# FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

# DESIGN AND DEVELOPMENT OF ARDUINO DATA GLASSES

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

by

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2019

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Tajuk: DESIGN AND DEVELOPMENT OF ARDUINO DATA GLASSES

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## APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Power Industry) with Honours. The member of the supervisory is as follow:

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# ABSTRAK

Bekerja di sekitar kawasan voltan tinggi adalah satu tugas yang sangat berisiko yang boleh melibatkan kematian akibat kemalangan. Salah satu sebab bagi kemalangan itu berlaku kerana kecuaian pekerja itu sendiri, sebagai contoh, seorang pekerja perlu memeriksa sama ada fius masih lagi berfungsi atau tidak ketika keadaan voltan masih berjalan dan dia secara tidak sengaja menyambung wayar fasa ke neutral menggunakan multimeter. Hasilnya akan mendapat litar pintas dan satu kilauan arka besar akan mengenai seluruh tubuhnya. Untuk mengelakkan situasi ini berlaku, projek ini akan memberi tumpuan bagaimana untuk fokus kepada kerja tangan sambil melihat data penting seperti paparan voltan pada multimeter. Idea untuk menyelesaikan masalah ini adalah dengan merekabentuk dan membangunkan peranti yang dapat memaparkan keluaran bacaan digital di depan mata pengguna. Setelah melakukan penyelidikan, peranti yang paling sesuai untuk keadaan ini adalah kacamata pintar. Oleh itu, projek ini akan merekabentuk dan membangunkan kacamata pintar dengan mengkaji dan mendapatkan idea yang berguna dari penyelidik terdahulu yang telah juga membuat kacamata pintar. Akhirnya, projek ini akan dibina semudah dan semurah yang mungkin supaya ia sesuai untuk digunapakai bagi setiap peringkat dalam komuniti sekarang.



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## ABSTRACT

Work around high voltage areas is a very risky job that involves accidental death. One of the reasons for the accident occurred because of the negligence of the worker himself, for example, an employee need to check whether the fuse is broken or not while the voltage is applied and he accidentally connect the phase wire to the neutral using a multimeter. The result will get a short circuit and one big an arc flash in his entire body. To prevent this situation occurred, this project will be focused on how to keep focus on hands-on job when viewing important data such as voltage value on the multimeter. The idea for solving this problem is to design and develop devices that can display output digital on front of user's eyes. After doing some research, the most suitable device for this situation is smart glasses. Therefore, this project will designing and developing of the smart glass by studying and earn a good idea from the previous researcher that also making the smart glasses. Lastly, this project will builds as simple and cheap as possible for suitable to every rank of community to earn it.



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## DEDICATION

To my beloved parents Mr. Ismaon Bin Osman and Mrs. Norzaiton Binti Yusof for their support and pray. A full appreciation to my supervisor Muhammad Fareq Bin Ibrahim for advising and helping through this project.



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## ACKNOWLEDGEMENTS

Alhamdulillah thanks to Allah S.W.T the Most Merciful, and all praises to Allah for his blessing in completing this project. I would also like to show appreciation to my supervisor Muhammad Fareq Bin Ibrahim for his support, consultation and professional cooperation. Most thanks to all other University Technical Malaysia Malacca panels and staff members that were help assist for consultation, comments and opinion to completed the project. I enjoin thankfulness to my family for supporting to finish this project. Also, my great thanks to all my friends for encouragement and support in this project.



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# TABLE OF CONTENTS


| | | PAGE |
|---|---|---|
| **TABLE OF CONTENTS** | | **x** |
| **LIST OF TABLES** | | **xiv** |
| **LIST OF FIGURES** | | **xv** |
| **LIST OF APPENDICES** | | **xviii** |
| **LIST OF SYMBOLS** | | **xix** |
| **LIST OF ABBREVIATIONS** | | **xx** |
| **CHAPTER 1** | **INTRODUCTION** | **1** |
| 1.1 | Introduction | 1 |
| 1.2 | Background | 1 |
| 1.3 | Problem Statement | 4 |
| 1.4 | Objective | 6 |
| 1.5 | Scope | 6 |
| 1.6 | Project Framework | 7 |
| 1.7 | Conclusion | 8 |
| **CHAPTER 2** | **LITERATURE REVIEW** | **9** |
| 2.1 | Introduction | 9 |
| 2.2 | High Voltage | 9 |




