# Design and Implementation of Smart Car Parking System

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# Design and Implementation of Smart Car Parking System

*A Project*

**Submitted to Al-Mustaqbal University College in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Techniques Engineering/ Communications and Networks**

*by*

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بسم اللَّه الرحمن الرحيم

اقرأ باسمِ ربِّكَ الَّذي خلَق (1) خلَقَ الإنسانَ من علَق
(2) اقرأ وربُّكَ الأكرم (3) الَّذي علَّمَ بالقلَم (4) علَّم
الإنسانَ ما لم يعلم (5)

صدق اللَّه العلي العظيم

سورة العلق

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# ABSTRACT

Due to the proliferation in the number of vehicles on the road, traffic problems are bound to exist. This is due to the fact that the current transportation infrastructure and car park facility developed are unable to cope with the influx of vehicles on the road.

To alleviate the aforementioned problems, the smart parking system has been developed. With the implementation of the smart parking system, patrons can easily locate and secure a vacant parking space at any car park deemed convenient to them.

Vehicle ingress and egress are also made more convenient with the implementation of hassle free payment mechanism. With vehicle detection sensors aplenty on the market, the choices made may defer due to the different requirements in addition to the its pros and cons.

Subsequently, the various sensor systems used in developing the systems in addition to the recent research and commercial system on the market are examined as vehicle detection plays a crucial role in the smart parking system.

The proposed system illustrates the counter for the cars enter the park and give the order to the park gate never to open

to any entered car when the number of cars in the car reach the highest number. In addition, the same counter made for the exit gate (where is the same the entrance gate in this project) count in reverse order for the cars exit from the park.

The principle of operation of the park is the piezoelectric sensor depends on the weight of the car (here small push button) when the car press the button, the counter adds or subtracts one from the counter number.

# CONTENTS

# CHAPTER ONE
# INTRODUCTION

In the recent years, a large number of new registered vehicles were reported compared to the previous years, which makes it a rough estimate of 54.5% increase in a span of 7 years (Malaysian Ministry of Transportation, 2007).

Referring to the aforesaid statistics provided by the Malaysian Ministry of Transportation, the current transportation infrastructure and car park facilities are deemed insufficient in sustaining the influx of vehicles on the road.

Therefore, problems such as traffic congestion and insufficient parking space inevitably crops up. In Asia, the situation are made worse by the fact that the roads are significantly narrower compared to the West (Inaba et al., 2001).

Various measures have been taken in the attempt to overcome the traffic problems. Although, the problem can be addressed via many methods, the paper focuses on the car park management system introduced, which is the smart parking system.

This study will review the evolution of vehicle detection technologies as well as the detection systems developed over the years.

## 1.1 Smart Parking Systems:

The smart parking system implemented mainly in the Europe, United States and Japan (Shaheen et al., 2005) is developed with the incorporation of advanced technologies and researches from various academic disciplines. With its deployment in the car park, it is hoped that it would solve the aforementioned problems faced by the patrons within the car park.

## 1.2 Advantages of smart parking system implementation:

The smart parking system is considered beneficial for the car park operators, car park patrons as well as in environment conservation (Shaheen et al., 2005; Chinrungrueng et al., 2007). For the car park operators, the information gathered via the implementation of the Smart Parking System can be exploited to predict future parking patterns.

Pricing strategies can also be manipulated according to the information obtained to increase the company's profit. In terms of environment conservation, the level of pollution can be reduced by decreasing vehicle emission (air pollutant) in the air (Shaheen et al., 2005). This can be attributed to the fact that vehicle travel is reduced. As fuel consumption is directly related to vehicle miles travelled, it will be reduces as well.

Patrons are also able to benefit from smart parking system as parking space are able to be fully utilized (Kurogo et al., 1995; Sakai et al., 1995) with a safer (Shaheen et al., 2005; Chinrungrueng et al., 2007), optimized and more efficient system implemented (Sakai et al., 1995; Shaheen et al., 2005). The system is made more efficient as vehicle travel time and search time are significantly reduced due to the information provided by the smart parking system.

