



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF SMART INFANT CAR SEAT USING A
MICROCONTROLLER**

URMILAA APPARAO

Bachelor of Electronics Engineering Technology with Honours

2022

**DEVELOPMENT OF SMART INFANT CAR SEAT USING A
MICROCONTROLLER**

URMILAA APPARAO

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours**



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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2022

Tajuk Projek : DEVELOPMENT OF SMART INFANT CAR SEAT USING A MICROCONTROLLER

Sesi Pengajian : SEM 1 2022/2023

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DR. VIGNESWARAN NARAYANAMURTHY

Pensyarah Kanan

Jabatan Teknologi Kejuruteraan Elektronik dan Komputer

Fakulti Teknologi Kejuruteraan Elektrik & Elektronik

Universiti Teknikal Malaysia Melaka

No.42, Jalan Dagang 12, Taman Dagang
Jaya, 68000 Ampang, Selangor Darul
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I declare that this project report entitled Development Of Smart Infant Car Seat Using A Microcontroller is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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: URMILAA APPARAO

Date

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I hereby declare that I have checked this project report and, in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronic Engineering Technology with Honours.

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Supervisor Name

:

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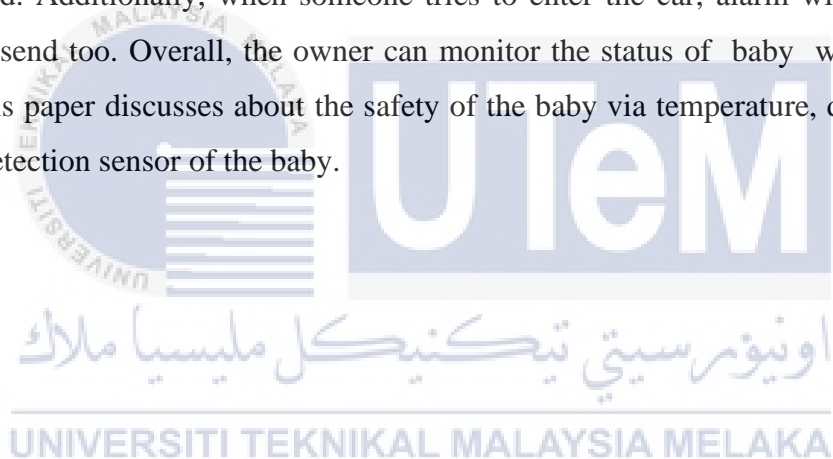
DEDICATION

*To my beloved mother, Madam Letchumi and father, MrApparao, and
my family members*



ABSTRACT

Baby car seat is very crucial and thermal comfort of children inside the car is a critical topic to address, as hot weather can be irritating and uncomfortable. More safety features should be added into the system to ensure can avoid scenarios like death by heat strokes, car stolen cases and baby's kidnapping. GSM 900MHz plays the main role, as it'll be connected once it has sensed the pressure on the car seat using the pressure mats. Push Button LA38 under the baby car seat to check whether the baby seat or not where alarm will work if it has moved, and SMS will be sent to the phone. After a certain time, it will check the temperature which can be maintained 29°C using temperature sensor DHT-11, throughout the time, and if it's more than the room temperature, a message will be sent too, and alarm will be buzzed. Additionally, when someone tries to enter the car, alarm will buzz, and message will send too. Overall, the owner can monitor the status of baby with message receiver. This paper discusses about the safety of the baby via temperature, door locking and motion detection sensor of the baby.



