

# **SOCCER ROBOT : SCORE BOARD SYSTEM**

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I dedicated this to both of my parents, my family,  
friends and electronic engineering education. Thanks for everything. You will be  
remembered till my last breath.

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## ABSTRACT

This project is a development of soccer robot team. This project will developed a set of soccer robot consisting of two players for each two teams. Each robot will be controlled by wireless controller through radio frequency (RF). Each robot will be equipped with a receiver and it will receive signal from the transmitter at the controller. Two controllers will be used to controlled the robots. One controller controlled a team which means each controller will control two robots but only one robot at one time. The robots can be controlled to move forward, backward, left, right and 360-degree turns. The robots motor drive system will be controlled by PIC. The signal will be transmit from the controller transmitter to the receiver at the robot. The receiver is connected to the PIC. The PIC will be programmed to respond to the signal that received from the transmitter. The microcontroller programming will determine the robot movements by referring to the signal that received at the receiver. Other feature of this project is to develop a score board for the field. The score board will display the goal match result during the match and the word 'GOLL!!' will be displayed every time a goal has been scored in the match.

## ABSTRAK

Projek ini adalah membangun satu pasukan robot bola sepak. Pasukan robot bola sepak ini yang akan dibangunkan mengandungi dua pemain untuk setiap dua pasukan. Setiap pasukan ini akan dikawal menggunakan pengawal tanpa wayar melalui frekuensi radio ( Rf ). Oleh itu setiap robot akan mengandungi penerima dan akan menerima isyarat daripada pemancar . Duah buah pengawal akan digunakan untuk mengawal robot-robot ini. Setiap pengawal akan mengawal duah buah robot tetapi dalam masa yang sama pengawal hanya boleh mengawal satu buah robot sahaja. Robot-robot ini boleh dikawal ke hadapan, ke belakang, kekiri, kekanan dan membuat pusingan sebanyak 360 darjah pusingan. Robot-robot ini akan dikawal menggunakan PIC. Isyarat akan dipancarkan daripada pemancar pengawal kepada penerima pada robot. Penerima akan dihubungkan dengan PIC. PIC akan diprogramkan untuk menerima isyarat yang diterima dari pemancar. Pengawal mikro akan menentukan pergerakan robot merujuk kepada isyarat yang telah diterima pada penerima. Satu sistem papan markah juga akan dibangunkan untuk memaparkan jumlah gol yang telah dijaringkan dan paparan perkataan GOLL!! setiap kali bola masa masuk ke dalam gol.



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## ABBREVIATION

IC	-	Integrated Circuit
IR	-	Infra Red
LED	-	Light Emitting Diode
PIC	-	Programmable Integrated Circuit
PCB	-	Printed Circuit Board
RF	-	Radio Frequency
RX	-	Receiver
TX	-	Transmitter



# CHAPTER I

## INTRODUCTION

### 1.1 Background

This project will developed a set of soccer robot consisting of two players for each two teams. Each robot will be controlled by wireless controller through radio frequency (RF). Each robot will be equipped with a receiver and it will receive signal from the transmitter at the controller. Two controllers will be used to controlled the robots. One controller controlled a team which means each controller will control two robots but only one robot at one time.

The robots can be controlled to move forward, backward, left, right and 360-degree turns. The robots motor drive system will be controlled by PIC. The signal will be transmit from the controller transmitter to the receiver at the robot. The receiver is connected to the PIC. The PIC will be programmed to respond to the signal that received from the transmitter. The microcontroller programming will determine the robot movements by referring to the signal that received at the receiver.

Other feature of this project is to develop a score board for the field. The score board will display the goal match result during the match and the word 'GOAL!!' will be displayed every time a goal has been scored in the match.

## **1.2 Objectives**

1. To develop an electronic score board for the field.
2. To develop the display board.
3. To implement ball detector by using wireless ( RF ) system.

## **1.3 Scope of Project**

There are two type of soccer robot. The first type is autonomous soccer robot. Autonomous soccer robot is an independent intelligent robot, have its own decision, communication, vision and perception, electromechanical control. The other type is call remote-controlled robot that can be control by human using wired or wireless remote-controller. In this project, the wireless remote-controlled robot had been choosing to develop the soccer robot. The robot will be control by using RF remote controller. They should be transmitter on remote controller and receiver on each robot. In this project, four units soccer robot will be develop and it will be separated into two teams. Each controller can control two units robot, but it only can control one robot at one time.

The remote-controlled robot has been choosing in this project because controlled robot is much fun than autonomous robot that we cannot control or play with them. The remote-controlled robot is low cost project compare to the autonomous robot that has more complex calculation, component and circuit to construct.

In addition for the project, a score board also will be develop to display the match goal results every time goal have been scored. Three students will be in charge

three main sections on developing this project. First section is to construct the circuit for transmitter on controller and receiver on the soccer robot.