With the information provided, drivers are able to avoid car park that are fully occupied and locate vacant parking spaces with ease elsewhere. The number of vehicles parked illegally by the roadside which leads to traffic congestion is also reduced as it is absorbed into the car parks (Kurogo et al., 1995). Most importantly, traffic congestion can be reduced. All this would eventually lead to convenience for the patrons.

## 1.3 Aim of the Work:

The purpose of the project is to reduce the number of workers in the garage and reduce the prevalence of owners of cars because there is in the 7-meter counter at the entry of the car has a count down. While, when the exit is counting ascending or according to what is mentioned or written within the programming of Arduino and determine the absorption of the garage number of vehicles through the owner.

When the highest value of the meter, the door of the garage is closed electronically and can not be opened until the exit of one of the cars and this project can be added by several devices that help the person to gain time and reduce the congestion caused by protrusion such as the depletion of the GPS.

# CHAPTER TWO

# THEORY OF THE PROJECT

The project works through a set of instructions and commands placed by the programmed engineer within the Arduino through the software.

Arduino was feed through DC 12V source and have several blocks as per use, including a 5-volt، We put the 7-segment device and it has 10 blocks and it is divided into three sections where 7 blocks of it are accompanied by resistance according to its size.

For our project, we chose 470 ohm and 7 resistors of the resistors connect with the 7 secmnet and the second end is connected by wires to the arduino and each son represents Line in the 7 Sequent. We will have three parties take two parties to the vcc and the third party to the ground according to the feed board and the engineer programmer through the program within the Adrienne places all these orders and definitions.

As for the machine Almator Servea be simple and work through the programming within the Ardennes and there are three exits to be the outlet to the ground and the second to the Vcc in the Ardennes and the third director to one of the girls in the Ardennes and control through the above program and works

Almator angle 90. Any angle list the corner program is preset in the preset program. The last piece is a sensitive car weight when entering or leaving the car .

The project needs some components to work properly. Here, all the components will introduced with details.

## 2.1 Arduino Board:

Arduino is a project made by the largest technical community of engineers, developers and hobbyists whose goal is to develop ideas and interactive control projects around the world, based on different types of electronic panels but programmed in a language Single programming and free.