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2.3 Head Mounted Display (HMD) 10
2.3.1 Optical Head Mounted Display (OHMD) 11
2.4 Smart Glasses 12
2.4.1 Working field 13
2.4.2 Education 14
2.5 Lens 14
2.5.1 Converging lens 15
2.5.2 Fresnel lens 17
2.6 Reflection 18
2.6.1 Reflection of light 18
2.7 Micro LED 19
2.8 Lithium polymer battery 20
2.9 Bluetooth V4.0 HM-11 BLE (Bluetooth Low Energy) Module 21
2.9.1 Specification 22
2.10 SolidWorks 22
2.10.1 Modelling technology 23
2.11 Bluetooth Multimeter 24
2.12 Arduino Pro Mini 25
2.12.1 Power 26
2.12.2 Connectors 26
2.12.3 Technical Specifications 27
2.12.4 Memory 28
2.12.5 Input and Output 28
2.12.6 Communication 29



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2.12.7 Automatic (Software) Reset 29

**CHAPTER 3 METHODOLOGY 31**

3.1 Introduction 31

3.2 Flow chart 32

3.3 Design and Development 34

3.4 Equipment and Material 37

**CHAPTER 4 RESULTS AND DISCUSSION 43**

4.1 Introduction 43

4.2 Optical Design 43

4.2.1 Appropriate Distance 44

4.3 Circuit Design and Program Development 46

4.3.1 Arduino Pro Micro 46

4.3.2 Bluetooth module 47

4.3.2.1 Step to Connect to The Bluetooth multimeter 49

4.3.3 Micro OLED 50

4.3.4 Charger Circuit for Battery LiPo 52

4.4 Casing Design 54

4.5 End Product of Data Glasses 57

**CHAPTER 5 CONCLUSION 58**

5.1 Introduction 58



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5.2 Summary of Research 58

5.3 Achievement of Research Objectives 59

5.4 Suggestions for Future Work 59

**REFERENCES** **60**

**APPENDIX** **64**



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# LIST OF TABLES


| TABLE | TITLE | PAGE |
|---|---|---|
| Table 2.1: | Specification Bluetooth Module | 22 |
| Table 2.2: | Specification of Arduino Pro Mini | 27 |
| Table 2.3: | Input and Output of Arduino | 28 |
| Table 4.1: | Result of converging lenses | 44 |
| Table 4.2: | Connection Bluetooth to Arduino Pro Micro | 48 |
| Table 4.3: | Connection Micro OLED to Arduino Pro Micro | 50 |




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# LIST OF FIGURES


| FIGURE | TITLE | PAGE |
|---|---|---|
| Figure 1.1: | User Viewing Field of Smart Glasses | 2 |
| Figure 1.2: | Workplace and Non-Workplace Electrical Accidents | 4 |
| Figure 1.3: | Electrical accidents – primary electrical source | 5 |
| Figure 1.4: | Example moment in electrical flashover | 6 |
| Figure 1.5: | Prototype of Arduino Data Glasses | 7 |
| Figure 2.1: | Examples of Injuries from Electric Accident | 9 |
| Figure 2.2: | Example of Head Mounted Display | 10 |
| Figure 2.3: | Example of Optical Head Mounted Display | 11 |
| Figure 2.4: | User Wearing Moverio | 12 |
| Figure 2.5: | Example of Smart Glasses in Working Field | 13 |
| Figure 2.6: | Example of Smart Glasses in Education | 14 |
| Figure 2.7: | Different type of Lens | 14 |
| Figure 2.8: | Example of Converging lens | 15 |
| Figure 2.9: | Theory of converging lens formula | 16 |
| Figure 2.10: | Examples of Fresnel lens Use in Daily Life | 17 |
| Figure 2.11: | Type of Reflection | 18 |
| Figure 2.12: | Theory of Light Reflection | 19 |