ABSTRAK

Tempat duduk kereta bayi adalah sangat penting dan keselesaan terma kanak-kanak di dalam kereta adalah topik kritikal untuk ditangani, kerana cuaca panas boleh menjengkelkan dan tidak selesa. Lebih banyak ciri keselamatan harus ditambah ke dalam sistem untuk memastikan dapat mengelakkan senario seperti kematian akibat strok haba, kes curi kereta dan penculikan bayi. GSM 900MHz memainkan peranan utama, kerana ia akan disambungkan setelah ia merasakan tekanan pada tempat duduk kereta menggunakan tika tekanan. Tekan Butang LA38 di bawah tempat duduk kereta bayi untuk memeriksa sama ada tempat duduk bayi atau tidak di mana penggera akan berfungsi jika ia telah berpindah dan SMS akan dihantar ke telefon. Selepas masa tertentu, ia akan menyemak suhu yang boleh dikekalkan 29°C menggunakan sensor suhu DHT-11, sepanjang tempoh masa, dan jika lebih daripada suhu bilik, mesej akan dihantar juga dan penggera akan dibunyikan. Selain itu, apabila seseorang cuba memasuki kereta, penggera akan berbunyi dan mesej akan dihantar juga. Secara keseluruhan, pemilik boleh memantau status bayi dengan penerima mesej. Kertas kerja ini membincangkan tentang keselamatan bayi melalui suhu, penguncian pintu dan sensor pengesanan gerakan bayi.

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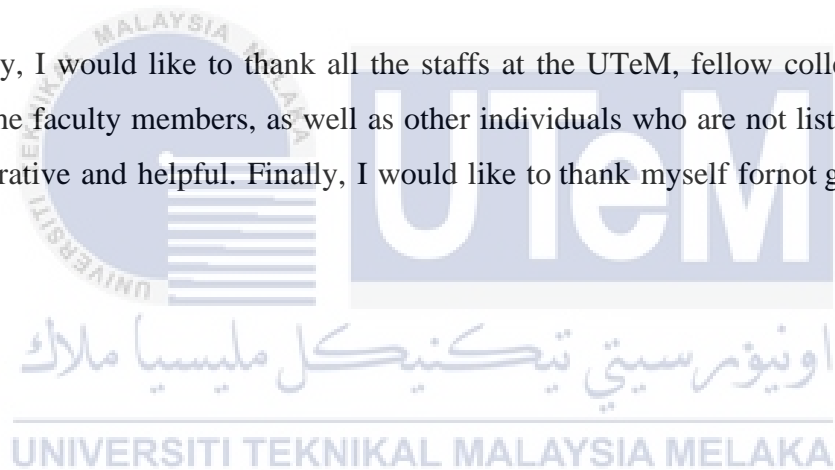


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LIST OF ABBREVIATION

FHSS technique	Frequency-Hopping Spread Spectrum technique
Tx	Transmitter
Rx	Receiver
IR sensor	Infrared sensor
GSM Module	Global System for Mobile Communication



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CHAPTER 1

INTRODUCTION

1.1 Background of Project

Most of the time young parents tend to leave their toddlers in the car and go shops to grab something and get carried away and forget about their babies which may lead them to suffocate or sometimes die. Toddlers who were unintentionally left in cars after the drivers reached their destination and go out have tragically perished on several circumstances [1]. Polls from 2014 and 2016–2017 have revealed that parents are still perplexed by the recommendations for car seat safety, and up to 59 percent of kids are either still riding in the wrong seats or are improperly buckled into their seats [2]. When a child experiences hyperthermia or heat stroke, their core body temperature rises, with deaths increasing with longer exposure durations. Children are especially at risk for heatstroke, injuries and deaths brought on by inadequate temperature regulation and a high surface-to-mass ratio. A kid with hyperthermia is vulnerable to organ failure, cardiac arrhythmia, delirium, seizures, and neurological impairment. It is essential that safety systems are precise and quick to prevent serious illness or fatalities in the event that a child is left unattended or locked in a car since young children are more susceptible to heat stroke [3].

To avoid this, some parents tend to leave the car with engine ON without unlocking the car to enable the car air conditioning to be ON when the child is in the car. This could lead to theft as there are many cases whereby vehicles like car, motorcycles, bus and lorries are being stolen due to improper security system and negligence of drivers. Kidnapping children frequently occurs. Infants are more susceptible, because they are defenseless and therefore more likely to be taken away without anybody noticing [4]. Moreover, infants may fall from seat when unnoticed. The most frequent form of injury was a head or neck

injury, which affected 84.3% of infants, 62.4% of whom were under the age of four months [5].