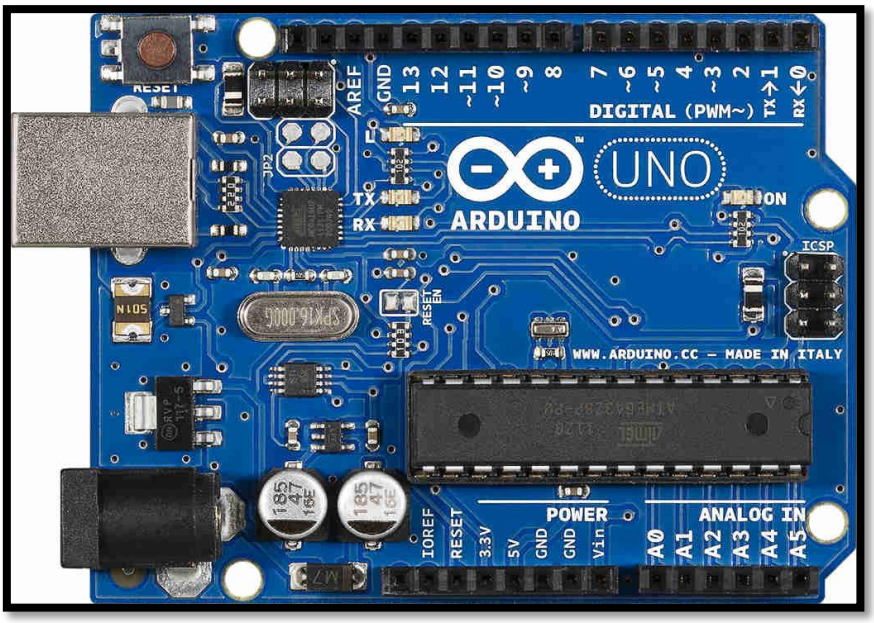



**Figure 1: Arduino UNO Board.**

Sure, Arduino is not the only electronic controller in the market, but there are many micro-controllers available in the market such as Parallax, Basic Stamp and the most powerful competitor, Raspberry Pi, all with powerful capabilities and the ability to work. Full projects, of course depending on the needs of your project, but what distinguishes the following Arduino Open source platform Open Source Hardware and Software.

Arduino is made primarily of ATMEGA8 and ATMEGA168 controllers, and all its designs are licensed under the Creative Commons license. This is the most important feature for electronic circuit designers because it makes it easier for them to design anything they wantThe software is written in C ++, and is available to everyone to download and programmers can modify it according to their needs.

It is the most widely used and widely used one of the many Arduino's. It is the first choice for beginners. It is easy to learn. It operates with an ATmega328 controller. This type has 14 digital ports (I / O), 6 of which can be used as ports to control the " PWM Outputs ", the most important feature of this type is that the control chip" ATmega328 "is not fixed in the board, but installed on the holder of the integrated circuit" IC ". This feature makes it the best option for beginners so that if burned the slide while working on your project by mistake, you can

Restore your work on the board as soon as you change the slide The ATmega328 controller is similar to the same model.

The first-ever type of Arduino's motherboard is the ATmega32u4 controller, which has a unique feature that contains a built-in USB connection, eliminating the need to use a secondary processor. The feature allows the panel as soon as it is connected to your device to appear as a keyboard and mouse, which makes it ideally suited to build various applications that enable you to control your PC.

Advantages of Arduino:

**1-Simplicity**

Arduino's paintings are designed to suit the needs of all engineers, designers, professors, students, and interactive electronics enthusiasts around the world.

**2- The price**

The Arduino Plate is less expensive than any competitor of the same type. The most expensive painting is not more than $ 50.

### 3- Self-Assembly

Easy to deal with and easy to connect circuits, as we mentioned in our first article that it was an easy solution to the problem of microcontrollers and complex connections.

### 4- Multi-platform

The Arduino program has the ability to work with all the different operating systems of Windows, Mac and Linux, while most other boards running on Windows only

### 5- Easy and simple software environment

The "Environment" programming environment is designed to be easy for beginners and powerful professionals and its programming language "Arduino C" is easy to learn

## 2.2 Seven Segment:

The *7-segment display*, also written as “seven segment display”, consists of seven LEDs (hence its name) arranged in a rectangular fashion as shown. Each of the seven LEDs is called a segment because when illuminated the segment forms part of a numerical digit (both Decimal and Hex) to be displayed. An additional 8th LED is sometimes used within the same package thus allowing the indication of a decimal point, (DP) when two

or more 7-segment displays are connected together to display numbers greater than ten.

