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Remote Controlled Hospital Bed Using Mobile Application

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اسم المشروع

Remote Controlled Hospital Bed Using Mobile Application

أسماء الطلبة

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بناء على نظام كلية الهندسة والتكنولوجيا واشراف ومتابعة المشرف المباشر على المشروع وموافقة أعضاء اللجنة الممتحنة تم تقديم هذا المشروع الى دائرة الهندسة الكهربائية ،وذلك للوفاء بمتطلبات درجة البكالوريوس في الهندسة تخصص هندسة اتصالات والكترونيات

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توقيع رئيس الدائرة

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Abstract

In This report , We design Remote Controlled Hospital Bed Using Mobile Application to reduce the effort of doctors and the time in response to all patients, and make the patient comfortable and help the bed syndrome .The device will be designed using microcontroller (arduino) , wi-fi shield , android application for mobile . We choose to use the App inventor to develop an application for the mobile software, and we designed mobile interfaces to control the mobile phone, via wi-fi , then enter the password, user name and choose the bed , also go on the camera will be operated at the request of the patient.

The device was programmed with using C programming language . After completing the hardware design of the project successfully, we suggested Connecting many hospital beds, it by using internet.

الملخص

تمت كتابة هذا التقرير لمشروع التحكم في سرير المستشفى باستخدام تطبيق على الهاتف المحمول ، لتوفير الوقت والجهد في استجابة الطاقم الطبي للمرضى وايضا مساعدة متلازمي الفراش. هذا الجهاز تم تصميمه باستخدام الأردوينو ودرع الواي فاي وتطبيق الأندرويد ،وقمنا باختيار برنامج App inventor لتطوير التطبيق المستخدم على الهاتف المحمول، وصممنا واجهات للتحكم في هذا الهاتف عن طريق الواي فاي حيث يتم ادخال كلمة السر واسم المستخدم ومن ثم اختيار السرير المطلوب للتحكم به عن بعد وتشغيل الكاميرا والصوت بناءا على طلب المريض . تم برمجة الجهاز باستخدام لغة سي. (C) عندما انتهينا من تصميم الجهاز بنجاح نطمح في المستقبل لربط مجموعة من أسرَة المستشفيات باستخدام الأنترنت.

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List of abbreviation

Abbreviation	Stand
Wifi	Wireless Fidelity
LCD	Liquid Crystal Display
IOS	Iphone Operating System
MATLAB	Matrix Laboratory
GPS	Global Positioning System

TV	Television
MCU	Micro Controller Unit
IDE	Integrated Development Enviroment
USB	Universal Serial Bus
AC	Alternating Current
DC	Direct Current
TCP	Transmission Control Protocol
IP	Internet Protocol
APP Inventor	Application Inventor
Tx	Transmitter
Rx	Receiver
IDE	Integrated Development Environment
MiB	Management Information Base
GPIOs	General Purpose Input/Output
PCB	Printed Circuit Board
APSD	Automatic Power Save
VCIP	Voice Over Internet Protocol
RF	Radio Frequency
VR	Voice Recognition
SIM	Subscriber Identity Module

CHAPTER ONE

INTRODUCTION

1.1 Overview.

1.2 Problem Statement .

1.3 Motivation.

1.4 Project Objectives.

1.5 Related Work.

1.6 Requirements .

1.6.1 Hardware

1.6.2 Software

1.7 Approach.

1.8 Expected Results .

1.9 Budget.

1.10 Time plan.

1.1 Overview

This chapter focuses on the main idea of the project, it start with the problem statement and motivation .Then, it describes the hardware and software requirements ,and discusses the challenges of building the system .Finally ,the approach and scenario of the project is presented ,we aim to build and develop the system in the lowest possible cost.

1.2 Problem Statement

The patient bed should be to move in different directions according to the patient's medical condition and doctor's request, so in this project a system for medical electrical bed has been constructed to make the medical bed moves in the direction required. An android application via wireless connections will be used in this project, instead of the electrical arm.

Microphone will be used to allow the patients to tell the doctor that he needs to change the position of the bed, and camera to allow the doctor to see the patients bed status.

1.3 Motivation

We designed remote controlled hospital bed using mobile application to reduce the effort of doctors and the time in response to all patients, and make the patient comfortable and help the bed syndrome.

First we visited Alya's hospital, and many hospitals and asked the stuff nurse about this project. They welcomed this idea and support us.

1.4 Project Objective

The proposed project is assumed to achieve these objectives:

- A patient bed should be designed to be able to move in directions required using Arduino system and other electrical components which in its turn send orders about how the direction of the patient bed must be.
- An android application should be programmed to transmit the orders from doctors to the medical bed using Wi-Fi connections.
- Design and implementation of this project in low cost.
- Help the bed syndrome.

1.5 Related Work

1- Development of the remote system in the use of changing the position of the electric bed close by using a mobile application remotely.

Many patient monitoring systems are designed to track patients' health conditions such as blood pressure, heart rate and temperature. This system is based on collecting patient information and delivering it via Wi-Fi to doctors.

The British Joe Kittan has developed a linen bed, a bed that vibrates to help you sleep, and can be programmed with a mobile phone to change its temperature, either by raising or lowering it. The bed can also be connected to screens that show different pictures on the ceiling.

In a recent report on the subject, the Daily Mail reported that the bed was made up of small air balloons surrounded by sponges to adapt to all weights and sizes. The bed costs £ 1000. The bed also has a fire alarm to ensure that the user is protected.

The 52-year-old British project designer was inspired by the bedside idea of increasing demands to improve the family's quality and characteristics. He says bed temperature control, for example, satisfies users.

The possibility of connecting the in-bed vibrator system to recreational games increases the options available to users. For example, a bedridden person can feel bumps and bumps if he is playing an electronic racing game.

The bed includes a pressure controller and massage options, options to connect the bed to Wi-Fi networks, and options to change the situation as in the beds of the hospital. Bed programs and applications automatically turn off when the user sleep.

"I was fed up with buying different types of family that would be damaged after a while," says Joe Kittan. And I was suffering from the discomfort and could not solve the problem, and after years of that case invented this comfortable bed and entertaining at the same time.

In addition to the comfort Linen emphasizes. The bed has characteristics to increase safety. The basic idea in this bed is that it works via an electronic application that can be used and applied to any "log" family system.

Our goal is for everyone to take advantage of this bed and be able to afford it at reasonable prices. The bed is suitable for home-based patients because of its flexibility and temperature control. Staying at home is an advantage for most patients.

Showcases the «Gadgat» in Birmingham, Britain, producer in the Department of Inventions British. Designer Kitan says he worked on the project for 8 whole years and thought about it during the nights he could not sleep, hoping to congratulate his employees on happy dreams.[1]

Two Palestinian students design a "smart bed" for child care.

