SOCCER ROBOT: RF WIRELESS CONTROLLER

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I dedicated this to both of my parents, my family,

friends and electronic engineering education. Thanks for everything. Your deed

will be remembered till my last breath.

ACKNOWLEDGEMENT

My sincerest appreciation must be extended to my supervisor, Nurulfajar Bin Abd Manap for all the help, guidance and support to accomplish this project. I also would like to thank for all the group members for their cooperation, support and spending their times together in completing the project from the start until the end of the project. Also, not been forgotten, to all my family members and members of 4 BENE for their everlasting support, motivation and ideas. Lastly, special thanks to those individuals for their suggestion and evaluations directly or indirectly for this project.

Thank you.

ABSTRACT

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. The objective of the project is to study how to develop and design a set of robot to play soccer. Then study how to develop wireless controller to control the movements of the soccer robot. It is the important part to control the movement of the robot. Most of the soccer robot is autonomous or semi-autonomous. 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. In this project, RF wireless controller have been choose because it much easier to setup and the objects are move from location to location. Two robots were equipped with 40MHz receiver and the other two were equipped by 315MHz receiver. Two receivers were receiving signal from transmitter in same time but only one robot was activated. They have many type of wireless controller such as using a Radio Frequency, Infra Red and Network control. Radio Frequency is used for this project due to it advantages.

ABSTRAK

Projek ini akan membangunkan dua set robot yang befungsi untuk bermain bola sepak. Setiap set mengandungi dua pemain. Setiap robot akan dikawal oleh alat pengawal tanpa wayar melalui frekuensi radio (RF). Setiap robot akan akan diletakkan litar penerima dan dikawal dengan alat kawalan tanpa wayar. Objektif projek ini adalah untuk mengkaji dan mempelajari bagaimana cara untuk membangunkan robot yang boleh bermain bola sepak. Selepas itu mempelajari bagaimana mengawal pergerakan-pergerakan robot bermain bola. Ia adalah sangat penting untuk mengawal pergerakan satu-satu robot itu. Kebanyakan robot adalah automatik atau semi automatik dan ia kurang menarik kerana ia bergerak sendiri tanpa dikawal. Sesetengah robot menggunakan lebih dari dua tayar untuk pergerakan. Ia menyebabkan robot lambat untuk membuat pergerakan berpusing. Sesetengah robot berwayar mempunyai masalah kerana wayar rosak dan tidak bebas untuk bergerak. Alat kawalan radio frekuensi dipilih kerana ia mudah di setkan dan objek yang dikawal bergerak dari satu tempat ke satu tempat yang lain. Dua robot dilengkapi dengan frekuensi 40MHz dan dua lagi dilengkapi dengan frekuensi 315MHz. Dua buah litar penerima pada robot akan menerima isyarat pada mase yang sama dari pemancar. Tetapi hanya satu buah robot akan bergerak pada satu masa yang sama. Terdapat banyak kaedah untuk mengawal pergerakan robot, contohnya seperti menggunakan infra-red, frekuensi radio dan kawalan rangkaian. Kaedah radio frekuensi dipilih berdasarkan kelebihan-kelebihan yang ada pada sistem tersebut.

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CHAPTER 1

INTRODUCTION

1.1   Introduction

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

The objective of the project is to study how to develop and design a set of robot to play soccer. Then study how to develop wireless controller to control the movements of the soccer robot. It is the important part to control the movement of the robot. In this project, we need to understand how to develop and design robots that can be moved forward, left, right and 360-degree turns.

1.3 Scope Of Work

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. They have many techniques of wireless such as Radio Frequency and Infra Red. In this project, we decided to use Radio Frequency as our wireless controller. 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 besides display the word 'GOAL' every time goal 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 Muhd Khalis Bin Abd Aziz. This project will be achieved its goal if all sections working successfully.

1.3   Problem Statement

Most of the soccer robot is autonomous or semi-autonomous. 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.

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 lives 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.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this project, Radio Frequency was used to controlling the robotic system. They have four units robot, and each robot will equip with the receiver. Its have two frequencies we decided to use to control the robot. Each frequency is used for control two robots.