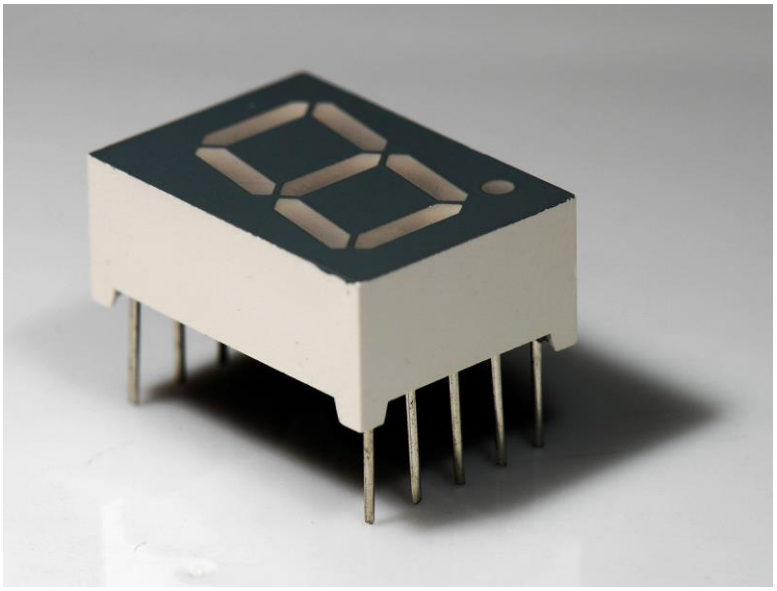


**Figure 2: Seven-Segment Display.**

## 2.3 The Servo Motor:

The servo engine is a motor that comes with a Gear gearbox and a Shaft transmission that gives motion greater torque and greater precision. This engine can rotate 180 degrees and in some types 360 degrees.

The servomotor is internally made up of a "mostly microcontroller" control circuit. When the engine gives pulses at a certain time constant, the engine rotates to the angle according to that time constant.

In each type, the time constant varies from one engine to another according to the manufacturer and the technical bullet in that comes with the servo engine.

In the Arduino, programming environment there is a library called Servo Library installed in the program. This library gives us the ability to control most of the 180 degree Cervo drives. At the end of this post, you will have the ability to use the library's commands through practical examples.


**Figure 3: Servo Motor.**

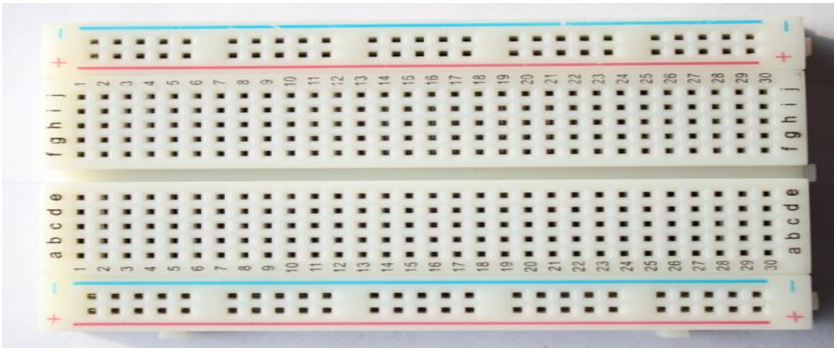
## 2.4 Other Components:

The project uses some other electronic components like:

### 1- 470 Ω Resistors:

*(a)*

### 2- Board:



*(b)*

### 3- Connecting wires:

*(c)*

**Figure 4: Other Components.**

## 2.5 The Chronometers counters:

Chronometers counters consist of a row of shutters moving from position to position in response to the so-called event. This incident can be one hour or more and the meter is used to count the number of accidents. The number of positions passed by the meter before returning to the first position is called Modulo. The counter contains a (n) flop on Modulo equal to a maximum limit, but of course it is not necessary for the meter to pass through all possible positions. In this case Modulo has less counter than The ring counter.

This counter is also seen as a displacement log consisting of 4 D - type conductors connected in a way that allows displacement to the right. The INITIATE is initially upgraded to a logical one for a short moment to transfer the FFO to the SET position and the rest of the jumpers to the RESET position. The clock pulse is then applied and the meter starts to count. Each edge causes a shift of SETT position from one flip to another. After four successive cycles, the meter returns to the initial position.

Reading the meter recorded in the ring meter is very simple. All we need to do is determine which flip is in the SET position. For this purpose, the output of each flip (Q) is connected to a show unit showing the number recorded when the level of (Q) is high and when the counter begins with the

count we will see that the numbers will appear according to the following sequence: 0_1_2_3_0.

The waves start at the moment of selection where (QO = 1) and (Q2 = Q3 = Q4 = 0). The higher logical level then moves from one output to another, giving a set of serial pulses that can be used to sequence the execution of a set of processes.