In a graduate project for two students at the Department of Computer Engineering at An-Najah National University in the Palestinian city of Nablus, where they designed a smart bed to help mothers care for their children and take care of the house at the same time.

The students also explained that the method of "smart bed" depends primarily on the activation of the system if used by the mother enter the number of her mobile phone through the keyboard to be saved automatically, and then can follow the work of the home, and if the child issued any voice or cry The child is alerted to the bed for five minutes, as well as playing music and moving games to calm down. During the process, the system sends a text message to the mother's phone to tell her, and provides additional information such as the temperature of the child and informing her by providing the baby with sensors. The mother can make a phone call to make her son heard her voice and control the bed whenever she wants.[2]

2-Your child's bed can be controlled through your smartphone.

The company launched in 2010 the first experience of the smart bed controlled by the phone. The Smart Bed provides a new set of different shaking movements that are designed to calm the baby and help him sleep and the bed is connected with your smartphone via Bluetooth.

The new version of the bed 4moms under the name of mamaRoo and carries the bed in front of the LCD screen to control the bed It also contains the music player files It also has its own speaker amplifiers and the bed is available in the United States and works in full compliance with different operating systems (Android - iOS) And the cost of getting this smart bed is only US $ 240.[3]

3- The Balluga smart bed is designed to solve all known sleep problems you can think of. British designers have built a smart "Balluga" bed made up of balls filled with air, equipped with technological features to monitor sleep and regulate heat.[4]

4- Human Smart Healthy Bed Project

What distinguishes their project is its more vocal support for patients who can not control the movement of their hands and the control of the bed. For example, "lift up" or "buck down" or drop the bed or "buck down" or show the patient's data on a screen For this purpose, the champion of "Check data" and other voice commands, especially if used in homes, in addition to being programmed to respond to the Arabic and English languages.[5]

1.6 Requirements

In order to finish our work in this project, we have to use these requirements:

1.6.1 Hardware

- Hospital bed (electric patient bed)
- Remote terminal unit
- The Microcontroller(Arduino Uno)

- Relays PCB
- Wi-Fi shield
- Wi-Fi camera and Microphone
- Mobile

1.6.2 Software

This part of project describes the software in its different parts the mobile application software , and arduino programming .

1.7 Approach

This project consists of two main components the first one is a software component which divide in two parts, the first one is android application which send orders and receive data and the second part is Arduino programming. The second component is the hardware which consists of Arduino system and Wi-Fi shield .

1.8 Expected Results

It is expected to achieve the most significant results of the system. A system that is able to send the controlling commands from the mobile application to the hospital bed and gathering the data and sends it wirelessly and saving time and effort for the doctor and Patient , also, help the bed syndrome

1.9 Budget

The system cost is provided in table(1.1)

No.	Component	Cost ($)
1	Hospital bed (electric patient bed)	4400
2	Arduino Uno	25
3	Wi-Fi shield	25
4	Wi-Fi camera and Microphone	132
5	Mobile	135
6	Relays PCB	30
7	Cables and power source	20
Total cost		4767

1.10 Time plan

Table 1.2 and 1.3 specifies the time plan of the project(for two semester).

Table(1.2) time plan for first semester(2016/2017)

Task/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Select the idea															
Preparing for the project and collecting information															
Project analysis															
Determine the project equipment and requirement															
Design and analysis															
Submit the report to electrical engineering department															

Table(1.3) time plan for second semester(2017/2018)

Task/ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Buy all components															
Connect all components together															
Start to write the cods															
Make many tests															
Start applying the code in arduino and solve the problems															
Rewrite the first four chapter ,and write chapter ,five ,and six															

CHAPTER TWO

PROJECT COMPONENTS

2.1 Introduction.

2.2 Microcontrollers.

2.2.1 Definition of Microcontroller.

2.3 Arduino.

2.3.1 Arduino Uno.

2.4 Electric Bed.

2.4.1 Electric Motor
2.4.2 Motor construction
2.4.3 Hand Remote Control

2.5 Wi-Fi (ESP 8260).

2.6 Wi-Fi Cam And Microphone.

2.7 Mobile.

2.1 Introduction

This chapter discusses the technology used in this project ,showing the main components of the project , analysis and specification .

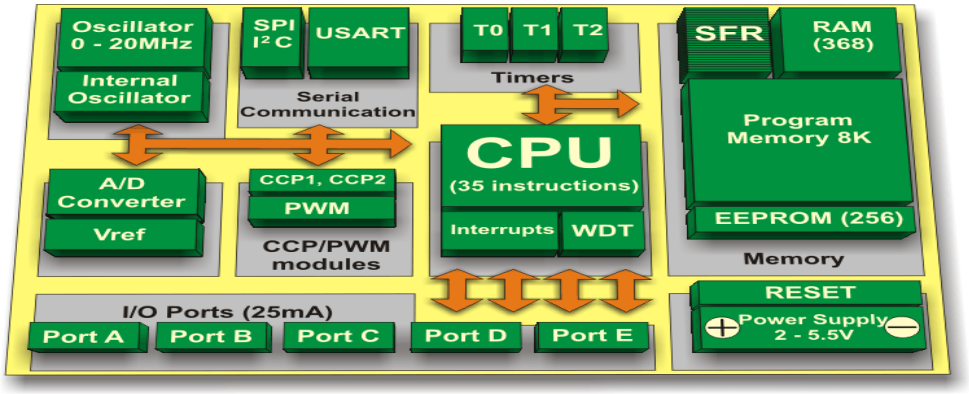
2.2 Microcontrollers

2.2.1 Definition of microcontroller

A microcontroller is a small economical computer-on-a-chip built for dealing with specific tasks, containing a processor core, memory, and programmable input/output peripherals. Program memory in the form ROM is also included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output, devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.[6]



Figure(2.1) microcontroller's

2.3 Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

Arduino has many properties such as : it easy to use and learn , it can be used by both professionals and beginners and it use everything you can think of.

Arduino can communicate with the surrounding environment through a number of sensors, and can influence its surroundings by controlling small motors or lights and other electronic parts.

Micro-controller is a microcomputer based on an integrated circuit consisting of a microprocessor, micro-memory, input / output accessories, and a lot of other electronic elements such as a timer for the operation of the processor clock and may contain an analogue digital adapter and a digital analogue converter.

The micro-controller on the board is programmed by easy-to-learn Arduino Programming language and by Arduino's integrated development environment (Arduino IDE).There is two ways to connect Arduino : Arduino can connect to its sensors and electronic parts only or Arduino can connect and communicates with programs on the computer, such as Processing, MaxMSP and MATLAB.

There are more than 20different types of Arduino different in their size , manufacturing and the function .So you can find types up to 4 inches and other types of circular diameter up to 2 inches.[6]

2.3.1 Arduino Uno

The Uno is one of the more popular boards in the Arduino family and a great choice for beginners.