2.2 Wireless

Wireless in dictionary defined as 'having no wire'. Wireless is a very generic term that may refer to numerous forms of non-wired transmission, including Radio Frequency (RF). Various techniques are used to provide wireless transmission, including infrared line of sight, cellular, microwave, satellite, packet radio and spread spectrum.[2]

2.2.1. Infrared

The term "infrared" refers to a broad range of frequencies, beginning at the top end of those frequencies used for communication and extending up the low frequency (red) end of the visible spectrum. The wavelength range is from about 1 millimeter down to 750 nm.

2.2.2 Radio Frequency

A transmitter is an electronic device which with the aid of an antenna propagates an electromagnetic signal such as radio, television, or other telecommunications. A transmitter usually has a power supply, an oscillator, a modulator, and amplifiers for audio frequency (AF) and radio frequency (RF). The modulator is the device which piggybacks (or modulates) the signal information onto the carrier frequency, which is then broadcast.

2.2.3 Speech recognition

In essence speech recognition is a form of remote control. It is probably one of the hardest remote control, but also one of the most impressive one. Although today there are modules that contain full speech recognition system capable of learning a dozen commands, those systems are still very limited as they can't handle sentences (just commands). This system need to be trained before they are useful and usually can only be used by one person only.

2.2.4   Sound

Sound also can be used as remote control. Generating a tone of a particular frequency is not hard besides building a receiver to detect this tone isn't hard either. Sounds like whistling and clapping hands have been used for remote control before.

2.2.5   Network controlled.

A further step would be to do the control over a network, from another device. This could be a wired network, like RS-232, RS-485 or Ethernet or a wireless one, as WLAN, Bluetooth or Zigbee.

2.2.6   Radio Frequency as a wireless controller

In this project, Radio Frequency is used as a wireless controller for the robot. Transmitter and receiver is the main device to functionalize the circuit. The signal from the transmitter will receive by the receiver and then it will be demodulate by the decoder. The signal that have been encode is same as signal that send by the transmitter.

A transmitter is an electronic device which with the aid of an antenna propagates an electromagnetic signal such as radio, television, or other telecommunications. A transmitter usually has a power supply, an oscillator, a modulator, and amplifiers for audio frequency (AF) and radio frequency (RF). The modulator is the device which piggybacks (or modulates) the signal information onto the carrier frequency, which is then broadcast.

More generally and in communications and information processing, a transmitter is any object (source) which sends information to an observer (receiver). When used in this more general sense, vocal cords may also be considered an example of a transmitter.

2.3 Transmitter and Receiver

A transmitter is an electronic device which with the aid of an antenna propagates an electromagnetic signal such as radio, television, or other telecommunications. A receiver is an electronic circuit that receives the signal from the transmitter circuit.[6]

2.3.1 Transmitter

A transmitter is an electronic device which with the aid of an antenna propagates an electromagnetic signal such as radio, television, or other telecommunications.
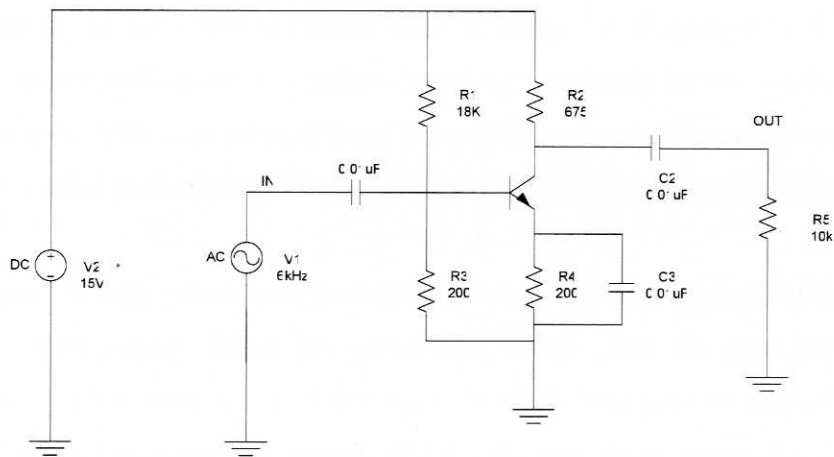

Figure 2.1   Example of transmitter circuit

Figure 2.1 is the example of transmitter. A transmitter usually has a power supply, an oscillator, a modulator, and amplifiers for audio frequency (AF) and radio frequency (RF). The modulator is the device which modulates the signal information onto the carrier frequency, which is then broadcast. Sometimes a device contains both a transmitter and a radio receiver, with the combined unit referred to as a transceiver.

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