## 2.6 Counter-connected counter or Johnson counter:

Despite the simplicity of the ring meter, it does not use the pulses economically. The ring-bearing (n) is flipped to it (MOD-n) while n is a position. The connected end meter, also known as Johnson Johnson makes better use of thrusters. As is evident from the figure, this annular counter is similar to one difference: the link between the end of the meter and its starting point is from 'Q3' instead of 'Q3'.

Assuming that all the shutters have been wiped out (Q0 = Q1 = Q2 = Q3 = 0) when the next open front comes, the zero moves to the shutters (FF3, FF2, FF1). The FFO will move to the SET position. Because the output (Q3) is connected to the inlet (FFO). If the meter moves from the position (0000 = Q0 Q1 Q2 Q3) to the position (1000 = Q0 Q1 Q2 Q3). The sequence of positions that the meter passes, which we note is equal to eight, twice the number of pulses in the meter. If the

connected end meter has a (MODULO-2n) while the ring counter as we have seen (MODULO-n). To read the count that the Johnson counter arrived at, there is a need for a number of separate outputs equal to the number of positions. So that only one out of these exits is at level 1 while the rest are at level (zero). To do this we use the Decoder circuit.

## 2.7 Other Examples of Metering Meters:

The ring counter and the Johnson meter are the same as the counters, because the clock is applied to all the pumps simultaneously, but these counters suffer from the economic non-use of the pumps. Although the Johnson counter is better than the ring counter in this respect, it needs the circuit to decipher the code while it does not need the ring counter.

We will now look at other types of counters that take full or near full advantage of the available positions and start with the counters using () mode. If we set up a table containing a set of binary numbers arranged in numerical order, we note that the lower BIT changes with each counting step and that the next BIT is changed with each counting step where the BIT is equal to one. The BIT () changes when both () and (BITS) are equal to one. In general, we can say that the top-ranking BIT changes when all lower-level BITs are equal to one at a time.

These observations lead us to devise the following method to form a counter that follows the counting sequence correctly: For the lower-order BIT, we use a flip switch to change its position with each hourly cycle.

For the next BIT, we use a flip switch to change its position when the initial pitch is in the SET position. In general, the meter will consist of a number of shutters equal to the number of BITS and each flip will change its position when all the lower-level BIT is hers are in the SET position. In this way, we obtain the counter shown in Fig. 5a which uses J-K skips that change from the position when J = K = 1. For example, the FF3 is replaced by J = K3 = 1 and this condition is achieved when Q0 = Q1 = Q2 = 1 is required. Figure 5b shows the output currents of this meter.

Note from Figure (5a) that Gate G1 is of no use, but used only to show the shape consistent. We also note that the number of entrances to AND gates used increases with the number of shutters and this, of course, leads to the complexity of the circuit. Therefore, it is usually used for another method of forming the meter. Here, too, it is possible to make sure that the switch will not change its position until all the predecessors are in position (SET = Q1 = Q1 = Q2 =1).

# CHAPTER THREE

# PROPOSED SYSTEM

The Proposed smart car parking system as the figure 5 explains based on smart gate and number of entrance and exit cars is shown in the sections below.

**Figure 5: Smart Implemented Project.**

## 3.1 Electronic Circuit:

The following electronic circuit shown in figure 6 explain the implemented circuit of the proposed project.