The Uno is a great. It's got everything you need to get started, and nothing you don't. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, a reset button and more. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.[7]

Specifications of Uno:

• Microcontroller : ATmega 328.
• Working voltage: 5 volts.
• Input voltage limits: 6-20 volts, preferably 7-12 volts.
• I / O outlet: 40 mA.
• Current voltage in the 3.3V pin: 50 mA.
• Memory Size: 32 KB.
• Speed: 16 MHz.

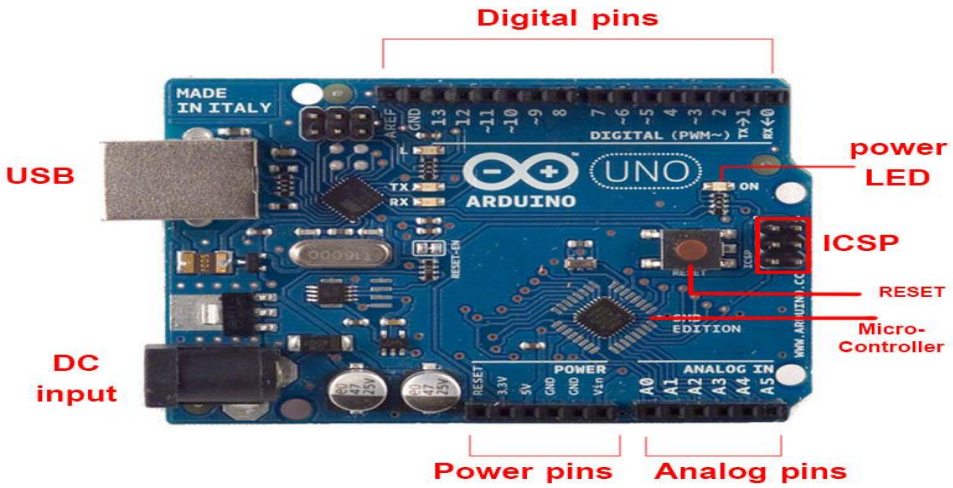


Figure (2.2) Arduino UNO

2.4 Electric Bed

An electric bed is designed specifically for patients in hospitals or others for those in need of health care, and has the advantages of health comfort, such as adjusting the position of the head and feet, electronic buttons through the remote control.

There are many varieties of electric bed with different specifications such as Semi electric hospital beds and full electric hospital bed.

Semi-electric beds are medical beds that are quite similar to full-electric hospital beds. Although both semi-electric and full-electric hospital beds both use motors to raise the head and foot sections of the bed, semi-electric homecare beds have the ability to raise or lower the height of the bed parallel to the floor automatically Semi-electric beds use a hand crank to raise and lower the bed deck.

Figure (2.3) Electric Hospital Bed

2.4.1 Electric Motor

An electric motor is an electrical machine that converts electrical energy into energy. Most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force.

Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as from the power grid, inverters or generators.

Figure (2.4) Electric Motor

2.4.2 Motor Construction

1) Rotor:

In an electric motor, the moving part is the rotor, which turns the shaft to deliver the mechanical power. The rotor usually has conductors laid into it that carry currents, which interact with the magnetic field of the stator to generate the forces that turn the shaft. However, some rotors carry permanent magnets, and the stator holds the conductors.

Figure (2.5) Electric motor rotor (left) and stator (right)

2) Bearings:

The rotor is supported by bearings, which allow the rotor to turn on its axis. The bearings are in turn supported by the motor housing. The motor shaft extends through the bearings to the outside of the motor, where the load is applied. Because the forces of the load are exerted beyond the outermost bearing, the load is said to be overhung.

3) Stator:

The stator is the stationary part of the motor's electromagnetic circuit and usually consists of either windings or permanent magnets. The stator core is made up of many thin metal sheets, called laminations. Laminations are used to reduce energy losses that would result if a solid core were used.

4) Air gap:

The distance between the rotor and stator is called the air gap. The air gap has important effects, and is generally as small as possible, as a large gap has a strong negative effect on the performance of an electric motor. It is the main source of the low power factor at which motors operate. The air gap increases the magnetizing current needed. For this reason, the air gap should be minimal. Very small gaps may pose mechanical problems in addition to noise and losses.

5) Windings:

Windings are wires that are laid in coils, usually wrapped around a laminated soft iron magnetic core so as to form magnetic poles when energized with current.

Electric machines come in two basic magnet field pole configurations: salient-pole machine and no salient-pole machine. In the salient-pole machine the pole's magnetic field is produced by a winding wound around the pole below the pole face. In the no salient-pole, or distributed field, or round-rotor, machine, the winding is distributed in pole face slots.

Some motors have conductors that consist of thicker metal, such as bars or sheets of metal, usually copper, although sometimes aluminum is used. These are usually powered by electromagnetic induction.

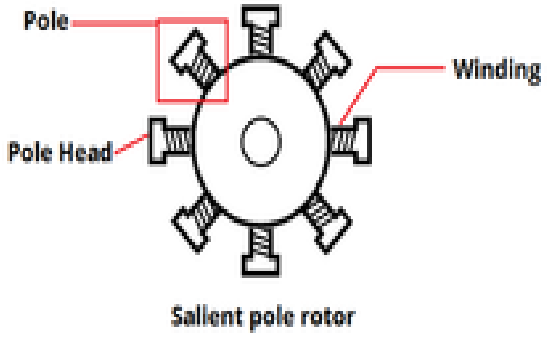


Figure (2.6) Salient-pole Rotor

6) Commutator:

A commutator is a mechanism used to switch the input of most DC machines and certain AC machines consisting of slip ring segments insulated from each other and from the electric motor's shaft. The motor's armature current is supplied through the stationary brushes in contact with the revolving commutator, which causes required current reversal and applies power to the machine in an optimal manner as the rotor rotates from pole to pole.

7) Motor Categories

In magnetic motors, magnetic fields are formed in both the rotor and the stator. The product between these two fields gives rise to a force, and thus a torque on the motor shaft. One, or both, of these fields must be made to change with the rotation of the motor. This is done by switching the poles on and off at the right time, or varying the strength of the pole.

AC electric motors are either asynchronous or synchronous.

Once started, a synchronous motor requires synchronism with the moving magnetic field's synchronous speed for all normal torque conditions.

In synchronous machines, the magnetic field must be provided by means other than induction such as from separately excited windings or permanent magnets.

2.4.3 Hand Remote Control

There are a lot kind of remote control for electrical bed, all of them have the same function but they different in the number of button they have.

Each button has a certain move used to control the patient bed, The doctor continuously presses the control button of the movement required to reach the appropriate position of the electric bed figure (2.6) to ensure the patient's comfort, so instead of controlling the movement by hand, the doctor control the bed move wirelessly by connect each button with the Arduino with two wires.

