UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AFFORDABLE SYSTEM PREVENTING DEATHS OF CHILDREN WHEN ACCIDENTALLY LEFT IN PARKED VEHICLES

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

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **SYSTEM PREVENTING DEATHS OF CHILDREN WHEN ACCIDENTALLY LEFT IN PARKED VEHICLES**

SESI PENGAJIAN: **2015 / 2016 SEMESTER 1**

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I hereby, declared this report entitled "Affordable System Preventing Deaths Of Children When Accidentally Left In Parked Vehicles" is the results of my own research except as cited in the references.

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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 of Engineering Technology (Department of Electronics & Computer Engineering Technology) (Hons.). The member of the supervisory is as follows:

……

(Mr. Shahrizal bin Saat)

ABSTRACT

Latterly, news regarding child's death due to the heatstroke after being trapped inside a motor vehicle is going viral despite the efforts of private and public organizations or institutions, car productions and punter group to prevent the issue. Even perfect parents can unknowingly forget about their child in the back seat. This project is basically to prevent deaths of children due to heatstroke when accidentally left in parked vehicles. This paper describes the design of an affordable module that interfaces between PIC 18F4550 and a PIR sensor together with a sound sensor module. The system allows the windows to be automatically rolled down when both PIR sensor and microphone sensor are in active state. Active state means the PIR sensor has detected a form of movement while microphone sensor has detected noise produced. Apart from that, two relays are used to allow the direction of the DC motor to rotate either clockwise or anti – clockwise. By installing this module, it can reduce the potential of a child to get heatstroke.

ABSTRAK

Sejak kebelakangan ini, jumlah kematian kanak – kanak akibat strok haba selepas terperangkap di dalam kenderaan bermotor makin meningkat walaupun dengan usaha pelbagai pihak organisasi dan institusi kerajaan mahupun swasta, pengeluar kereta dan pengguna untuk membanteras masalah tersebut. Malah ibubapa yang sempurna tanpa disedari boleh melupakan anak – anak mereka di tempat duduk belakang. Pada dasarnya projek ini direka untuk mencegah kematian kanak – kanak akibat strok haba jika ditinggal secara tidak sengaja di dalam kenderaan bermotor. Kertas kerja ini menghuraikan reka bentuk mampu pilik produk antara PIC 18F4550 dan sensor PIR berserta modul sensor bunyi. Sistem ini membolehkan penurunan tingkap kereta secara automatic apabila PIR sensor dan mikrofon sensor berada dalam keadaan aktif. Keadaan aktif bermakna PIR sensor telah mengesan satu bentuk pergerakan manakala mikrofon sensor telah mengesan bunyi yang telah dihasilkan. Selain itu, dua relay digunakan untuk membolehkan DC motor untuk berputar sama ada mengikut arah jam atau arah lawan jam. Dengan memasang produk ini, ia boleh mengurangkan risiko seorang kanak – kanak untuk mendapat strok haba.

DEDICATIONS

To my beloved family

NOOR CHAMAN BIN GUL MOHAMED

SERI RAHAYU BINTI ISMAIL

SABREENA CHARMEIN BINTI NOOR CHAMAN

CHIARA CHARMEIN BINTI NOOR CHAMAN

"Thank you for the support, encouragement and affection that able me to complete this report"

ACKNOWLEDGMENTS

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LIST OF SYMBOLS AND ABBREVIATIONS

PIR	=	Passive Infra – Red
PIC	=	Programmable Intelligent Computer
DC	=	Direct Current
DO	=	Digital Out
LED	=	Light Emitting Diode
VDD	=	Voltage Drain Drain
GND	=	Ground
VCC	=	Voltage Collector Constant
VIN	=	Voltage In
PC	=	Personal Computer
CCS C	=	Custom Computer Services Compiler
I / O	=	Input / Output
SK	=	Start – Up Kit
US	=	United State
AC	=	Alternating Current

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter is reviewed about the project background, project condition, project objectives and the project scopes.

1.1 Background

In the recent past, the number of children that die from heatstroke after being left alone in a motor vehicle has increased. According to KidsandCars.org, the average number of children that dies due to motor vehicle heatstroke per year since 1998 is 38 which is equivalent to one every nine days.