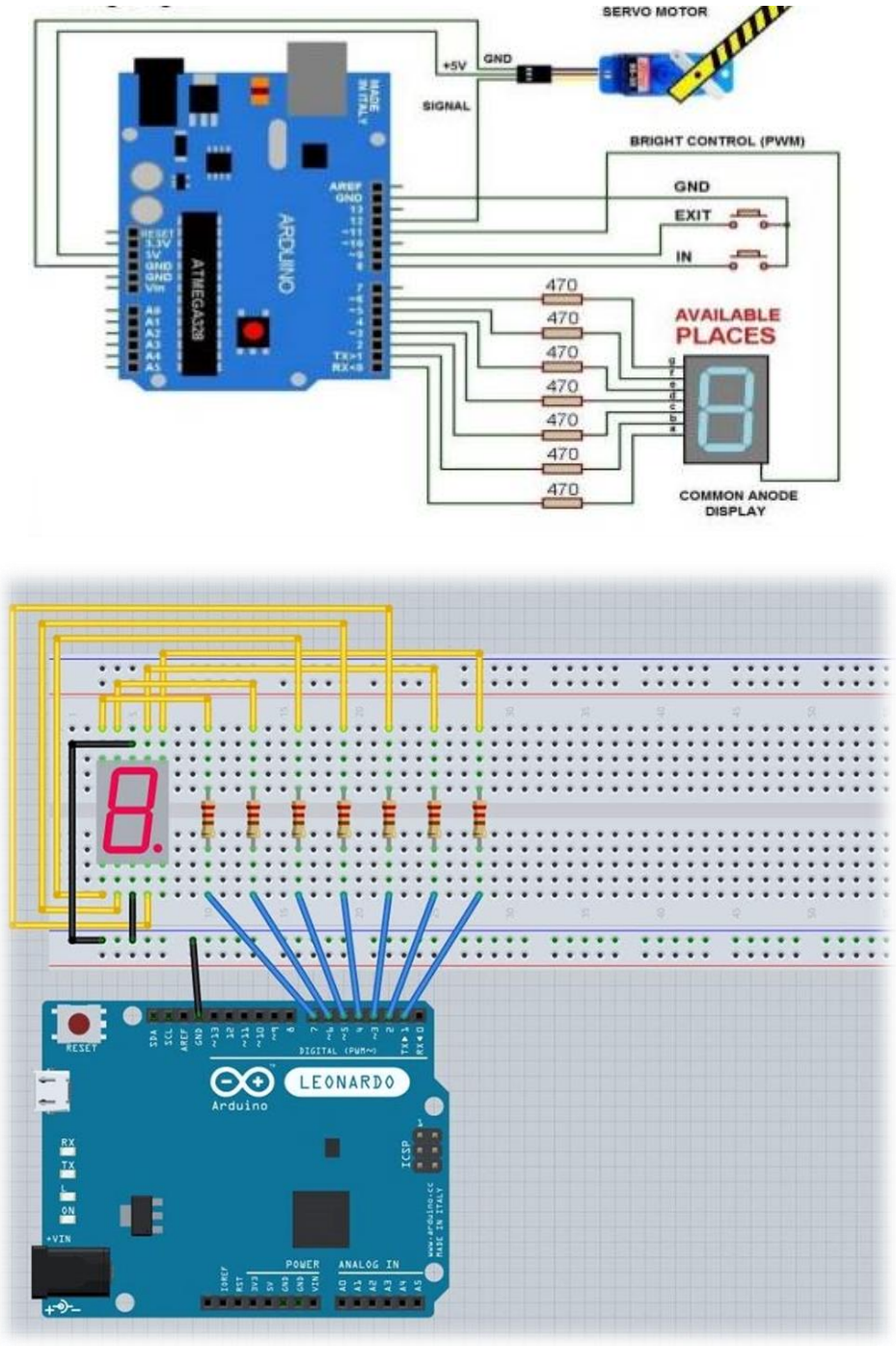