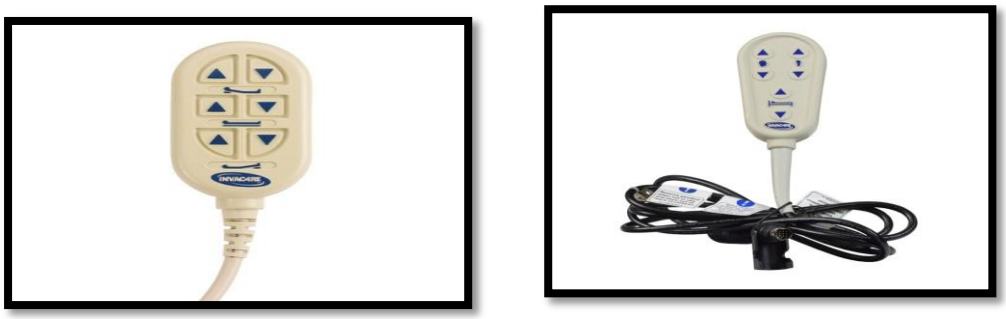


Figure (2.7) Hand Remote Control

2.5 Wi-Fi (ESP 8260)

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer.

The chip first came to the attention of western makers in August 2014 with the ESP-01 module. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.

The ESP8285 is an ESP8260 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi

Figure (2.8) ESP 8260

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

2.6 Wi-Fi Cam and Microphone

The video and sound from this camera could take by its IP address.
We will add the button to control to run or to turn off the operation according to the patient's desire, It is ethical to preserve the privacy of the patient.[13]

Figure (2.9) Wi-Fi Camera and Microphone

2.7 Mobile

The principle of mobile phone work is the reception and transmission signals of vibration transmitted by ground and satellite transmission stations, which is very powerful, up to 20MZ transmission and reception per second, and the process of communication is through an integrated circuit located in the mobile phone with a SIM card has a very slim and compact volume as well as a processing unit that stores user data to communicate with others.[9]

Figure (2.10) Mobile

CHAPTER THREE

TECHNOLOGIES AND METHODOLOGY

3.1 Introduction.

3.2 Hardware Design.

3.2.1 Hospital Bed (Electric Patient Bed).

3.2.2 Remote Terminal Unit.

3.2.3 The Microcontroller.

3.2.3.1 Why Arduino Uno.

3.2.4 Wi-Fi Connection Module.

3.2.5 Relays PCB.

3.2.6 Wi-Fi Cam and Mic.

3.2.7 Mobile.

3.3 Software design

3.3.1 Mobile Application Software.

3.3.1.1 App Inventor.

3.3.2 Arduino Software and Programming.

3.1 Introduction

This chapter provide an overview for technologies used to implement all parts of our project. The set of technologies includes hardware components and programs written by several programming languages suitable for running project operations.

3.2 Hardware Design

3.2.1 Hospital Bed (Electric Patient Bed)

It's a patient bed that electrically operated with four axes movement :

a) Knee break.
b) Height adjustment.
c) Tilting with two axes.

It has a nurse hand set which controls the movement of the bed by sending signals to the control box to control each motor individually .

The project improves another handset tool (remote unit) added to the control unit that receives a commands of motion via Wi-Fi, then sends control signals to the main control unit of the electric bed.

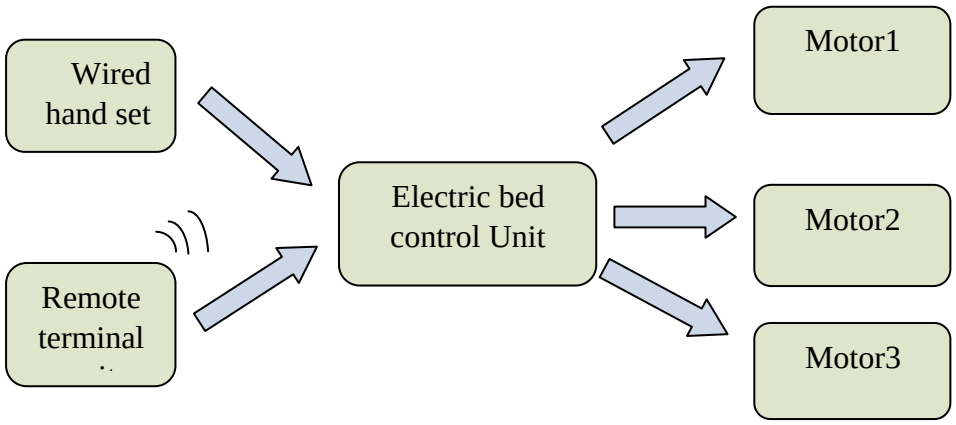


Figure (3.1) Bed With Remote Terminal Unit

3.2.2 Remote Terminal Unit

This unit is the terminal box in the system which replaces the control handset of the bed. Or can be added to the bed without affecting the old handset.
It construct of several parts to receive the signal from Wi-Fi and analyze it then sends control signals to a relay BCP to control the motors.

3.2.3 The Microcontroller

It is important to understand that the Arduino board includes a microcontroller, and this microcontroller is what executes the instructions in your program.so you won't use the common nonsense phrase "Arduino is a microcontroller" ever again.

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

Arduino has many properties such as : it easy to use and learn , it can be used by both professionals and beginners and it use everything you can think of .

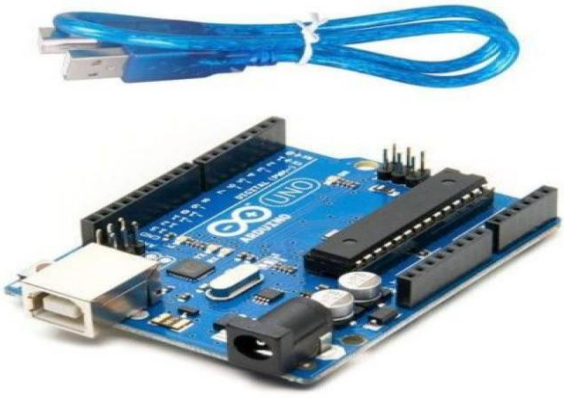


Figure (3.2) Arduino

3.2.3.1 Why Arduino Uno?

The Uno is one of the more popular boards in the Arduino family, and more easier to deal with other component and modern technology.

Also it has enough pins and specifications for our project.