Almost half of these cases, the individual responsible for the child's death accidentally left them in the motor vehicle. This incident can happen to anyone, including the most caring, loving, affectionate, protective parents. It has happened to a teacher, dentist, social worker, police officer, nurse and even a soldier (Factors n.d.). Figure 1.1 shows the causes of motor vehicle heatstroke death.

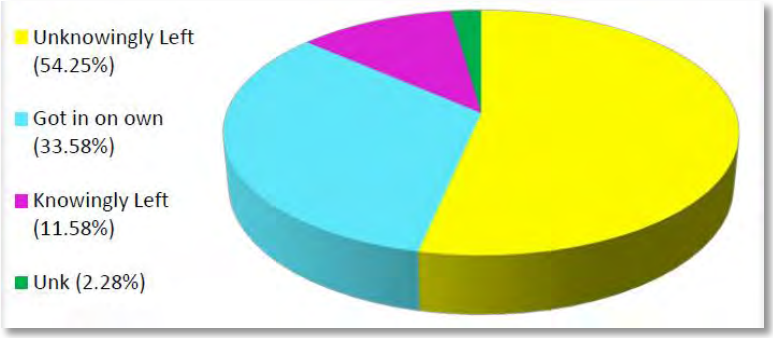

Figure 1.1: Causes Of Motor Vehicles Heatstroke Death (Factors n.d.)

Heatstroke is the leading cause of a non – crash motor vehicle fatalities in children aged below fourteen (Soto et al. 2014). Heatstroke occurs when the body becomes dehydrated and is unable to cool itself enough to maintain a healthy temperature. Heatstroke normally occurs when the core body temperature rises above 40.5° Celsius and the body's internal systems start to shut down.

Children have the highest potential because a child's body overheats three to five times faster than an adult body. It can take as little as 15 minutes in an overheated car for a child to suffer life – threatening brain or kidney injuries (Garethiya et al. 2015).

A motor vehicle when can be heated up strenuously because of the window on the vehicle is translucent towards the sun's short – wave radiation. The temperature level could be hazardous, even be disastrous because of sunlight, exterior temperature, color and type of the vehicle (Sasidharan 2015). Also upon windy days, vehicle's temperature may rise to a dangerous level quickly.

According to the heatstroke data sheet by KidsandCars.org 87 percent of children who died from a motor vehicle heatstroke are aged three and younger while 54 percent of this tragic case involves children age one and younger. Since they are small in size, this can lead parents to think that their child is no longer in the car with them. Figure 1.2 shows the ages of the motor vehicle heatstroke victims.

Figure 1.2: Ages of Motor Vehicle Heatstroke Victims (Factors n.d.)

1.2 Problem Statements

On average, thirty – eight children die in hot cars each year from heat – related deaths after being trapped inside a motor vehicle (Arbogast et al. 2012). Babies and young kids can sometimes sleep so peacefully that parents forget they are even there. It can also be tempting to leave a baby alone in a car while we quickly run into the store. The problem is that leaving a child alone in a car can lead to serious injury or death from heatstroke. Young children are particularly at risk, as their body heat up three to five times faster than adults. With this affordable system, number of casualties of children due to heatstroke when accidentally left in parked vehicle can be lessened.

1.3 Objectives

The objectives of this project are to:

i. To construct an affordable system that can prevent children's casualties when accidentally left in parked vehicles
ii. To ensure the PIR sensor can detect movement
iii. To ensure the sound sensor module can detect the sound produced

1.4 Project Scopes

This project has two scopes:

i. Using PIR sensor and sound sensor module for this system
ii. Program PIC microcontroller to interface with PIR sensor, sound sensor module, two relays and a DC motor

1.5 Thesis Overview

This thesis is a combination of 6 chapters that contains and elaborates specific topics such as Introduction, Literature review, Methodology, Result and Analysis, Conclusion and Further Development that can be applied in this project.