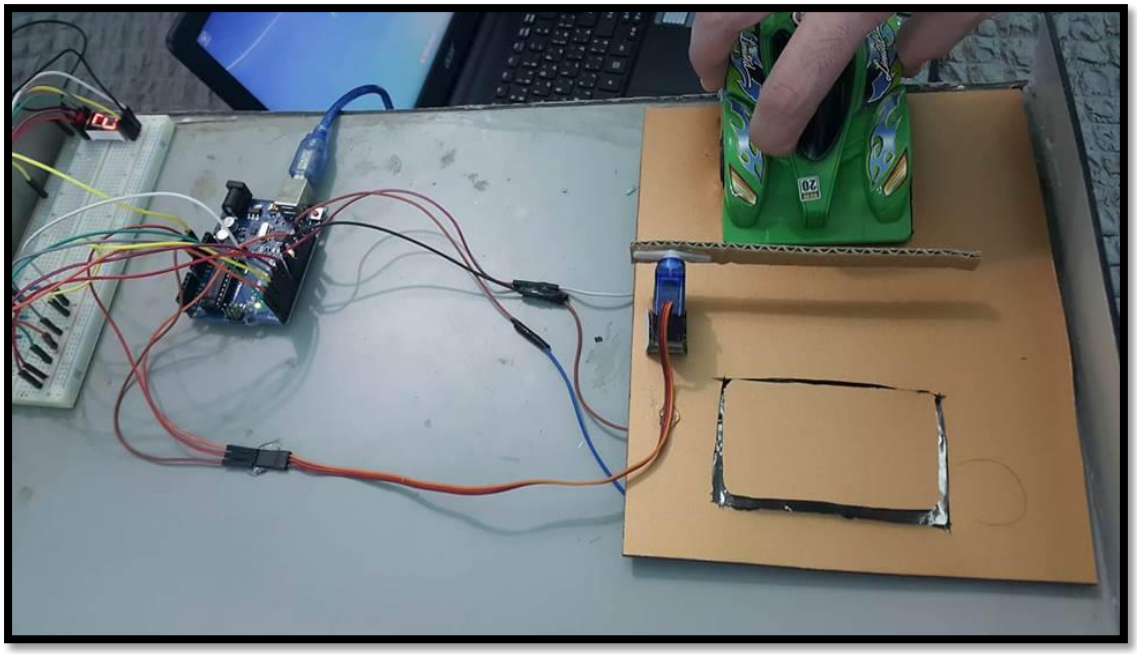