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| | | |
|---|---|---|
| Figure 2.13: | Example of Micro LED | 19 |
| Figure 2.14: | Example of Lithium polymer battery | 20 |
| Figure 2.15: | Example of Bluetooth module | 21 |
| Figure 2.16: | Example of drawing using SolidWorks | 22 |
| Figure 2.17: | Bluetooth Multimeter | 24 |
| Figure 2.18: | Arduino Pro Mini | 25 |
| Figure 2.19: | FTDI Cable | 25 |
| Figure 2.20: | ATmega328 | 29 |
| Figure 3.1: | Field Diagram of this project | 31 |
| Figure 3.2: | Flowchart of project | 33 |
| Figure 3.3: | Schematic Diagram of Data Glasses | 34 |
| Figure 3.4: | Coding program of Arduino Pro Micro | 35 |
| Figure 3.5: | Theory of converging lens equation formula | 36 |
| Figure 3.6: | Prototype of Casing Data Glasses | 37 |
| Figure 3.7: | Arduino Pro Micro | 37 |
| Figure 3.8: | Bluetooth V4.0 HM-11 BLE | 38 |
| Figure 3.9: | Micro OLED | 38 |
| Figure 3.10: | Mini USB Charger | 39 |
| Figure 3.11: | Lithium Polymer Battery | 39 |
| Figure 3.12: | Mini Slide Switch | 40 |
| Figure 3.13: | Bluetooth Multimeter | 40 |




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| | | |
|---|---|---|
| Figure 3.14: | Jumper Wire | 41 |
| Figure 3.15: | Small Mirror | 41 |
| Figure 3.16: | Safety Glasses | 42 |
| Figure 3.17: | Small Fresnel Lenses | 42 |
| Figure 4.1: | Distance of the Optical Design | 45 |
| Figure 4.2: | Result of the Optical Design | 45 |
| Figure 4.3: | Pin Arduino Pro Micro | 47 |
| Figure 4.4: | HM-11 Pin | 48 |
| Figure 4.5: | Connection Bluetooth to Arduino Pro Micro | 49 |
| Figure 4.6: | Connection Micro OLED to Arduino Pro Micro | 51 |
| Figure 4.7: | Result of Connection between Micro OLED to Bluetooth | 52 |
| Figure 4.8: | Charger Circuit Connection | 53 |
| Figure 4.9: | Full Circuit Complete | 53 |
| Figure 4.10: | Bottom of Electronic Casing | 54 |
| Figure 4.11: | Top of Electronic Casing | 54 |
| Figure 4.12: | Top of Optical Casing | 55 |
| Figure 4.13: | Bottom of Optical Casing | 55 |
| Figure 4.14: | Glass Reflector Holder | 56 |
| Figure 4.15: | Final result of 3D print design | 56 |
| Figure 4.16: | Final Result of the Project | 57 |
| Figure 4.17: | Output Display Success | 57 |




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# LIST OF APPENDICES


| APPENDIX | TITLE | PAGE |
|---|---|---|
| APPENDIX A: | Blinking Coding for Arduino Pro Micro | 61 |
| APPENDIX B: | Coding AT Mode for Hm-11 Bluetooth Module | 63 |
| APPENDIX C: | Arduino Code Print at Serial Monitor | 64 |
| APPENDIX D: | Final Coding for this project | 67 |




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# LIST OF SYMBOLS

| | | |
|---|---|---|
| IT | - | Information Technology |
| Θr | - | Angle of Reflection |
| Θi | - | Angle of Incident |
| I | - | Distance of Virtual Image |
| O | - | Object Distance |
| F | - | Focal Length |



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# LIST OF ABBREVIATIONS

| | |
|---|---|
| HMD | Head Mounted Display |
| OHMD | Optical Head Mounted Display |
| TMD | Transmissive Mirror Device |
| AR | Augmented Reality |
| BLE | Bluetooth Low Energy |
| OLED | Organic Light-Emitting Diode |
| LED | Light-Emitting Diode |
| LiPo | Lithium-Ion Polymer Battery |
| SPI | Serial Peripheral Interface |
| CAD | Computer-Aided Design |
| CAE | Computer-Aided Engineering |



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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This chapter represent idea to develop a Smart Glasses. It also includes the background, problem statement, objectives, and project scope. A problem statement was summarized to propose a solution for the problem. The solution is stated as the objectives of developing this project. Hence, the scope is covered the functionalities provided by this project.

