



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND DEVELOPMENT OF DEAD MAN'S SAFETY
DEVICE FOR URBAN CONCEPT CAR**

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

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as partial fulfillment of the requirement for the Degree of Bachelor of Mechanical And Manufacturing (Automotive) with Honour. The member of the supervisory is as follows:

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ABSTRAK

Matlamat projek ini adalah untuk mereka bentuk dan membangunkan alat keselamatan “Dead Man Switch” untuk kereta konsep bandar menggunakan kod yang sesuai yang boleh diprogramkan. “Dead Man Switch” adalah suis yang telah direka untuk menjadi aktif apabila orang itu tidak berupaya. Sebagai contoh, melalui kematian, kehilangan kesedaran, atau kawalan terlepas dari badan. Fungsi suis ini biasanya digunakan sebagai satu jenis untuk menjaga atau mengawal apabila tiada pengendali suis ini akan menghalangnya daripada aktiviti yang mungkin berbahaya atau peranti untuk org tidak berupaya kerana kemalangan, kerosakan, atau penyalahgunaan. Tujuan projek ini adalah untuk mencegah dan mengurangkan kemalangan yang berlaku. Ia juga dapat membantu mengurangkan kematian akibat kemalangan. Sistem ini akan dibangunkan menggunakan perisian Arduino Uno yang diintegrasikan dengan butang tekan pada stereng. Sistem ini bekerja sebagai peranti keselamatan seperti ketika pemandu menekan tombol tekan enjin yang berjalan dan mengesan kehadiran drive. Jika butang dibebaskan sistem akan menangguhkan selama lima saat untuk mengesan kembali pemandu semasa. Tetapi selepas lima saat butang masih tidak ditekan sistem akan memotong pencucuhan dan membuat enjin kembali ke keadaan terbiar. Butang push diletakkan pada roda stereng untuk membantu memandu dengan mudah untuk menyentuh dan tekan butang menggunakan indeks atau jari ibu jari.

ABSTRACT

The aim of this project is to design and development of a dead man's safety device for urban concept car using the suitable programmable code. Dead Man Switch is a switch that has been designed to be active when the person is incapacitated. For example, through death, loss of awareness, or missed control from the body. The function of this switch generally utilized as one type for safeguard when there is no operator this switch will stop them from possibly hazardous activity or incapacitate devices because of accidents, malfunctions, or misuse. The purpose of this project is to prevent and reduce accidents to occur. It also can help to reduce death happen because of an accident. The system will be developed using Arduino Uno software integrated with the push-button attach at the steering wheel. This system working as a safety device like when the driver pressed the push button the engine running and detect the presence of the drive. If the button is released the system will delay for five seconds to detect back the present of the driver. But after five seconds the button still not being pressed the system will cut off the ignition and make the engine back to the idle state. The push-button is placed at the steering wheels to helps the drive easily to touch and press the button using an index or thumb finger.

DEDICATION

I want to dedicate this work to all my family members who have helped me a lot and supported me in completing my studies, especially in my fall and downtime. Never forget my supervisor Ts. Khairul Amri Bin Tofrowaih and my academic supervisor who helped me a lot by giving me advice and guidance until I was able to complete my work. To my colleagues who have helped me in this work both directly and indirectly. My endless thanks to everyone who has helped me through this study.

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CHAPTER 1

INTRODUCTION

1.1 Background

A switch that has been designed to be active when the person is incapacitated is called a dead man's switch. For example, through death, loss of awareness, or missed control from the body. Initially, this switch is connected to a vehicle or machine, this switch has been used since to depict other immaterial utilization's like in computer programming. The function of this switch generally utilized as one type for safeguard when there is no operator this switch will stop them from possibly hazardous activity or incapacitate devices because of accidents, malfunctions, or misuse. For some machines, it brings the machines back to the safe state by using these switches, for example, the switches will be applying brakes while leaving the machines or decreasing the throttle while the machine is still running and is prepared to continue its operation once the control is restored. Besides work as stop machines and prevent harm this switch also can be used as fail-deadly, when it no longer held down the spring-operated switch can be used to complete a circuit which means this dead man's switch can be a harmful device such as to active bomb or improvised explosive device. The device is commonly used by the extremist to be activated bombs and commits suicide bombings. Electrical engineer Frank Sprague developed a device in the 1880s. With the development of a new machine to power street railways and electric elevators he has to work

on electric traction motor technology, the DC motor is used to control both street railways and elevators that required operator so he came out with the idea the operator can use a hand to control or move the street railways to move forward and backward along the track and help to manage the speed of the vehicle. For elevators, it is using the same concept to control speed and stop the elevators at the appropriate floor. With this design and innovation, the term 'dead man' exists. (“Stop using the term 'Deadman'!” n.d.)