Chapter 1: Introduction of the project

Chapter 2: Literature review of the project

Chapter 3: Methodology regarding the project's architecture that consists of hardware and software implementation

Chapter 4: Result obtained regarding the project system's performance and overall discussion about the project

Chapter 5: Conclusion and future recommendation of the project

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter will cover on the review from previous research that is related to this project. There are previous researches on systems that are used to prevent heatstroke for young children left in a vehicle. Apart from that, previous study on embedded system, PIR sensor, sound sensor module and PIC 18F450 are also included in this chapter.

2.1 System On Preventing Heatstroke For Young Children Accidentally Left In Parked Vehicles

By using the latest technology, multi – agent architecture has been developed to detect young children that are left in a child safety seat in a motor vehicle. INGENIAS methodology is used to develop this multi – agent system (Soto et al. 2014). This system has two major sections which are monitoring section and user section. The monitoring system is responsible of monitoring conditions regarding young children left mistakenly in a baby seat in a vehicle motor. This unit consists of coordinator module, the temperature module, GPS, sound module and motion module. Meanwhile, user unit is formed by interface module which is a mediator between users and modules. It is used to send heatstroke risk alert to the user's smartphone.

Children die of vehicular heat stroke because the surrounding air temperature is scorching and results in an escalation of body temperature. This car safety seat uses thermoelectric cooler to maintain the temperature of the body for a limited time. Thermoelectric cooling device directed chilled air onto the occupant, providing convective cooling on the occupant's skin (Vinoth 2014). The alarm and cooling systems will be activated when occupant sensor and thermistor detect an unsafe temperature rise for small child. Thermoelectric coolers maintain the temperature around only two hours below the actual tolerances in a parked vehicle. Figure 2.1 shows the hardware of the car safety seat uses thermoelectric cooler.

Figure 2.1: Hardware Setup (Vinoth 2014)

The existing technologies aimed at preventing children from being left alone in a motor vehicular such as Deluxe Padded Safety Seat Alarm, Child Minder Smart Clip System and Backseat Minder have many flaws such as malfunctioning devices when it is not installed or used according to the manufacturer's specification and generate false alarms (Aiello et al. 2014). Therefore, a system which applied the principle of cyber physical system is purposed. These devices are able to sense and monitor the environment, integrate and process collected data and take action with no or limited human supervision that will affect one or more physical variable, feasibly correcting the risky situation.

The motor vehicle compartment is a tiny spot where by severe issues including health – related difficulties can take place when passengers spend quite a long time inside the encapsulated area. Examples of minor cases tend to occur are exhaustion, headache, dizziness, nausea, heat exhaustion, asthma etc. and for most detrimental circumstances are vision breathing, chest pain, heatstroke and lung cancer which can results in loss of life when one is trapped for a long time in the motor vehicle. Hence a system that composed of temperature sensor (to monitor interior vehicle temperature), humidity sensor (to measure vehicle cabin humidity level), oxygen sensor (to measure proportion of oxygen in ambient air), PIR sensor (to detect presence of humans or pet animal), LPC1768 microcontroller and alarm system (to alert user during any form of danger) are proposed (Sasidharan 2015). The block diagram for the system is shown in Figure 2.2.