## 1.2 Background

Due to technological development, various portable terminals and computers are nowadays part of business as usual. Everyone obviously has cell phone which is most likely a smart phone, but diverse portable terminals and relevant applications are nowadays basic equipment for mobile workers. Wearable technology represents the next stage of development that are running smoothly with hands and eyes free.

It is very important to have a wearable technology which the devices are small and the design allows them to be either integrated to clothing or otherwise easily portable. With the latest technology, it is easy to provide variable accurate and additional information for a mobile worker without disturbing the actual work with some devices or workflow interruptions.



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In order to develop a device that can display data at front of user's eyes, Smart Glasses has been introduced. The display may be projected or reflected on the lens of glasses or it can be a separate component brought to the eye sight. Most importantly, user can observe the environment without distractions when he is not in need of the information provided by the Smart Glasses.

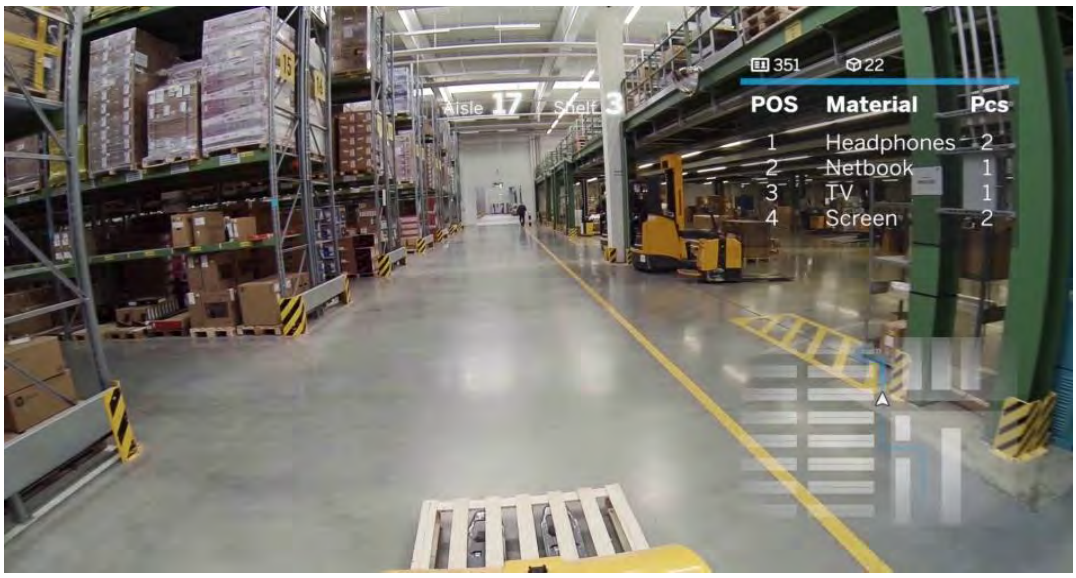


**Figure 1.1: User Viewing Field of Smart Glasses**

Smart Glasses are usually called augmented reality, means by displaying digital information in the real world. For watching video or moving pictures or to virtual reality, there are dissimilarity when doing comparison on display techniques. Data about an objective in sight, for example, an item on hands, data about view of a person and even recognition of human face are mostly provided by Smart Glass systems.

User can communicate with the system, for example with voice, signs or finger sweeps. It is important that managing the system is easy and practical and should be suited for the task and user. The device ought to fit or suit perfectly so that you don´t have to



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think about using it or paying attention to it while not in use. In business use, the device also needs to be compatible with other IT infrastructure.