1.2 Problem Statement

Nowadays we all heard that fatal accident always occurs involving a vehicle. Mostly the accident happens when the driver or human that the operator becomes incapacitated. For example, they will microsleep, fatigue, and any health problem. Based on statistics given in 2018, 4832 accidents have occurred (Jabatan Keselamatan Jalan Raya Malaysia, 2018) and almost 85% of the accidents are happening over their own negligence especially microsleep. Microsleep is when the body 'sleep' for a very short time period condition. The brain cannot process any input from hearing or sight sense. It can happen around 1 to 30 seconds even when the eye is open. The brain has been shut down like a computer. It refers to a short rest scene that cannot be controlled and happen for a brief timeframe. It occurs suddenly and regularly happens when a person who is tired attempts to oppose the inclination and remain wakeful. Typically, people who experience them do not realize that they have fallen asleep. This microsleep issue represents a threat with regards to driving or is working on a machine, possibly expanding the danger of a serious incident (“Bahaya ‘Microsleep’ - Majalah Sains,” n.d.). The manufacturing of the car nowadays rarely does not have any safety precaution or safety system that can automatically switch off the ignition system when any unwanted incident happens to the driver. None of the systems is installed in the automobiles have this

safety system that can cut off or slow down the moving vehicles and the switch is placed at the foot pedal acceleration. Mostly this dead man's switch only installed in the locomotive and some lorry (“Tiller Deadman switch — tractor-drawn aerial,” n.d.) for a compact car or urban car rarely for us to see this switch is installed in. So, with this device, it can be attached in the urban and compact car. This device is very useful that can help to prevent an accident and serious injury. This dead man's switch that already has in the industry located on the foot pedal. This is not suitable and applicable because when the driver falls asleep, they will more push and press on the pedal. Other cases are when the driver got a heart attack or epilepsy they were in pain and the possibility for them to press more on the car foot pedal is higher, so this switch is not suitable to place on the foot pedal. For example, can refer to table 1, the car is recorded as the second-highest total death of users in Malaysia for the year 2018. Therefore, there is a need for developing and improving a new type of Dead Man’s Switch. By that this switch can be improved by adding this system with locating it at steering wheel.

Table 1.1 Death statistic based on users from Jan-Sept 2018 Retrieved from <http://www.jkjr.gov.my> (Jabatan Keselamatan Jalan Raya Malaysia, 2018)

TYPE OF CAR/ MONTH	TOTAL OF DEATH OF USERS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OC	NO	DEC	TOTAL
MOTORCYCLE	327	323	396	379	384	371	342	357	300				3179
CAR	95	79	78	94	106	135	86	110	98				881
PEDESTRIAN	29	29	42	40	30	36	49	29	31				315

LORRY	24	9	20	17	15	12	13	18	11				139
4WD	9	11	5	7	12	12	2	11	6				75
OTHERS	4	11	9	4	5	21	12	11	7				84
BICYCLE	18	9	13	6	7	9	13	12	7				94
VAN	7	4	4	1	2	3	5	3	4				33
BUS	3	1	0	4	0	8	0	2	5				23
TOTAL	516	476	567	552	561	607	522	553	469				4823



Figure 1.1 Position of Dead Man Switches on a lorry. Reprinted from (“Tiller Deadman switch — tractor-drawn aerial,” n.d.) retrieved from <http://www.tractordrawnaerial.com/tiller-deadman-switch>

1.3 Objective

The purpose of this project is to make sure that these projects meet the requirement:

- i. To develop the emergency shut down system proof of concept model that can be activated if the operator becomes incapacitated for the urban car concept.
- ii. To modify the steering wheel of the urban car concept that can be attached with the working prototype of an electric dead-man switch.

1.4 Scope

To develop a dead man's switch in urban concept car:

- i. The design only covered on dead man's switch located at the wheel steering part as opposed to the currently available located at the driver accelerator pedal.
- ii. Source of input comes from push button switch attach at the steering only. The heart rate, eye movement, touch sensor and any related sensor used for dead man switch are not covered.
- iii. Arduino is used to storing data, embedded delay function for the push-button when released and set the program for a push-button switch to attach with the steering.
- iv. Design dead man switch using push-button connect with wheel steering
- v. The design will focus only on the urban concept car.
- vi. Ergonomics factor of the driver to reach/push the switch is not being studied.
- vii. Arduino act as the microcontroller to receive the input and process the input to give output.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

For this chapter, it is about to design and understand what the dead man switch is based on a literature review study. The system and component that been used also been described based on research that has been made. It will only focus on the main topic on how to develop a dead man's safety device on the urban concept car.