Specifications of Uno:

• Microcontroller: ATmega 328
• Working voltage: 5 volts
• Input voltage limits: 6-20 volts, preferably 7-12 volts.
• I / O outlet: 40 mA
• Current voltage in the 3.3V pin: 50 mA
• Memory Size: 32 KB
• Speed: 16 MHz

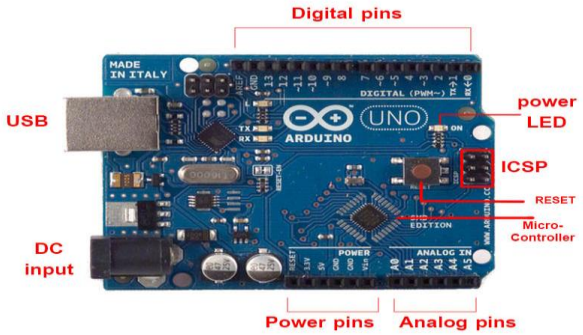


Figure (3.3) Arduino UNO

In this project the Arduino will be programmed to communicate with the Wi-Fi shield and give the connection commands (AT commands) throw the serial port (Tx , Rx) , then it receives the data from the WIFI shield . Then it analyses the data and sends the orders to the controller of the electric bed to actuate the motors.

Also it controls the opposite side by a connected buttons that allows the patient to open or close the camera or the microphone .

3.2.4 Wi-Fi Connection Module

In this project we use esp8266 from Express if systems company. The ESP8266 is a low-cost/low – power Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability produced by Shanghai-based Chinese manufacturer.[14]

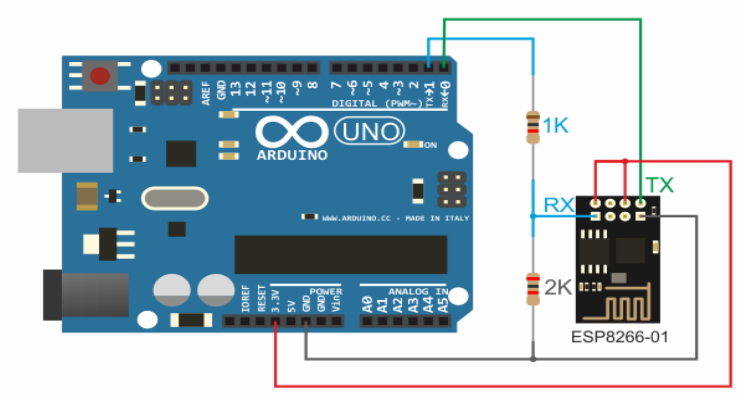


Figure (3.4) Arduino with esp8266

3.2.5 Relays PCB

The voltage of the Arduino part is 5 volts , but the electric bed uses 25 volts , so we need a relays connection to drive the motors .

Figure (3.5) Relays PCB

3.2.6 Wi-Fi Camera And Microphone

We may use an wi-fi iP camera . Nether we use it will be connected directly to the Router or access point , and will be browsed from the mobile application .

Also it will be controlled from the Arduino to allow the patient to enable it or block it.[15]

Figure (3.6) Wi-Fi Camera and Microphone

3.2.7 Mobile

In our project we need an android mobile device , to install the application of the remote control .

Figure (3.7) Mobile

3.3 Software design

This part of project design describes the project software in its deferent parts the mobile application software , and Arduino programming .

3.3.1 Mobile Application Software

We choose to use the App inventor to develop an application for the mobile remote control software .

3.3.1.1 App Inventor

App Inventor for Android is an open-source web application originally provided by Google.

It allows newcomers to computer programming to create software applications for the Android operating system (OS). It uses a graphical interface, very similar to Scratch and the StarLogo TNG user interface, which allows users to drag-and-drop visual objects to create an application that can run on Android devices.

App Inventor and the projects on which it is based are informed by constructionist learning theories, which emphasizes that programming can be a vehicle for engaging powerful ideas through active learning.

MIT App Inventor is also supported with the firebase database extension. This allows people to store data on Google's firebase.

In this project we decide to choose the app inventor because, it doesn't need code writing but, it depends on available blocks and the users only need to choose the suitable blocks for his program, and one of it best advantage is the app inventor has online link so the programmer don't need to download applications in the computers.

This project consist of three screens, the first is the entrance of the whole program, and it contains the username and password that allow the user to login the program.

The second screen is the main screen which contains all control tools and all the choices that allow the doctor to entrance to suitable screen for any patient he chooses.

Finally, the third screen contains the main orders that allow the doctor to control the patient bed.[11]

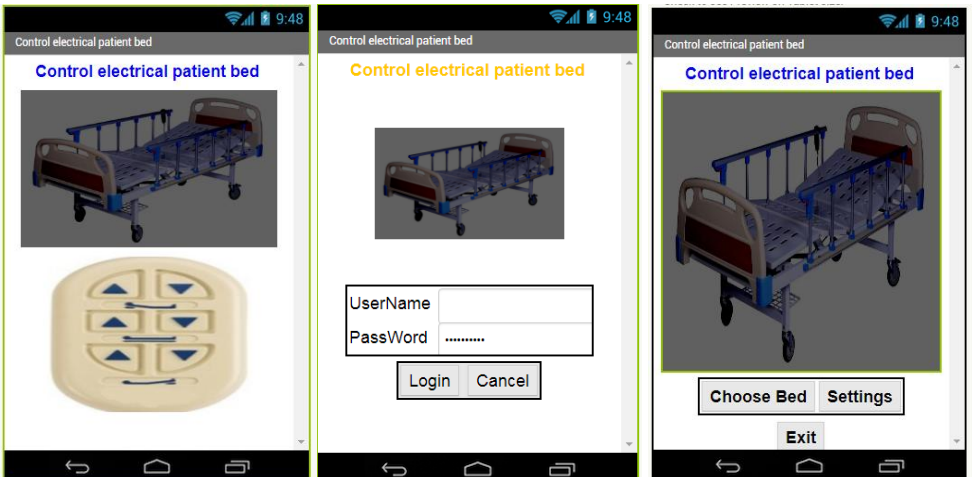
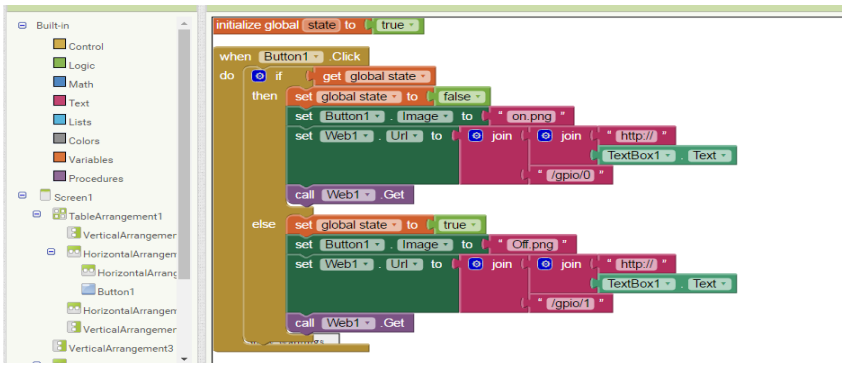


Figure (3.8) Application Basic Pages Design

And these are example block coding using the app inventor , after designing the main pages of the application , we assemble the block code to send and receive data via Wi-Fi network that the mobile connected with .



