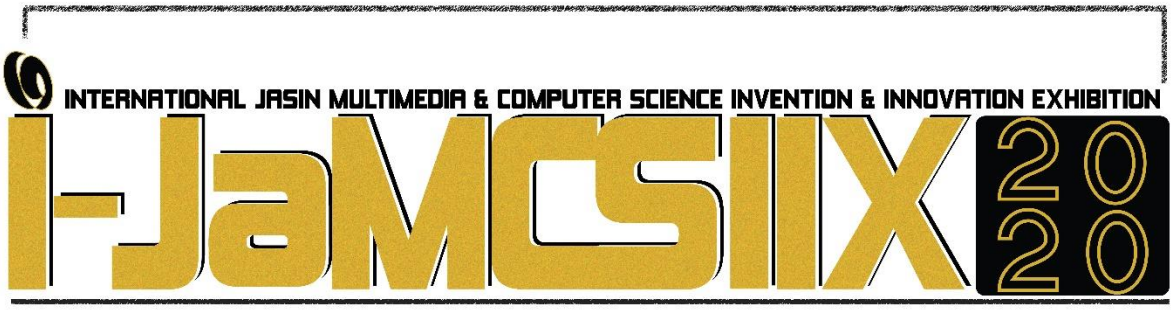

Anti-Driving While Intoxicated Device (Anti-DWI Device)

Ahmad Najmie Rusli[1], Nurul Nadiah Rasdi[2], and Muhammad Fadil Mustar[3]
Faculty of Mechanical Engineering, UiTM Pasir Gudang
ahmad7586@uitm.edu.my
Academy of Language Studies, UiTM Pasir Gudang
nurulnadiahrasdi@uitm.edu.my
Faculty of Mechanical Engineering, UiTM Pasir Gudang
mfadilmustar@gmail.com

ABSTRACT

Driving while intoxicated (DWI) caused by alcohol can increase the risk of a road accident. This is because a drunk driver is 13 times more likely to cause a road accident compared to a sober one. The cases of road accidents due to DWI have risen alarmingly and the consequences are dire that includes minor injury, major injury, or even death towards the driver, passengers, or pedestrians. To prevent road accidents, a solution needs to be done before the driver operates the motor vehicle. So, the objectives of this project is to design and develop a prototype device called Anti-Driving While Intoxicated Device (Anti-DWI Device). This device can detect the alcohol level, temperature, and heart rate of a person before driving. These three stimulants will be detected by three sensors and these sensors are controlled by a microcontroller that applies Arduino code. When the person exhibits the signs of intoxication, the engine of the motor vehicle will not start. A message will then be sent to a registered family member to inform of the situation as to make certain the intoxicated person can get home safely. Consequently, it will prevent the driver from driving and curb road accidents from happening. This situation will not only benefit the driver but also other people on the road in terms of safety. Overall, the result of designing and developing the prototype device is successful.

KEYWORDS: intoxicated, drunk, driving, accidents, safety

1 INTRODUCTION

Road accidents are common worldwide. In Malaysia, the number of road accidents has increased yearly. From the report, it shows that the rate of fatal road accidents in Malaysia was among the highest in the world [1]. Detailed information on the number of road accidents is presented in Table 1 [2], [3], [4].

Table 1 Statistics of Road Accidents from Year 2012-2018

Year	Cases
2012	462,423
2013	477,204
2014	476,196
2015	489,606
2016	521,466
2017	533,875
2018	548,598

One of the causes of road accidents is drunk driving. Drunk driving is an offense of driving a motor vehicle with an excess of alcohol in the blood. There are many terms for drunk driving which are DWI, DUI, OUI, and OWI [5]. DWI is an acronym that stands for 'driving while intoxicated' or 'driving while impaired'. DUI is an acronym for 'driving under the influence.' OUI is an acronym that means 'operating under the influence.' OWI is an acronym for 'operating while intoxicated' A drunk driver is 13 times more likely to cause a road accident compared to a sober one. People who are involved in DWI road accidents may endure a minor injury or major injury and the worst-case scenario is death. The statistics of road accidents due to DWI is illustrated in Table 2 [6].

Table 2 Statistics 0f DWI Road Accidents from Year 2012-2018

Year	Death	Serious Injury	Minor Injury	Total
2012	136	50	60	246
2013	207	47	73	327
2014	192	56	84	333
2015	229	95	96	420
2016	237	113	111	461
2017	58	81	73	212
2018	54	74	63	191

From Table 2, it can be seen that the trend of DWI road accidents increase from the year 2012 to 2016, but decrease from the year 2017 to 2018. Although the statistics shown are only until the year 2018, there are many recent road accidents because of DWI that can be read in newspapers or heard via televisions or radios. The reports indicated that the driver was unharmed while other people suffered from a minor injury, serious injury, or death [7], [8], [9]. In Kuala Lumpur alone, it is said that 158 drunk drivers have been arrested earlier this year, January 2020 [10]. Currently, the driver is only tested on alcohol consumption after road accidents occurred [8]. However, a solution needs to be done before the driver operates the motor vehicle to prevent road accidents from happening.

2 OBJECTIVES

The objectives of this project are to design and develop a prototype device that can detect the alcohol level, temperature, and heart rate of the driver before driving.

3 SIGNIFICANCE (S)

The significance of this project is in terms of safety on the road. The prototype device will be used before the driver drives. It will prevent the driver from driving if the driver is found to exceed the alcohol level legal limits, have low body temperature, and have a slow heart rate. Additionally, family members will also know about the situation as they will receive a message

that inform them about it and bring the intoxicated driver home safely. Therefore, road accidents due to drunk driving will not take place and many people will benefit from the use of this prototype device regardless of the driver or other people.