This section will be in charge by Nurul Azman Bin Mohd Ali. The second section is to develop the soccer robot circuit and mechanical parts on the robot system. Supardi Bin Dawing will be in charge this section. The third section is to build the field and scoreboard display for this project. This section will be in charge by Muhammad Khalis Bin Abd Aziz. This project will be achieved its goal if all sections working successfully.

#### **1.4 Problem Statement**

Most of the soccer robot is autonomous or semi-autonomous [1]. It is less fun because it moved by itself. Beside that, certain soccer robots are using more than two wheels. This cause the robot takes a long time in doing rotation movements. Problems often occur in wired robot due to broken wires, difficulties in system placement and movement poor adaptation [2].

Wired remote control or tethered control can be the right way to interface a computer with a stationary robot. For mobile robots, the cable can become a burden for the robot. Other problem with the wired robot is the electric signals transferred over a wire lose energy because of the wires resistance. The result is that the amplitude of the signal decreases as distance increase.

Reflection also can be a problem when the data rate is high. This means a previous signal doesn't disappear before the next is transmitted. This is why transmission lines are 'terminated' with a resistor to ground.

Mechanical issues with cables also become problems to wired robot. Cables have fixed number of wires in them, so if we need more cables, we have to replace the whole cable, which can be very time consuming. Cables also have certain stiffness. The thicker the cable, the more force we need to apply to bend cable. Another problem with wired robot is the cables have weight. This can make it hard for smaller robots to drag around. Beside that the cable can get in the way of robot. So this project proposes a wireless system soccer robot where all wires and cables can be eliminated.

## **1.5 Project Outline**

This report represent by five chapters. The outline of the soccer robot using wireless controller is following chapter by chapter. So the chapter are :

### **1.5.1 Chapter 1**

This chapter is brief about the project overview including introduction, objectives, problem statement and scope of the project.

### **1.5.2 Chapter 2**

This chapter describe about the research and the information of the project.

### **1.5.3 Chapter 3**

This chapter is about the project methodology that used in this project.

#### **1.5.4 Chapter 4**

This chapter is describe about the project finding for earlier result and analysis.

#### **1.5.5 Chapter 5**

This chapter is about the discussion and conclusion for the project.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The scoreboard have three characteristics, they are display, counter and detector. The scoreboard will be display when a sensor detect the ball. At the same time, the counter count the number to shows the total of the ball for each goal.

A scoreboard is a large board for publicly displaying the score in a game or match. Most levels of sport from high school and above use at least one scoreboard for keeping score, measuring time, and displaying statistics. Scoreboards in the past used a mechanical clock and numeral cards to display the score [3].

When a point was made, a person would put the appropriate digits on a hook. Most modern scoreboards use electromechanical or electronic means of displaying the score. In these, digits are often composed of large dot-matrix or seven-segment displays made of incandescent bulbs, light-emitting diodes, or electromechanical flip segments. An official or neutral person will operate the scoreboard, using a control panel. A soccer scoreboard usually shows the score for the home and away team.

## 2.2 Seven Segments Display

A seven-segment display (abbreviation: "7-segment) display"), less commonly known as a seven-segment indicator, is a form of display device that is an alternative to the more complex dot-matrix displays [4]. Seven-segment displays are commonly used in electronics as a method of displaying decimal numeric feedback on the internal operations of devices. In this project, it's used the Common Cathode Display as shown at Figure 2.2.

### 2.2.1 Concept And Visual Structure

A seven segment display, as its name indicates, is composed of seven elements. Individually on or off, they can be combined to produce simplified representations of the Hindu-Arabic numerals. Each of the numbers 0, 6, 7 and 9 may be represented by two or more different glyphs on seven-segment displays.

The seven segments are arranged as a rectangle of two vertical segments on each side with one horizontal segment on the top and bottom. Additionally, the seventh segment bisects the rectangle horizontally. There are also fourteen-segment displays and sixteen-segment displays (for full alphanumeric); however, these have mostly been replaced by dot-matrix displays. The segments of a 7-segment display are referred to by the letters A to G, as follows in Figure 2.1 .

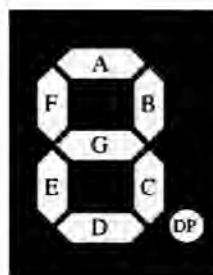


Figure 2.1 : 7-Segment display

Where the optional DP ( decimal point for eight segmnet ) is used for the display of non-integer numbers.



Figure 2.2 : Common Cathode Display

### 2.3 Counter

In general, a counter is a device which stores (and sometimes displays) the number of times a particular event or process has occurred, often in relationship to a clock signal. In practice, there are two types of counters ; up counters which increase (increment) in value and down counters which decrease (decrement) in value. An increment is an increase, either of some fixed amount, for example added regularly, or of a variable amount. A decrease would rather be called a decrement. In electronics, counters can be implemented quite easily using register-type circuits such as the flip-flop, and a wide variety of designs exist:

- Asynchronous (ripple) counters
- Synchronous counters
- Johnson counters
- Decade counters
- Up-Down counters