Figure(3.9) Block Coding Using The App Inventor

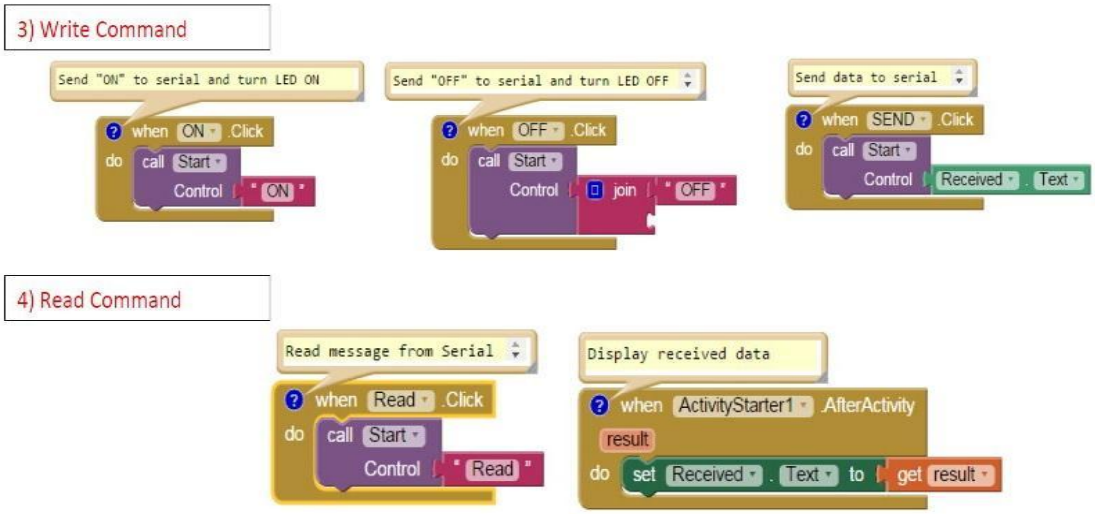


Figure (3.10)Block Programming Sample

3.3.2 Arduino Software And Programming

The programming of the Arduino is more simple than other microcontrollers , because it has its own IDE , basically its C programming language .

We will program the Arduino to do many tasks:

First it will connect with the Wi-Fi shield throw the serial port by the AT commands. Then it will accomplish Wi-Fi connection with the access point.Then receives the commands from Wi-Fi.And give the commands signals to the electric bed control unit.After that we will be able to send and receive command from the mobile to the Arduino and vice versa .[10]

CHAPTER FOUR

DESIGN AND IMPLEMENTATION

4.1 Block Diagram.

4.2 Flow Chart.

4.2.1 Flowchart of Mobile Application.
4.2.2 General Flowchart of the System.

4.3 Hardware Design.

4.1 Block Diagram

In this project we will use an electric patient bed to control the motion of its axes by a modified remote control unit, it added to the basic control unit on the bed. The control unit that receives a commands of motion via Wi-Fi, then sends to receive the signal from Wi-Fi and analyze it ,then sends control signals to a relay BCP to control the motors.

In this project the Arduino will be programmed to communicate with the Wi-Fi shield and give the connection commands (AT commands), then it receives the data from the Wi-Fi shield. Then it analyses the data and sends the orders to the controller of the electric bed to actuate the motors.

Also it controls the opposite side by a connected buttons that allows the patient to open or close the camera or the microphone.

The Figure (4.1) shows the system parts design, and how they interacted with each other via Wi-Fi connection. Also, the figure shows the type of each components. That will be discussed in this chapter.

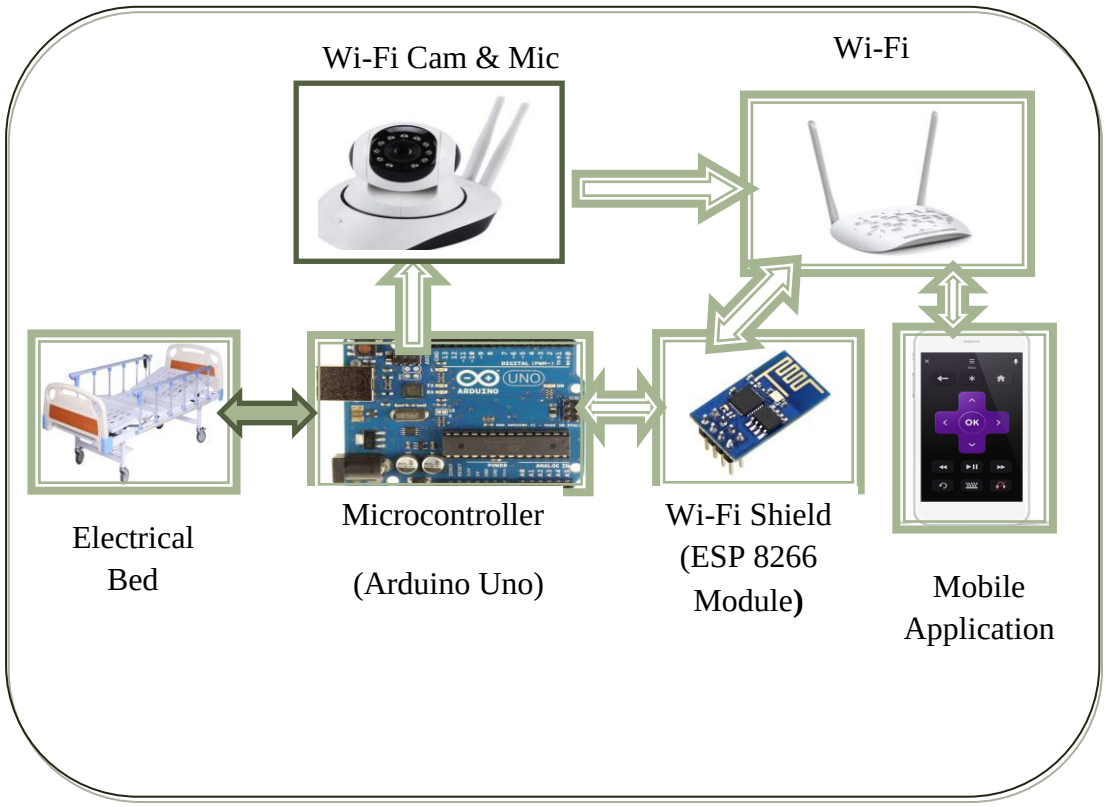


Figure (4.1) System Design Block Diagram

4.3 Flow Chart

When the patient push button for this operation, a request from the patient is received by the Arduino which sending it to the nurse at the same time, the Wi-Fi camera which is connected with the system is turn on by supplying it with electricity, also a microphone is turn on.

When the Arduino receive the patient request it send the patient address throw the Wi-Fi module (Esp8266) to the nurse.