2.2 Urban Concept Car

The urban concept car is a model of the car that powered either one which is by internal combustion engines or electrical drivelines that suitable for small city cars. The car design must have and equip with windscreen wipers, enclosed cabin, four-wheel with disc brakes, luggage space and door must be in a reasonable size. This car is powered by internal combustion engines that can allow running with any type of fuel. The fuel includes ordinary gasoline and diesel, DTU Dynamo is running on, Compressed Natural Gas (CNG) and 2nd generation of bioethanol E100. The main objective for the Urban Concept class is to see whether the industry can go further in developing the technology for the internal combustion

engine. From there can see if this type of car has high efficiency in saving fuel when the usage of the energy used is maximum. (“About the Urban Concept class - Ecocar,” n.d.)



Figure 2.1 Urban Concept Car in Shell Eco-Challenge. Reprinted from DTU Roadrunner.

Retrieved from (<http://www.ecocar.mek.dtu.dk/english/-/media/Subsites/Ecocar/dynamo-urban-concept2.ashx?h=525&w=700&la=da&hash=475B7D9BBF13A8E1473F77BD5089F72979B8E597>)

2.2.1 Honda Urban Concept Car

For this type of car, this is the 1st electric concept car, Honda already spent the second half of the 20th century to expertise about the combustion engine. Hodgetts told that their car would be different from the other electric motors manufacturer because they made it with a slimmer condition and maybe have an engine. It was already proven that the reputation of electric power is one important part of the strengths of the combustion engine. This car is using a type R turbo engine. This car design is having two larger doors and has large wheels, wheels that been used must be smaller and had low exaggerated proportions, but for the rear side, the concepts are to use a rear-hinged door and the manufacturer used B-pillar concepts

to open the car doors similar like a four-seater concept. (“Honda Urban EV prototype to debut at 2019 Geneva motor show, on sale later this year,” n.d.)



Figure 2.2 Urban Concept Car for Honda. Reprinted from (“2019 Honda Urban Concept | Car Review 2018,” n.d.) Retrieved from <https://trekaletuan.com/2019-honda-urban-concept/>

2.2.2 Audi Urban Concept Car

For the Audi Urban Concept Car, it is using the 1+1 type of seat, has an ultra-light vehicle to blocked urban spaces. This Concept for this car is a combination of a racing car, urban car and fun car to create a new radical concept, it also presented a Spyder variant addition from a Sportback model. This Urban Concept car not depending on the previous model. The development is exclusively arranged based on exacting standards for lightweight development, proficiency, and reduction. The ideal vehicle for this concept is to ensure that no redundant weight and the main focuses on the unadulterated pith of energetic movement. The idea of the Audi Urban is to has a smooth body. Unsupported type of wheels uses, their encompassing protectives plates highlight flickering segments of the LED light. This car is only can fit only for two people, the position somewhat stunned and at a sporty, low

dimension. Ultra-lightweight is liable to manage the controls and materials development to guarantee that the tactile experience they pass on is one of a unique and convincing. The drives can change the guiding hagggle to his own body characteristic. For future trademark highlights of the Spyder incorporate its low, constant window region and its entryways that open corner to corner to the top. The innovation for this Audi Urban will show their full idea reflects the full capabilities of the product, particularly about ultra-lightweight development. (The Audi urban concept – a completely new kind of concept car | Audi MediaCenter, n.d.)



Figure 2.3 Audi Urban Concept Car. Reprinted from (“Audi urban concepts | What Car?” n.d.). retrieved from <https://www.audi-mediacyenter.com/en/press-releases/the-audi-urban-concept-a-completely-new-kind-of-concept-car-1078>

2.3 Automotive sensor

A sensor in the automotive industry is important to making vehicles greener, more connected and safer. Vehicles need data for transport passengers efficiently and safely. A sensor in the vehicle can sense and respond to changing conditions inside and outside. It can provide the data for adaptation, respond and control of vehicle functions that can increase efficiency, comfort, and safety. The manufacture and design of the automotive sensors to follow the exacting specifications and custom basic. It has several sensors already equip in