4 METHODOLOGY/ TECHNIQUE

Design and Program Code:

The philosophy of design is mini size, effective, and commercial. CAD software was used in the designing stage. Based on the identification of intoxicated symptoms which are alcohol level, temperature, and heart rate, the program code was prepared to signal the sensors. If the output is satisfied, the next stage is to fabricate the prototype. In this project, the Arduino code was used as the main operating code.

Prototyping and Testing:

The prototype was built using Arduino as a microcontroller and three types of sensors which are an infrared temperature sensor, heartbeat sensor, and alcohol sensor. Then, the test was conducted to ensure the output as the design project. According to Section 45G of the Road Transport Act 1987, a person is intoxicated when the concentration of alcohol in the breath is 35 microgrammes of alcohol in 100 millilitres of breath which is the prescribed limit [6]. Other than that, the person is also intoxicated when the body temperature is low and the heart rate is slow [11]. When the person exhibits these signs of intoxication, the engine of the motor vehicle will not start. A message will then be sent to a registered family member to inform of the situation as to make sure the intoxicated person can get home safely. Fig. 1 shows the 3D diagram and installation of the prototype device on the sun visor at the driver's side.

Fig. 1 Prototype of Anti-DWI Device

5 RESULTS

The operation of prototype has been tested for its effective time detection DWI by using multiple sensors of alcohol (A), temperature (T), and pulse rate (P) sensors as demonstrated in Table 3. The effective time detection by using a single sensor alcohol is 3 seconds, followed by 10 seconds of combined alcohol and temperature sensors. The additional of pulse rate sensors resulted of 16 seconds of effective time detection. The effective time detection of DWI prototype by applying three types of sensors is acceptable since the values are still 30 seconds.

Table 3 Effective Time Detection of DWI Prototype by using Multiple Sensors

Apply Sensor	A	A+T	A+T+P
Effective Time (Second)	3	10	16

6 CONCLUSIONS

This project achieved the objectives which are to design and develop a prototype device that can detect the alcohol level, temperature, and heart rate of the driver before driving. The effective time detection of DWI condition of this prototype is 16 seconds combined of three sensors. The prototype device can be commercialized as an additional feature in automotive industries to emphasize safety. However, the prototype could also be improved in terms of design and material used. The design should take into consideration of vehicle's interior design.

REFERENCES

[1] RM100,000 fine, jail 20 years for drunk driving. New Strait Times [Internet]. 2020 Feb 15 [cited 2020 Feb 20]; News: [about 1 p.]. Available from: https://www.nst.com.my/news/nation/2020/02/565868/rm100000-fine-jail-20-years-drunk-driving

[2] Department of Statistics Malaysia, Official Portal. Social Statistics Buletin, Malaysia, 2017 [Internet]. Malaysia: Department of Statistics Malaysia; 2017 [cited 2020 Feb 9]. Available from: https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=152&bul_id=aktTTjhhRHd1aHBCZGF1N01aaTl3dz09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09

[3] Department of Statistics Malaysia, Official Portal. Social Statistics Buletin Malaysia 2018 [Internet]. Malaysia: Department of Statistics Malaysia; 2018 [cited 2020 Feb 9]. Available from: https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=152&bul_id=NU5hZTRkOSs0RVZwRytTRE5zSitLUT09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09

[4] Department of Statistics Malaysia, Official Portal. Social Statistics Buletin, 2019 [Internet]. Malaysia: Department of Statistics Malaysia; 2019 [cited 2020 Feb 9]. Available from: https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=152&bul_id=eVZ5NnJPMm5PTEFxbVdWcERzdGNrZz09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09

[5] Buddy T. DUI vs, DWI: What's the difference? [Internet]. California: Dotdash; 2020 [updated 2020 Jan 13; cited 2020 Feb 9]. Available from: https://www.verywellmind.com/dui-vs-dwi-what-is-the-difference-67214

[6] Megat Khushari MFI. Don't drink and drive [Internet]. [place unknown]. Available from: https://docplayer.net/155687469-Don-t-drink-and-drive-megat-farizul-ikhwan-bin-megat-khushari-ministry-of-transport-malaysia.html

[7] Basyir M. Drunk driver ploughs car into MyVi, motorcycle in Penang. New Strait Times [Internet]. 2020 Jan 25 [cited 2020 Feb 9]; News: [about 1 p.]. Available from: https://www.nst.com.my/news/crime-courts/2020/01/559691/drunk-driver-ploughs-car-myvi-motorcycle-penang

[8] Penang drunk driver crashes car into motorcycle, killing man, injuring woman. New Strait Times [Internet]. 2020 Feb 10 [cited 2020 Feb 9]; News: [about 1 p.]. Available from: https://www.nst.com.my/news/nation/2020/02/564147/penang-drunk-driver-crashes-car-motorcycle-killing-man-injuring-woman

[9] Singh S. Man, 34, dies after drunk driver crashes into car, three bikers. The Star [Internet]. 2020 Feb 16 [cited 2020 Feb 20]; News nation: [about 1 p.]. Available from: https://www.thestar.com.my/news/nation/2020/02/16/man-34-dies-after-drunk-driver-crashes-into-car-three-bikers

[10] 158 drunk drivers arrested in KL in January. The Star [Internet]. 2020 Feb 13 [cited 2020 Feb 20]; News nation: [about 1 p.]. Available from: https://www.thestar.com.my/news/nation/2020/02/13/158-drunk-drivers-arrested-in-kl-in-january

[11] National Institute on Alcohol Abuse and Alcoholism. Understanding the dangers of alcohol [Internet]. USA: National Institute on Alcohol Abuse and Alcoholism; 2020 [updated 2020 Feb; cited 2020 Feb 20]. Available from: https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/understanding-dangers-of-alcohol-overdose