The nurse can solve the patient problem he must enter to the application on his mobile by enter the correct username and password. If he enter incorrect username or password he has the ability to try three times only, if else he enter to the application.

A list of requests will appear to the nurse when he enter to the application he choice the suitable request and then enter to it own control screen.

By using the Wi-Fi camera, communicating with patient and the control buttons on the application the nurse can adjust the appropriate position of the bed to achieve the patient's comfort.

The appropriate camera is operated by its own IP address, this flowchart describe it.

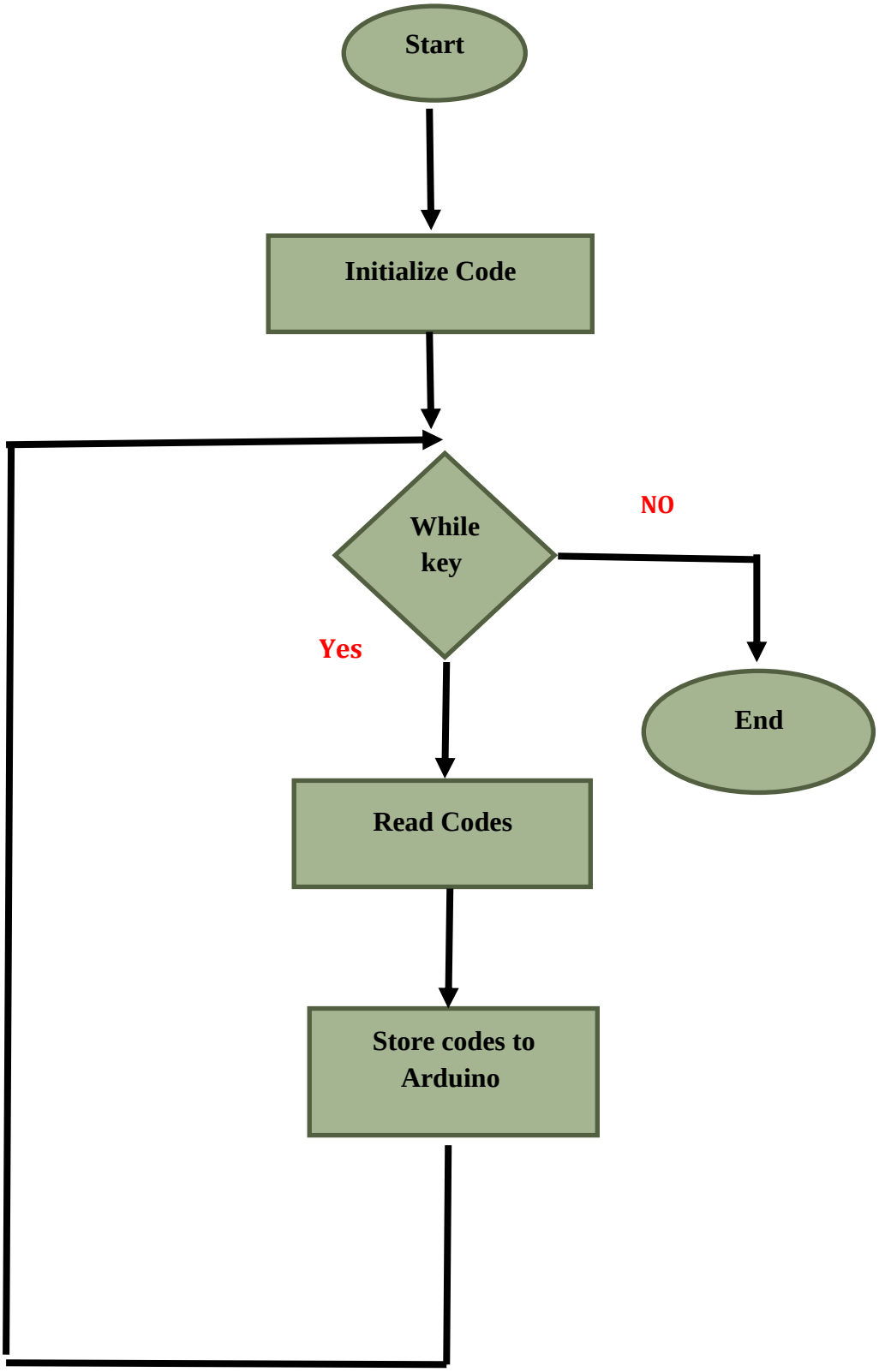


Figure (4.2) Flowchart of Mobile Application

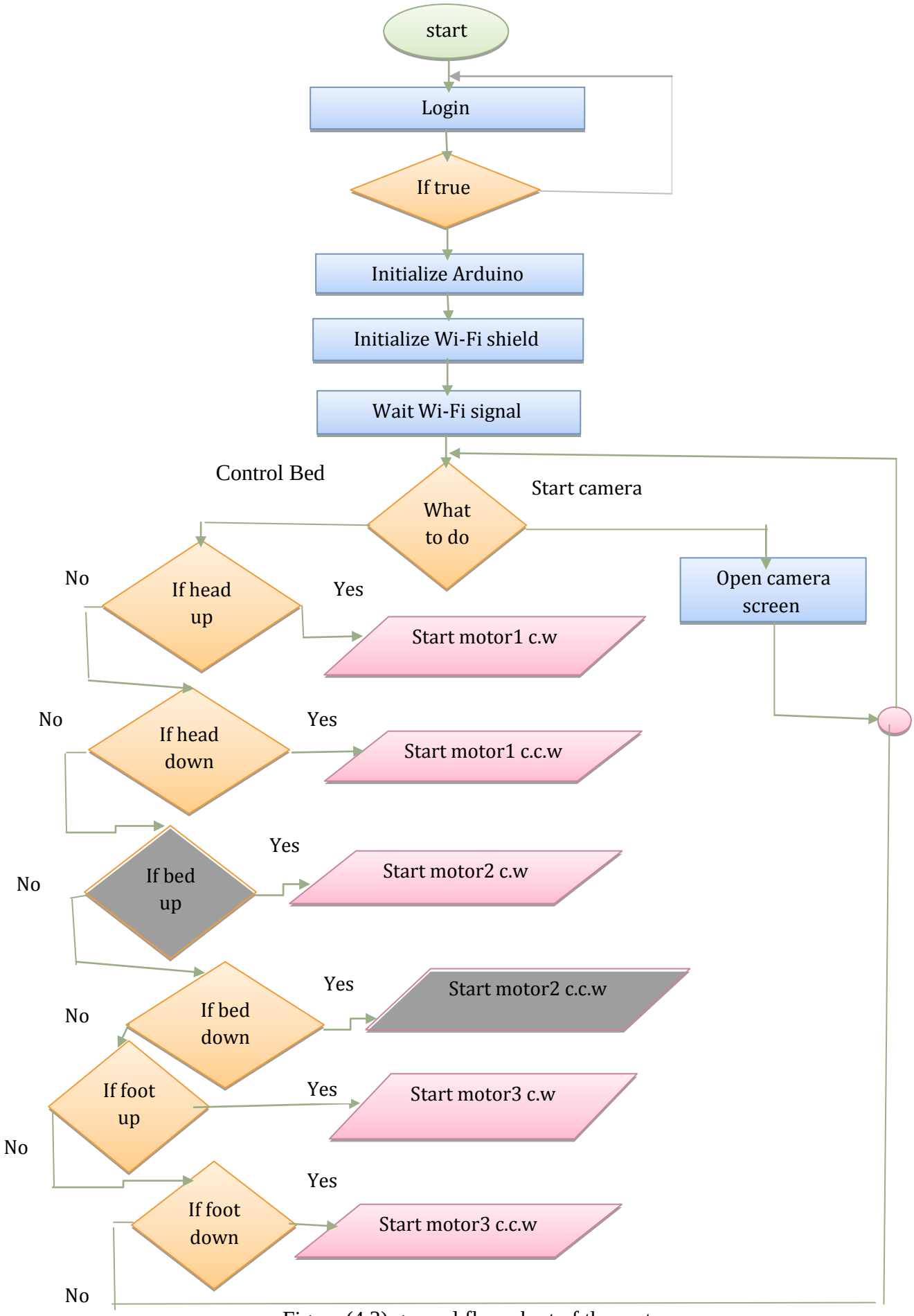


Figure (4.3) general flow chart of the system.

4.3 Hardware Design

In this section, contain explain the hardware design:

The hardware design of project as a block diagram show in Figure(4.4)