To ensure this situation are avoided, an inexpensive automated car seat for infants is proposed, used to detect the temperature in a warm car and later alert the parents if temperature arises. In this project, the temperature is maintained at 29°C when the air conditioner is on. This project also can be used as an anti-theft and anti-kidnapping system as it will alert the parents when someone tries to enter. Where the project also can be monitoring the security system via smart phone. This will enable the users to see the safety of the child and the car. This can also be a good way to ensure the car is locked if someone has forgot or overlooked this situation. Next, this project also works by just monitoring the pressure sensor of the baby on or off the seat. If the is off the seat it will also notify the parents and people around the car. Through this system, we can ensure the baby is safe all the time even when the parents are away from them. We also would be able to make sure that, the car cool and comfortable for the driver and passengers to start their journey [6]. Given the foregoing, one of the invention's goals is to offer a system that alerts when a child has been left in an infant seat under risky circumstances. The provision of a system that alerts when a child is left in an infant seat is a further goal of the idea.

1.2 Problem Statement

In several incidents parents forget their child inside of a vehicle might be due to emergency reasons. To avoid this horrible scenario from happening again, a method to protect children from this type of situation must be developed. This device will address the issue by assisting parents when they leave their child in the vehicle and walk away [7]. Furthermore, car theft occurrence was due to improper security system. So, this system also

enables to check the car locking system using smartphone because it works as an anti-theft system in motor vehicles which ensures the safety of the auto. Next, no proper Air-Conditioner system for babies that has been left in the car. Air conditioner of the car will automatically on when the engine has been started so when a person enters the car they would want to travel in comfort, to ensure this happens when the air conditioner is on it is kept at constant temperature. The implications of this study will keep these sad occurrences from happening, and the vehicle will need to be equipped with a system that alerts parents or caretakers when their children are left alone in the car, putting their lives in danger [8].

1.3 Objectives of the Project

1. To design an infant car seat system that enable the temperature detection, presence of baby on seat and door safety system.
2. To integrate the system with SMS notification using GSM.
3. To evaluate the system performance and functionality.

1.4 Scope of Project

The goal of this project is to design and construct a low-cost automatic infant car seat. The Arduino Uno microcontroller board will be used to control the overall project control component of the project. Because it's simple to include into an analogue components, automatic engines, sensor, and other electronic automations systems for automobile. The various architectural designs can provide devices numerous new functionalities. A lengthy code is not necessary [10]. The project also employs GSM to transfer data from mobile devices over short distances (using 900MHz) [11]. Three sensors will be used for each objective that are, IR Infrared 2 Sensor FC 51, Temperature

sensors, and Pressure sensors @ Push Button. IR sensors is a module used in obstacle avoidance robots to detect whether something is nearby or passing by. It works by sending infrared rays, which, if something is in their path, will reflect. The DHT11 Temperature and Humidity Sensor generates a digital signal on the data pin by using a thermistor and a capacitive humidity sensor to measure the surrounding air (no analogue input pins needed) [12]. The DHT-11 is a simple, very cost-effective digital temperature and humidity sensor. As for the pressure sensors, they do not require much installation and no assembly is required, they are among the most inexpensive of security measures. Push buttons on Arduino Uno R3 function by causing the voltage to drop when the button is pressed.

1.5 Significance of the Project

As the demand of safety is increasing among people. This project has a safety feature which is security of car and baby via a smart phone. This can be considered as an anti-theft device. Furthermore, the air conditioner can also be monitored to ensure the comfort and safety of the children during the absent of the parents. So, in conclusion this project can secure both the child and car.