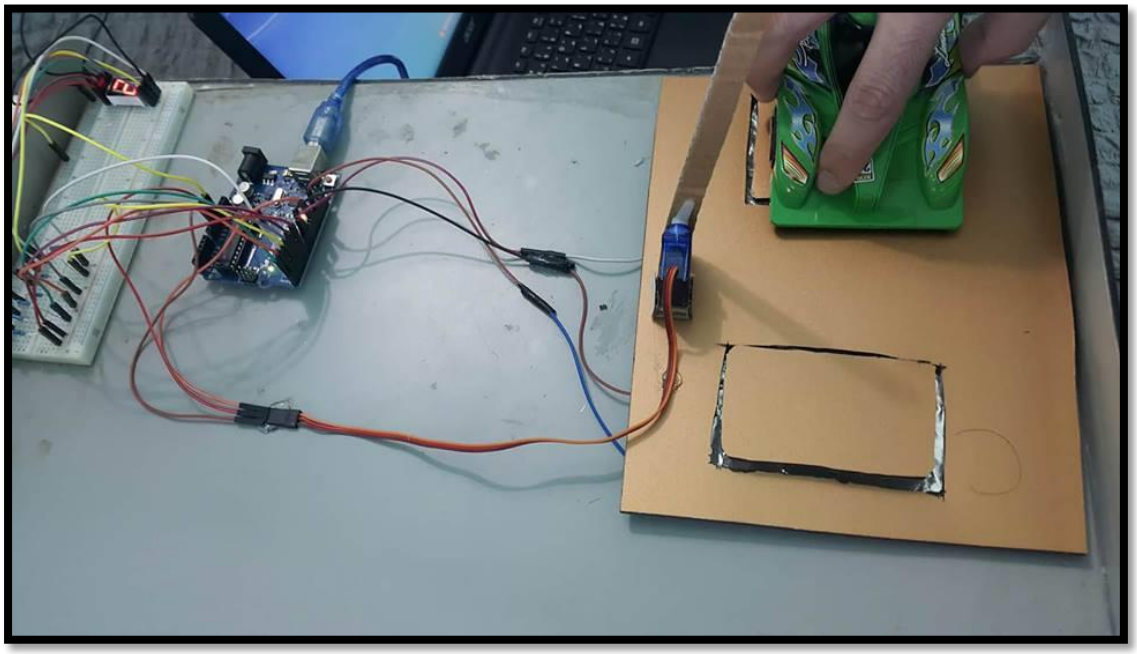

**Figure 6: Electronic Circuit.**

## 3.2 Implemented Project Work:

The project that implemented in this work has three steps to work is shown in the figure 7 below:



*(a)*



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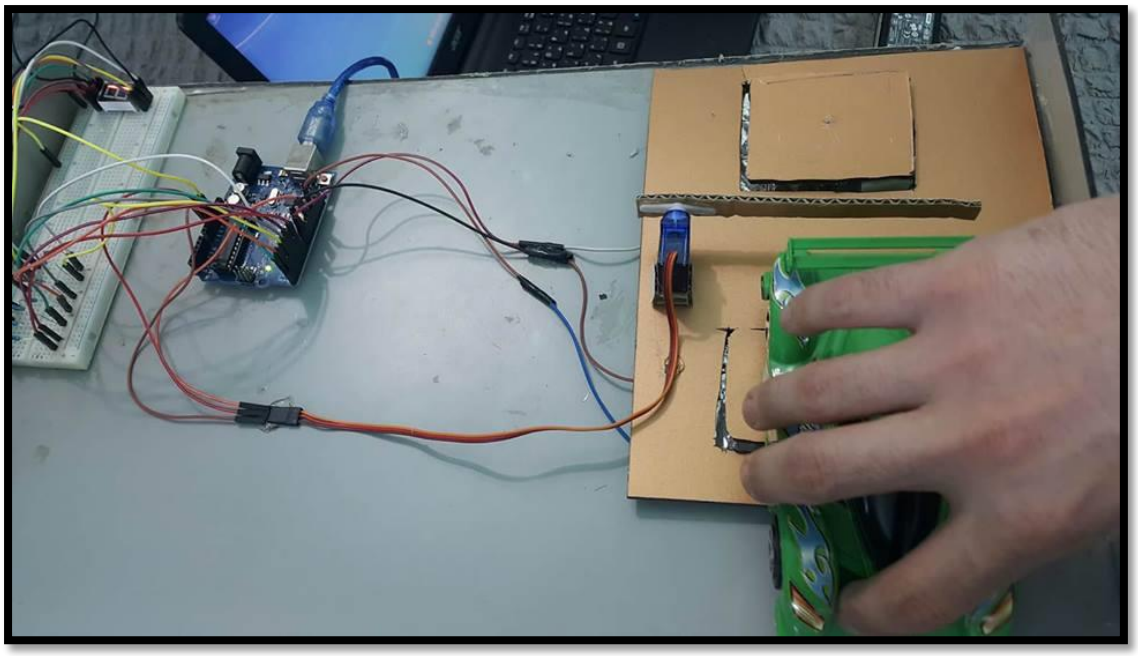

***(c)***

**Figure 7: The project work.**

# CHAPTER FOUR

# CONCLUSIONS

In this study, the various types of smart parking system and has been presented. From the various examples of the implementation of the smart parking system being presented, its efficiency in alleviating the traffic problem that arises especially in the city area where traffic congestion and the insufficient parking spaces are undeniable. It does so by directing patrons and optimizing the use of parking spaces.

With the study on all the sensor technologies used in detecting vehicles, which are one of the most crucial parts of the smart parking system, the pros and cons of each sensor technologies can be analysed. Although, there are certain disadvantages in the implementation of visual based system in vehicle detection as described earlier, the advantages far outweighs its disadvantages.

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