

DESIGN AND DEVELOPMENT OF IOT BASED
SCORECARD FOR GOLF SPORT



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DESIGN AND DEVELOPMENT OF IOT BASED SCORECARD FOR GOLF SPORT

MICHAEL CHIN KAH CHOON



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

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY

2021

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DESIGN AND DEVELOPMENT OF IOT BASED SCORECARD FOR
GOLF SPORT

Sesi Pengajian: 2020

Saya **MICHAEL CHIN KAH CHOON** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

- SULIT* Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.
- TERHAD* Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.
- TIDAK TERHAD

Yang benar,



MICHAEL CHIN KAH CHOON

Disahkan oleh penyelia:



IR. DR. MOHD FARRIZ BIN HJ. MD

BASAR

Alamat Tetap:

9, Jalan Bukit Markisa 2,

Taman Bukit Markisa,

70200 Seremban,

Negeri Sembilan

Cop Rasmi Penyelia

Tarikh: 15/01/2021

Tarikh: 15/01/2021

*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini

DECLARATION

I hereby, declared this report entitled DESIGN AND DEVELOPMENT OF IOT BASED SCORECARD FOR GOLF SPORT is the results of my own research except as cited in references.

Signature:

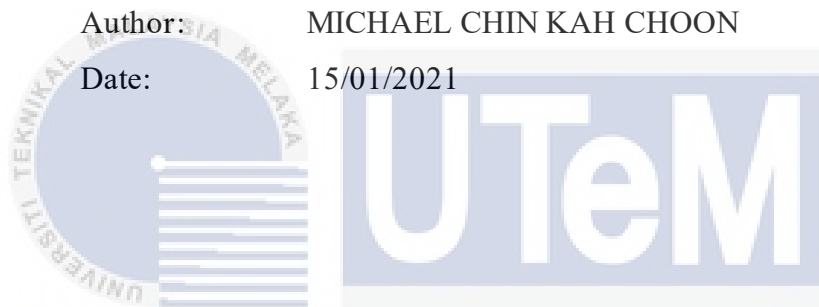


Author:

MICHAEL CHIN KAH CHOON

Date:

15/01/2021



اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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 Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:



ABSTRAK

Kad skor berasaskan IoT untuk sukan golf ialah sistem rakaman skor yang digunakan untuk mengumpulkan, merekod, dan memaparkan keputusan masa nyata semasa kejohanan golf. Perkara ini dapat dilakukan dengan menggunakan aplikasi berbasis Android sebagai peranti input bagi sistem tersebut untuk memasukkan skor yang diperoleh, dan menampilkan kedudukan pemain secara masa nyata. Objektif projek ini adalah untuk mereka bentuk dan membangunkan kad skor berasaskan IoT untuk sukan golf. Selain itu, projek ini akan menguji prestasi kad skor berasaskan IoT terhadap sistem rakaman skor tradisional. Projek ini menggunakan Google Firebase sebagai pangkalan data dalam talian untuk menyimpan dan memproses data yang dimasukkan oleh pengguna. Kemudian, keputusan pertandingan golf akan dipaparkan di monitor komputer atau TV pintar dengan akses ke Google Firebase. Jangkaan hasil daripada projek ini diketengahkan kad skor golf berasaskan IoT yang memberikan pengalaman berguna kepada pemain golf untuk merekodkan skor dan analisis pemenang dalam sebuah kejohanan. Selain itu, projek ini juga akan mengurangkan masa yang diperlukan untuk menamatkan sebuah kejohanan golf.

ABSTRACT

IoT based scorecard for golf sport is a score recording system used to collect, record, and display the real-time results during a golf tournament. This can be done by using an Android based application as the input device of the system to key in the score obtained and display the players' real-time ranking. The objective of this project is to design and develop the IoT based scorecard for golf sport. Other than that, this project will test the performance of the IoT based scorecard against the traditional score recording system. This project uses the Google Firebase as the online database to store and process the data enter by users. Then, the real-time results of the golf tournament will be display on a computer monitor or a smart TV with access to Google Firebase. The results of this project featured an IoT based golf scorecard provide handy experience to golfers regards to score recording and winner analysis in a tournament. Other than that, this project will also reduce the time taken to complete a golf tournament.