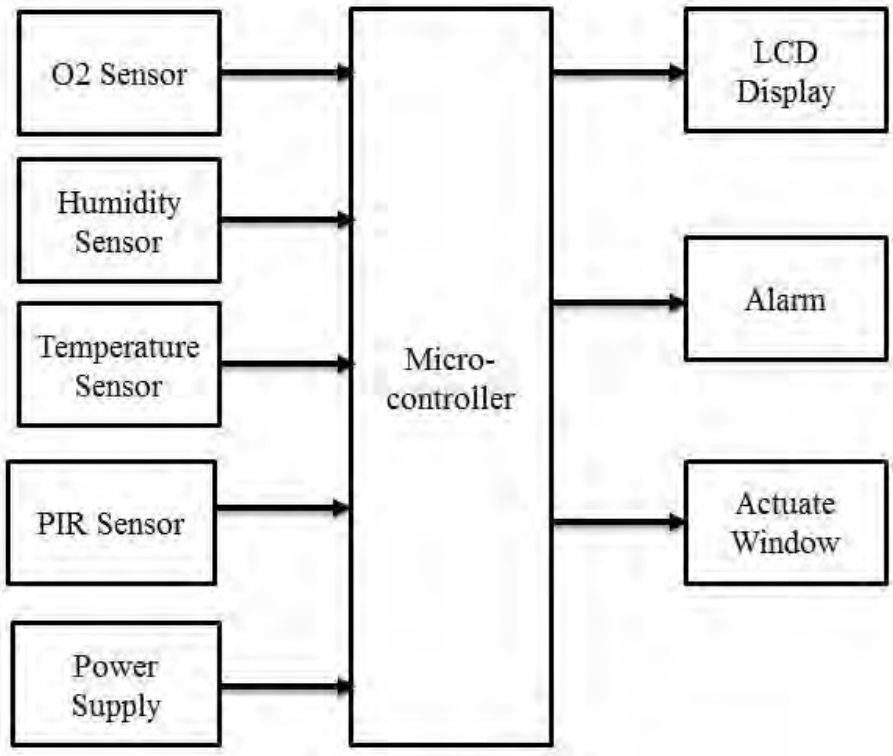

Figure 2.2: Block Diagram (Sasidharan 2015)

Of all non – crash related accidents, heatstroke is the main factor that contributes in children deaths. Since the year 1998, total number of children that have died in the United State of America (USA) from such reason in locked car is 556. Between year 2006 and 2010, heat stroke hits nearly 15 percent for children under 15 years of age. Figure 2.3 represents the number of children deaths left in cars in US. Thus, an advanced system model that are basically divided into three parts which are monitoring unit, coordinate unit and real time control unit is introduced (Garethiya et al. 2015). Monitoring unit consists of the sensing devices and controller such as temperature sensing module, presence detection module, GPS module and real time clock module to observe the person inside a car. Meanwhile, coordinator system is in charge for recognizing critical circumstances which may cause a high risk of heatstroke for the child. The last unit which is the real time provides proper control actions in case the temperature rises at or above 104° Fahrenheit.

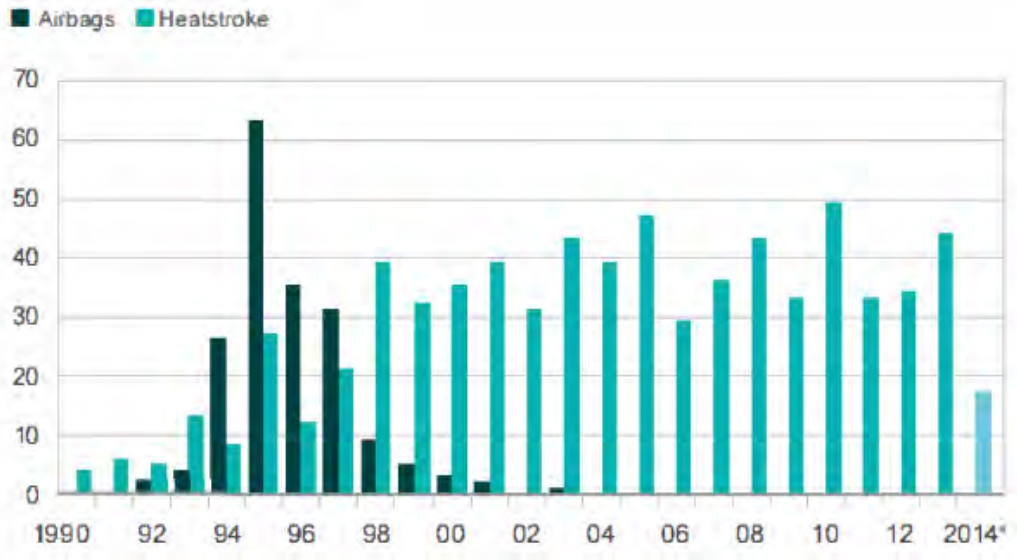

Figure 2.3: Graph Of Number Of Children Deaths Left In Cars In US (Garethiya et al. 2015)