Faculty of Electrical and Electronic Engineering Technology

THE DEVELOPMENT OF CAR SEAT ALERT SYSTEM BY USING IoT

SYUKUR BIN SAMSUDIN

Bachelor of Electrical Engineering Technology with Honours

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THE DEVELOPMENT OF CAR SEAT ALERT SYSTEM BY USING IoT

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A project report submitted
in partial fulfillment of the requirements for the degree of
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DEDICATION

To my beloved parents especially my mother, Noriani Binti Shariff, and my father, Samsudin Bin Harun that give their full support during my journey to complete this project in term of moral support and encouragement until I able to finish this project, and also my dearest siblings and my friend that also help moral support in term of giving some ideas and opinions to fulfil the requirement to finish this project. Praise is to Allah S.W.T that I get family and friend that very understand and always give me some idea that might help this project. Thankful for all advices I am very blessed .

ABSTRACT

The overall goal or purpose of this paper was to design and build a car seat alert system for children who have been left in vehicles and have died from heatstroke. This is known as vehicular heatstroke, and it is extremely harmful for a newborn due to the fact that young bodies heat up three to five times faster than adults. Furthermore, the inside of a vehicle heats up quickly, which is a major issue for parents who want to travel by car with their children. Heatstroke mortality among children in automobiles are on the rise these days, with an annual increase in the number of cases. A caring parent mistakenly left their child in most kid vehicle heatstroke deaths. This initiative was created to inform and alert parents who may forget their children in any kind of situations. NodeMCU ESP8266 is utilized as a microcontroller to control all the input and output devices in this system, making it more realistic. This device includes an indicator lamp, LED strip and a buzzer to trigger and alert parents when this sort of carelessness occurs. Aside from that, an LCD is used to show the presence of the children in the seat as well as the temperature inside the vehicle. Other than that, the GPS module is used to provide the user with the location of the child who has been left in the car. Apart from that, the system will send the alert message to the user through WhatsApp application for monitoring and notifying the alert message. To ensure that the specified aims are archive, extensive research has been conducted that will serve as references throughout these studies for this project.

ABSTRAK

Tujuan keseluruhan laporan ini adalah untuk merancang dan membina satu sistem amaran tempat duduk kereta untuk kanak-kanak yang ditinggalkan di dalam kenderaan yang boleh nengakibatkan meninggal dunia akibat serangan panas. Serangan panas dikenali sebagai serangan panas kenderaan dan sangat berbahaya bagi bayi yang baru lahir kerana badan mereka tiga hingga lima kali lebih cepat panas daripada orang dewasa. Dalam pada itu, bahagian dalam kenderaan juga menjadi panas dengan cepat adalah merupakan salah satu masalah utama bagi ibu bapa yang ingin melakukan perjalanan dengan kereta bersama anak-anak mereka. Kematian strok panas di kalangan kanak-kanak dalam kenderaan semakin meningkat pada hari ini, dengan peningkatan jumlah kes tahunan yang amat tinggi. Seorang ibu bapa yang prihatin secara tidak langsung tidak sedar telah meninggalkan anak mereka dalam kenderaan yang kebanyakannya kematian akibat strok panas dalam kenderaan. Justeru itu, inisiatif ini dibuat untuk memberi tahu dan memberi amaran kepada ibu bapa yang mungkin terlupa anak-anak mereka di dalam kenderaan yang ditinggalkan terlalu lama. Oleh itu, NodeMCU ESP8266 digunakan sebagai pengawal mikro untuk mengendalikan semua peranti input dan output dalam sistem ini untuk menjadikannya lebih realistik. Peranti ini dilengkapi dengan lampu penunjuk, *LED strip* dan bel untuk memberi amaran kepada ibu bapa apabila berlaku kecuaian yang telah ditetapkan. Selain itu, LCD digunakan untuk menunjukkan kehadiran kanak-kanak di tempat duduk serta suhu di dalam kenderaan pada waktu semasa. Selain itu, modul GPS digunakan untuk memberitahu pengguna lokasi anak yang ditinggalkan di dalam kenderaan jika suhu di dalam kenderaan melebihi paras bahaya. Disamping itu, sistem ini juga akan menghantar pesanan amaran kepada pengguna melalui aplikasi WhatsApp untuk memantau dan memberi tahu pengguna pesanan amaran. Untuk memastikan bahawa tujuan yang dinyatakan adalah tercapai, penyelidikan yang luas telah dilakukan untuk dijadikan rujukan sepanjang kajian projek ini.