DEDICATION

This report is dedicated to my beloved parents who educated and supported me throughout the process of doing this project. I am also wanted to say thank you to my supervisor and my friends who have encouraged, guided and inspired me to complete this project.



ACKNOWLEDGEMENTS

This report is as a mark of my sincere appreciation to Universiti Teknikal Malaysia Melaka (UTeM) for giving me this chance to further study on bachelor's degree in Electronics Engineering Technology (Telecommunications) in Faculty of Electrical and Electronics Engineering Technology (FTKKEE). I would like to thanks to my supervisor, Ir. Dr. Mohd Farriz Bin Hj. Md Basar for the guidance, advices, encouragement, inspiration and attention given throughout the day in development of my final year project and while writing this report entitled as Design and Development of IoT based Scorecard for Golf Sport. With this continuous support and interest, he was guiding me to complete this project with full commitment and dedication. My gratitude goes to my beloved family and my friends that always give courage and support me to achieve the goal of my project. Thanks to their moral support and care they had given to me up until this project done.



TABLE OF CONTENTS

	PAGE
DECLARATION	i
APPROVAL	ii
ABSTRAK	iii
ABSTRACT	iv
DEDICATION	v
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF APPENDICES	xiii
LIST OF ABBREVIATIONS	xiv
CHAPTER 1 INTRODUCTION	1
1.0 Introduction	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Objectives	3
1.4 Scope of Work	3

1.5	Project Significant	3
CHAPTER 2 LITERATURE REVIEW		5
2.0	Introduction	5
2.1	Previous Project Related	5
2.1.1	Golf Scorecard	5
2.1.2	Electronic Golf Scorecard	7
2.1.3	Golf Score Recording System and Network	9
2.1.4	Android based Live Score Application for Flag Football	12
2.1.5	Real-time Communication Application Based on Android Using Google Firebase	14
2.2	Summary	16
CHAPTER 3 METHODOLOGY		18
3.0	Introduction	18
3.1	Flowchart for the Project	18
3.2	Milestones of the Project	21
CHAPTER 4 PROJECT IMPLEMENTATION		23
4.0	Introduction	23
4.1	Block Diagram	23
4.2	Hardware Development	24

4.2.1	Android-based Smart Device	24
4.2.2	Google Firebase Online Database	25
4.3	Scorecard Implementation in Golf Tournament	27
4.3.1	Implementation of Current Golf Scorecard	27
4.3.2	Implementation of IoT based Golf Scorecard	31
CHAPTER 5 RESULTS AND ANALYSIS		35
5.0	Introduction	35
5.1	Results	35
5.2	Analysis	41
CHAPTER 6 CONCLUSION		48
6.0	Introduction	48
6.1	Conclusion	48
6.2	Recommendation	49
REFERENCE		51
APPENDIX		53
Appendix I		53
Appendix II		57

LIST OF TABLES

TABLE	TITLE	PAGE
Table 3.3:	Five (5) Major Stage of the Project	22
Table 5.7:	Types of Blocks	42
Table 5.9:	Effects for Absence of Specific Blocks for Screen 1	43
Table 5.11:	Effects for Absence of Specific Blocks for Screen 2	45
Table 5.15:	Effects for Absence of Specific Blocks for Screen 3	47



LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1:	Golfers Record Score Obtained by using Golf Scorecard	1
Figure 2.1:	Plan view of one side of the scorecard	6
Figure 2.2:	Golf Scorecard from Cresta Verde Golf Course	7
Figure 2.3:	Electronic Golf Scorecard Design	8
Figure 2.4:	Blocks of Central Computer Module	10
Figure 2.5:	Blocks of Mobile Computer Module	11
Figure 2.6:	Mobile Computer Module	11
Figure 2.7:	American Flag Football League	12
Figure 2.8:	Match Schedule Interface on Mobile	13
Figure 2.9:	Mobile Data Match System Input Interface	14
Figure 2.10:	The Firebase Database with user entries and message entries	16
Figure 3.1:	Flowchart of the Development of IoT based Golf Scorecard	19
Figure 3.2:	Interface of MIT App Inventor II	20
Figure 4.1:	Block Diagram of the Project	24
Figure 4.4:	Sample Specification of Android device	25
Figure 4.5:	Google Firebase Layout with Data	26
Figure 4.7:	Golf Line for Group A and Group B	27
Figure 4.8:	The Golf Tournament Starts at 8AM	28
Figure 4.9:	Progress of Group A and Group B	29

