety of design and models of camp stove .These portable camp stove can be categorized based on the type of burner used and stove design. There are many types of camping stove people always use like canister , liquid fuel , alcohol burning , solid fuel and wood burning (Handbook, 2014). Portable camp stove allowed people to cook anything wherever they are. But some of this portable stove is not suitable for high land which has a high pressure so it is difficult to light up the flame. Furthermore, these stoves do not work in extreme cold.

The current portable camp stoves are still not light in weight. Although these type of burner are small but the stove is still heavy to bring. People also will bring the fuel according to how long the duration. Then, people should bring many burners for long distance explorations .In addition, the heat distribution, pollution, safety, the stove weight is difference based on the characteristics. Figure1.3 shows the types of camping stove people that had in market.