There was an increase in development on Smart Glasses. Because of its features such as user sharing their viewpoint with other people with remote location or users may look into digital displayed without using hand, Smart Glasses are hoped-for be used on field of worked. An example of work system, that use Smart Glasses is when workers are primarily using the Smart Glasses to avoid whatever failure from looking at the digital display while focusing on their hands work.

Among of it is Graphical User Interface (GUI) design based on Smart Glasses for assist pilots on harbour manoeuvres that has been discussed by (Marie-Christin Ostendorp, 2015) which provide pilots for approach any information while continuing to look outside the window and thus continue to focus on their hands work. The result was the pilot has ability to see and solve a problem quickly with help of information from interface.

Besides that, Tsunami Evacuation Drill (TED) system has been developed by (Junya Kawaia, 2015) in order to solve the problem of participants were not committed or interested to the Evacuation training. The objective was success which is the participants able to moving quickly while view text and map material provided by the system.

Furthermore, Smart Glasses has not been establish to be used at context of complex ICU said by (Charlotte Romarea, 2017). Research about views of Smart Glasses in intensive care was carried out for determine the possible intensive care position where Smart Glasses can be used for improve patient safety. Unfortunately, the result was said human presence is more needed than Smart Glasses in intensive care.



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There are some various type of Smart Glasses has been designs. Depending at their functional condition, each form have their own advantages and disadvantages. Therefore, in order for users to comfortably wear the Smart Glasses and see the digital output clearly, the choice of Smart Glasses designation is very crucial. A good display of Smart Glasses depending on the combination of the optical system with the Smart Glassed itself, which can only be achieved by selecting the right type of lens to use in optical system.

## 1.3 Problem Statement

Work around high voltage areas is a very risky job that involves accidental death. For example, Electrical Incident Safety Report 2016-2017 of Western Australia shows that there were 135 electrical accidents which occurred over the 10 years and also electrical accidents have increased in 2016-2017 compared to the previous year (Bowron, 2017).

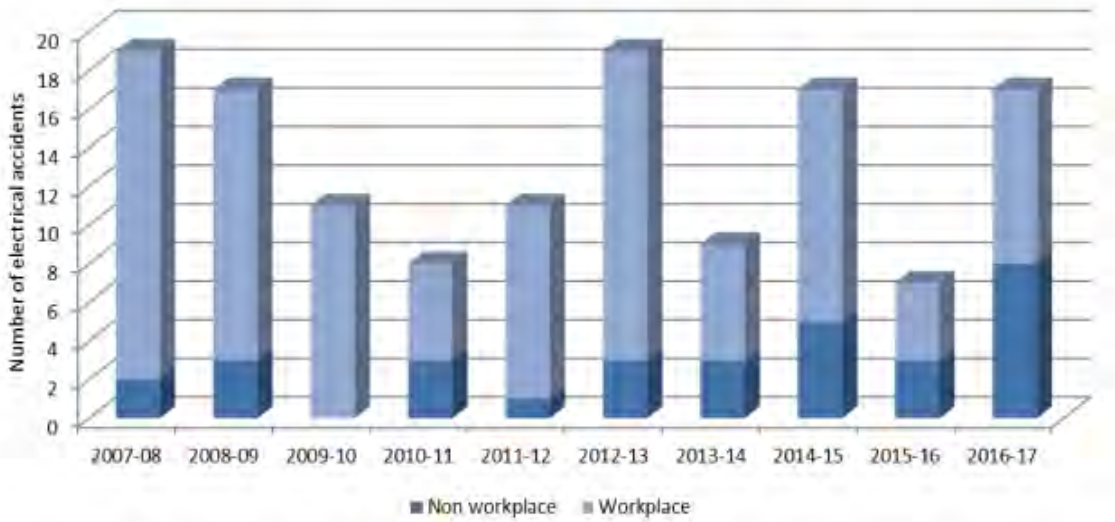


**Figure 1.2: Workplace and Non-Workplace Electrical Accidents**



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