Figure 4.10:	Final Progress for Group A and Group B	30
Figure 4.11:	Winner Announcement at 1.30PM	30
Figure 4.12:	Golfers Submit the Score Obtained via Scorecard Application at 8AM	32
Figure 4.13:	Progress of Group A and Group B at 10AM	33
Figure 4.14:	Final Progress for Group A and Group B	34
Figure 4.15:	Winner Announcement at 12PM	34
Figure 5.1:	Main Page of the Scorecard Application	36
Figure 5.2:	Players Selection Page	37
Figure 5.3:	Score Recording Page for Player 1	38
Figure 5.4:	Score Recording Page for Player 1 with Sample Score	39
Figure 5.5:	Firestore Layout in the Scorecard App	40
Figure 5.6:	Firestore Layout with Sample Score of Player 1	41
Figure 5.8:	Block Language for Main Page of the Scorecard Application	43
Figure 5.10:	Block Language for Screen 2	44
Figure 5.12:	Declaration Blocks for Players' Score Recording Page	45
Figure 5.13:	Button Action Blocks	46
Figure 5.14:	Screen 3 Action Blocks	47

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix I	Block Program Language used in the project	52
Appendix II	MIT App Inventor II Project Layout	56



LIST OF ABBREVIATIONS

IoT	Internet of Things
API	Application Programming Interface
SDK	Software Development Kit
CPU	Central Processing Unit
IFFA	Indonesian Flag Football Association



CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter purpose is to create the outline of this project. All the requirements need to be achieved by the end of this project will be included. The project background will be provided in brief and the architecture of the project will be precisely illustrated.

1.1 Background

According to Hardin, J. D. (1991) Golf scorecard is a sheet material used to register the identification of four players and record individual player stroke total in score boxes aligned next to the identification blocks which are now widely used in golf clubs during a golf tournament to be register and record the stroke score by the golfers. Figure 1.1 shows a golfer record score obtained by using golf scorecard.



Figure 1.1: Golfers Record Score Obtained by using Golf Scorecard
[Source: <https://www.golf-monthly.co.uk/features/golf-scorecard-rules-simple-but-important-67737>]

According to Lambourne, G. T. (1996) electronic golf scorecard is number pad and display packed in a casing to serve as a golf scorecard which will record initials of the players, handicap details and the stroke score of each player in the individual holes during a golf game. Development of an IoT based golf scorecard is to improve the efficiency of the score recording and analyzing process during a golf tournament. Furthermore, this will also reduce the burden on the analyzers of the golf tournament.

1.2 Problem Statement

At most of the golf clubs in Malaysia, golf tournament takes a very long time to be finished and analyze the winner of that golf tournament. This is because golfers in that tournament have to write down their stroke score manually in the given traditional golf scorecard. After the golfers finished their games and recorded their score, all the scorecard will be handed over to the tournament analyzers to be calculate and analyze the winner with the least stroke score in the tournament. The time taken to be analyzed the winner may longer than the time taken by the golfer to finish their games.

Other than that, the analyzation of the winner might have error in terms of the stroke score written by the golfers. There might be reading and writing error occur when recording and analyzing the stroke score. This will cause an unfair result for all the golfers participated.

1.3 Objectives

The objectives for this project are:

1. To design an IoT based golf scorecard.
2. To develop an IoT based golf scorecard by using MIT App Inventor II and Google Firebase Online Database.
3. To analyse the performance of the IoT based golf scorecard with online database system for tournament that having in golf clubs in terms of accuracy and efficiency.

1.4 Scope of Work

This project purposely focuses on the design and development of the IoT based golf scorecard. The main product will be based on an android based application, an online database. The programming language used to develop the android-based application will be block language. The online database will be setup based on Google Firebase online database due to its simplicity and no cost will be needed. The data stored in the online database will then display through computer monitor or Smart TV.

1.5 Project Significant

Previously, golf score recorded manually by using physical scorecard and pencil. The winner analysis will start after the game finished by golfers and all the scorecards been submitted by participants. This project unique from work that previously done is it uses a real-time online database to store the stroke score recorded by golfers by the

android-based application, and the data stored will then display through the computer or Smart TV on the spot. Thus, it will be improving the accuracy and efficiency of the score recording and analysing process.



CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter consists of the previous project explanations and the findings from previous related project to be improve in this current project.

2.1 Previous Project Related

This section will discuss the related previous project. A comparison between this project and previous project will be present.

2.1.1 Golf Scorecard

According to Laakso, J. K. (1994) this golf scorecard had been invented back in 1991. It is used to record totals for individual and team stroke as well as total points for individual and team play. This invention is to provide a golf scorecard with a basic layout that can be used to record amounts of strokes and total game points for individual golfers and golf teams concisely and effectively. Other than that, it was also meant to provide a unique scoring system for the different known golf games which effectively helps speed play by simplifying the scoring process. The plan view of the scorecard is shown in Figure 2.1 below.

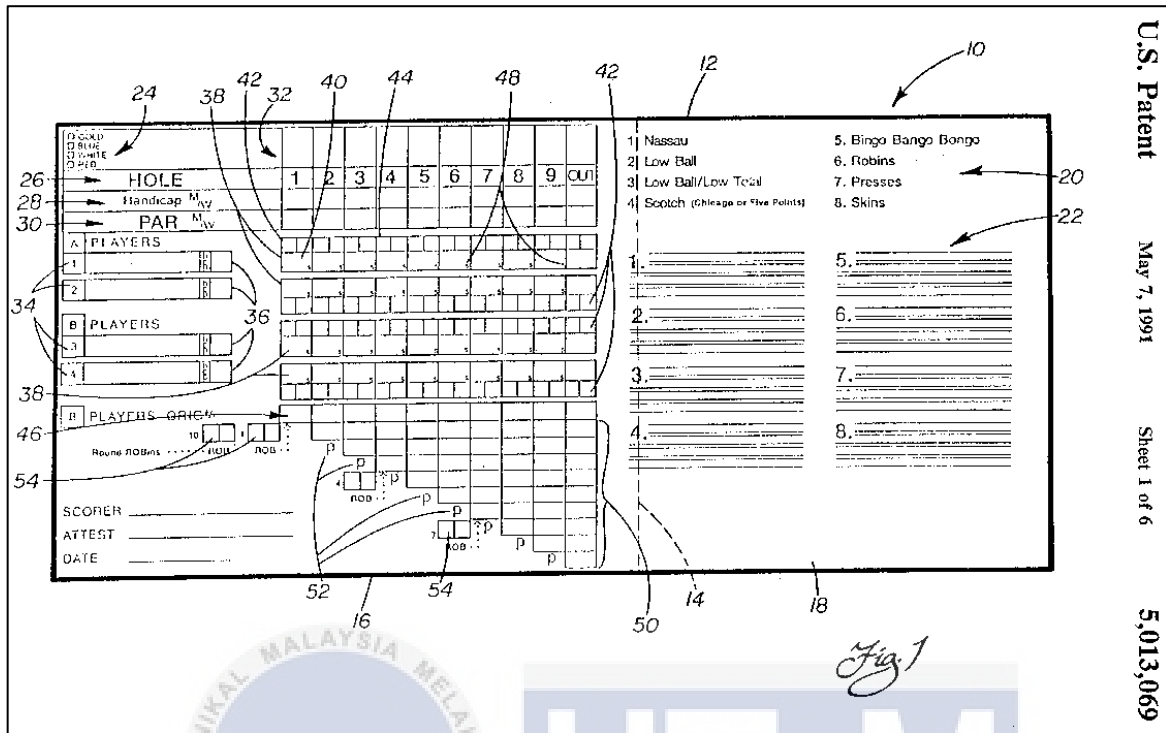


Figure 2.1: Plan view of one side of the scorecard
 [Source: Laakso, J. K. (1994). Golf Scorecard]

The advantages of this golf scorecard effectively increase the interest of players in the different golf games established over the years, thereby increasing the camaraderie among players and their interest in golf. Moreover, by providing an easy-to-learn and easy-to-follow scoring system, the scorecard encourages quicker play from which everybody on the golf course profits by considerably reducing the time required to play a golf round. On the other hand, the time taken to analyse the winner of a tournament will be long due to the manual score recording by using the scorecard. Then, the probability of a wrongly record score is much higher due to the score is written by handwriting. A physical golf scorecard from Cresta Verde Golf Course, United States is shown in figure 2.2 below