1.6 Limitations of the Project

The limitation of the study is that by GSM because digital interference the pulse-transmission method used by GSM known to create interference. It also lag in Bandwidth. Multiple users share the same bandwidth when using GSM technologies, which can occasionally, cause significant. Limited data transport in GSM, has made users needs migrate to gadget with more modern GSM forms to achieve better data rates. Whereby all these it will affect the performance of the project system. In other words, the GSM cannot be detected at a far range, thus it will reduce the efficiency of the system.

1.7 Organization of the Project

The report for the project, Inexpensive Automated Car Seat for Infant is divided into four main chapters as follows:

Chapter 1: The purpose of this chapter is to describe the project's overview, including the project's background, objectives, problem statement scope, and outline.

Chapter 2: Summarize any past studies and researches that are relevant to this subject. This information was gathered from a variety of sources, including periodicals, reference books, the internet, and research papers. Researching the components and circuits associated with this project will also aid in comprehension.

Chapter 3: Explains the project's process, including how the design system was developed and how the project was organised. This chapter covers the entire project from start to finish, from development to completion.

Chapter 4: This chapter focuses on the project's final presentation. This chapter will also cover the testing of the hardware and software components. Finally, in this chapter, the results were analysed and discussed.

Chapter 5: Summary of the whole report. This chapter will conclude the outcome of the project and potential of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter Overview

The research literature related to the project's issue is discussed in this chapter. Its goal is to raise awareness of current thought and research on an inexpensive automatic car seat for infants, as well as to justify further study into an area that has been previously neglected or understudied. This section includes clarified essential phrases utilised in this research that are discussed in journals and may be encountered during the reading of this research.

2.2 Alissa Chavez's Hot Seat alarm aims to prevent child hot car deaths

Alissa Chavez of Albuquerque came up with the idea to make it less likely that a child would be left alone in an overheated vehicle. The youngster has been working with engineers to finalise the design of the item, which has been dubbed Hot Seat, and is currently soliciting funds on the Indiegogo website to produce a model so it can be manufactured [8].

The device consists of a cushion that detects whether a child is in the car seat and connects with a fob attached to a parent's key chain via Bluetooth. If the parent walks away from the child for more than 10 metres, it will set off alarms on:

- The fob.
- The parent's cell phone, through an application.
- The car itself.

"In the event that the parent doesn't have the key fob or the cell phone, the general population around the vehicle will at present have the capacity to hear the alert". Explain what Figure 2.1 is and 2.2.



Figure 2.1: Hot Seat alarm synced with smart phone [8]



Figure 2.2: Car alarm if child is left in the car unattended [8]

2.3 Bluetooth and WLAN coexistence: challenges and solutions

Bluetooth is a wireless personal area network (WPAN) system that is intended for link substitution and short-distance communication, with a focus on planned availability. WPAN stands apart from other types of remote systems in terms of size and range. WPAN conversations are usually limited to one person or question and can span up to 10 metres. Wireless local area networks (WLANs), on the other hand, utilise IEEE 802.11 specifications to cover a relatively small physical territory, such as a single building or grounds. In this literature, the terms WLAN and IEEE 802.11 are used interchangeably. WLANs have a range of 100 metres and are meant to complement rather than replace traditional cable LANs. They are frequently utilised to provide the final couple of feet of accessibility between the primary arrangement and the secondary arrangement [9].

The project's completion plan solves the issue caused by Bluetooth and WLAN systems running in close vicinity and at the same time. In this paper, we examine a number of solutions for preventing time and repetition crashes in WLAN and Bluetooth transmissions. We compare their execution and talk about the patterns and trade-offs they provide for different applications and impedance levels. To evaluate execution, bundle misfortune, TCP good put, postponement, and defer jitter are all applied. [10].

Bluetooth is the outcome of this, but it has a number of drawbacks, including slow communication speeds, poor data security, and a limited battery life. The power level of Bluetooth was set to 4 dBm. With 3 dB, the WLAN power level was changed from 0 to 24 dBm.. WLAN traffic load was changed between 10-50 Mbps with 10 Mbps step size, in addition to the maximum achieved. This is shown in Figure 2.3.