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LIST OF SYMBOLS

$°C$	-	Degree Celcius
μ	-	Micro
k	-	Kilo
m	-	Mili

LIST OF ABBREVIATIONS

V	-	Voltage
LCD	-	Liquid Crystal Display
GPS	-	Global Positioning System
IoT	-	Internet of Things
CRS	-	Child Restraint System
RF	-	Radio Frequency
SMS	-	Short Message Service
GSM	-	Global System for Mobile Communication
FSR	-	Force Sensitive Resistor
PIR	-	Passive Infrared
$GPRS$	-	General Packet Radio Service
$CO2$	-	Carbon Dioxide
SDK	-	Software Development Kit
$Wi-Fi$	-	Wireless Fidelity
$GPIO$	-	General Purpose Input/Output
DCF	-	Distributed Control Function
BSS	-	Basic Service Set
$P2P$	-	Peer to Peer
CPU	-	Central Processing Unit
ROM	-	Read Only Memory
$SRAM$	-	Static Random Access Memory
RTC	-	Real Time Clock
DHT 11	-	Digital Temperature and Humidity Sensor
DC	-	Direct Current
IDE	-	Integrated Development Environment
PCB	-	Printed Circuit Board
V	-	Voltage
Hz	-	Hertz
LED	-	Light Emitting Diode

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CHAPTER 1

INTRODUCTION

1.1 Background

Every year, mobile data services become less expensive and more widely available. People are spending more time online than ever before, which opens enormous opportunities for ventures involving the Internet of Things (IoT). Around 47% of the world's population currently uses the Internet [1] and the number of Internet-connected devices is expected to reach 50 billion by 2020 [2]. If the world population rises to 8 billion people in the same year, that means everyone would have more than six devices connected to the Internet.

Several unfortunate accidents have occurred in which children were left unintentionally in closed parked cars after the drivers had arrived at their destination. Due to the greenhouse effect, when a car is parked with all windows closed in direct sunlight, the interior temperature will easily rise to dangerous levels. In addition to the greenhouse effect, children with a less functional thermoregulatory system are more likely to develop hyperthermia, a disorder in which the body absorbs more heat than it can release. Children are more likely than adults to develop hyperthermia because of their inability to efficiently lower their body temperature, owing to their greater surface to body ratio, increased metabolic heat production, and decreased sweating power.

Since 1998, there have been a total of 882 heat stroke related deaths among children left in vehicles. There were 24 cases registered in 2020. Then, a total of 467 cases related to the forgotten child in parked vehicles had been reported until February 2021,

where more than half of these cases involved children of 2 years old and below. The most common scenario involved a caregiver especially a parent forgetting about the infant.

The project goal is to create a dependable system for alerting parents or caregiver when leave their children in a car seat inside a vehicle using the WhatsApp Messenger app.

1.2 Problem Statement

Today, the IoT is defined as “the ability of everyday objects to connect to the Internet and send and receive data” on their own. Every enabled device that can be integrated, such as the smartphones will be connected to the car and so on as part of the Internet of Things.

Heat stroke occurs as the body is unable to dissipate the heat it generates and absorbs because of being stuck in an enclosed car parked outside after being left unattended. In addition, the number of children die from automobile related heat stroke is lower than the number of children die in traffic accidents, the nature of these deaths demands attention.

Two reasons children are more susceptible to vehicle related heat stroke than adults. Firstly, children are most likely to be left alone in a parked vehicle compared to adults and unable to exit by themselves. Second, children's bodies are less equipped to deal with the extreme heat that can quickly build in a parked vehicle.

A project titled "The Development of Car Seat Alert System by Using IoT" has been proposed to avoid this type of accident by sending out a safety alert signal to parents or caregivers.

1.3 Project Objective

The main aim of this project is to propose a systematic and effective system to develop of car seat alert system by using IoT. Specifically, the objectives are as follows:

a) To study the existing infant car alert detection system.

b) To design a temperature level detection system with automatic roll down window and safety alert system in vehicle.

c) To develop an infant car seat alert system through WhatsApp Application.

1.4 Scope of Project

The scope of this project are as follows:

a) The project Car Seat Alert System by Using IoT is a system for children in cars to user monitor and alert system.

b) NodeMCU, a small microcontroller that also serves as a control unit, oversees this system. The two basic components of this suggested system are the detection mechanism and the preventive mechanism, both of which are coupled to the control unit.

c) The detection system is utilised to detect the presence of a children within the car as well as the temperature.

d) The preventive mechanism is used monitoring and alert the parent or caregiver the presence of a baby in the seat. GPS technologies are used to send an alert message with a real-time tracking system, in which the approved user will be informed of the location in terms of longitude and latitude via the WhatsApp application.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The search databases used for the literature review were ScienceDirect, Google Scholar and Web searches. “Safety Alert System in Vehicle”, “Car Seat Alert System”, “Baby Car Seat Safety”, “IoT Technologies”, “Vehicle Detection System”, “Heatstroke”, “Arduino”, “Forgotten Child” and “Sensors” are some of the search phrases. In addition, the search was limited to the between 2015 and 2020 (5 years). The quest was limited to English-language papers. The things were chosen based on the title, abstract, and full text.

2.1.1 Unattended Child in Car

Heatstroke deaths of 1-3 year old children occurred in 6 out of 9 cases across Malaysia between 2011 and 2018. Those who made it through the ordeal of being trapped in a passenger car were left alone for 30 to 40 minutes. The victims in the six fatal cases were trapped inside the car for four to nine hours in the sweltering sun [3].

The primary cause of such tragedies was carelessness on the part of either the parents or the caregivers. Although uncommon, these so-called "hot car accidents" show that the problem of a child left alone in a vehicle must be solved, perhaps by the use of technology that can warn the driver to take appropriate precautions.

2.1.2 Heat stroke

Malaysia tropical climate features dry, humid weather with occasional downpours during the year. Regardless, the heatwave that hit Malaysia a few years ago (owing to the El Nino phenomenon) was said to have had some health consequences for Malaysians, mostly due to the dramatic rise in ambient temperature. The worst-affected places included Chuping in Perlis, Alor Setar in Kedah, Ipoh and Lubuk Merbau in Perak, and Batu Embun and Temerloh in Pahang [3].

As a result, one of the factors that could have an effect on human health is extreme weather or a heatwave, as many places in the northern states of Penang, Kedah, and Perlis witnessed temperature rises of more than 38 degrees Celsius in 2016. It's also important to remember that both vehicle heating and physical activity can cause heat-related illnesses.

2.1.3 Effect of Heat stroke

The human body needs a temperature of 37 degrees Celsius to function properly. Furthermore, our body temperature rises in tandem with our physical activity. Its important to keep in mind that infants and young children are not miniature adults. Both physiologically and behaviorally, they are distinct [3].

As a result, infants and children absorb heat from the atmosphere faster, are unable to increase their cardiac performance, and experience decreased sweating as well as increased body heat production from a physiological standpoint. In terms of behaviour, children are known to be unaware of danger and rely on their caregiver to understand the effects of heat and take appropriate action.