Figure (4.4) hardware design

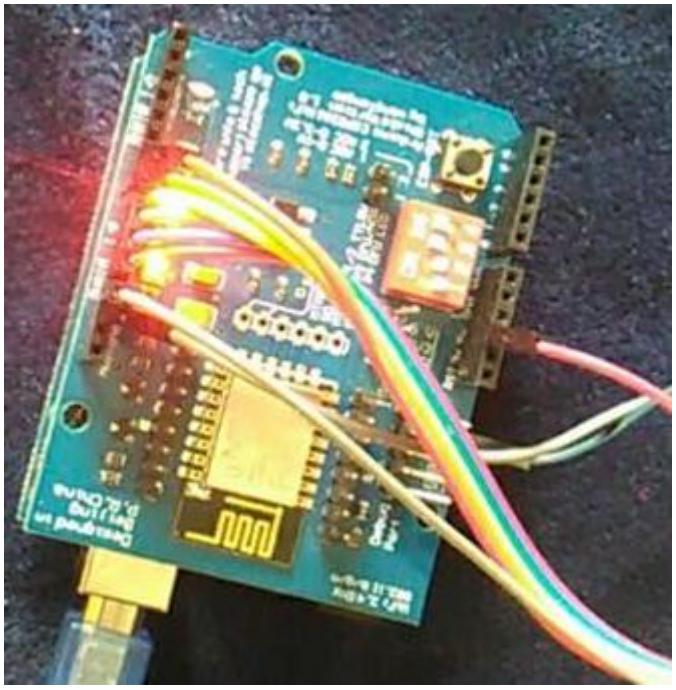


Figure (4.5) pins [4-13]

CHAPTR FIVE

IMPLEMENTATIONS AND TESTING

5.1 **Implementations.**

5.2 **Testing .**

This chapter provides implementations and testing of the system .First explain implementation of the project, second explain the testing of the project.

5.1 Implementations

To run the system, turn on the power in microcontroller (Arduino), then the username and password interface will appear figure (5.1).

Figure (5.1) Login interface.

To open the system, but username and password correctly. The username is PPU and the password is PPU, if the username and password is wrong then the message "Error in Username or Password' will appear, look figure(5.2).

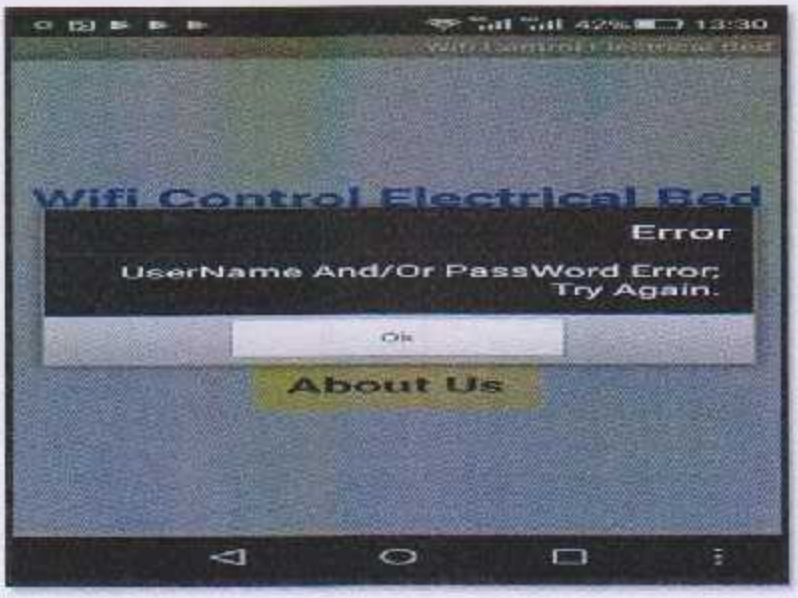
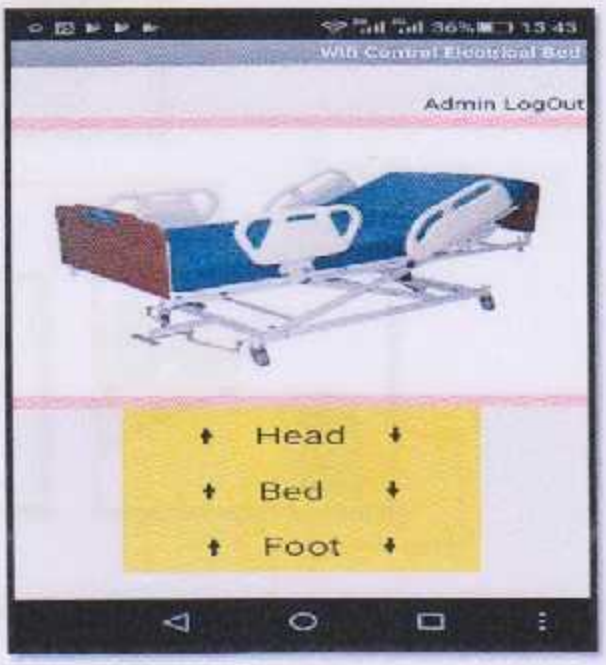


Figure (5.2) Login if make an error



After login in the system, then the new interface is appear, refer to figure (5.3)

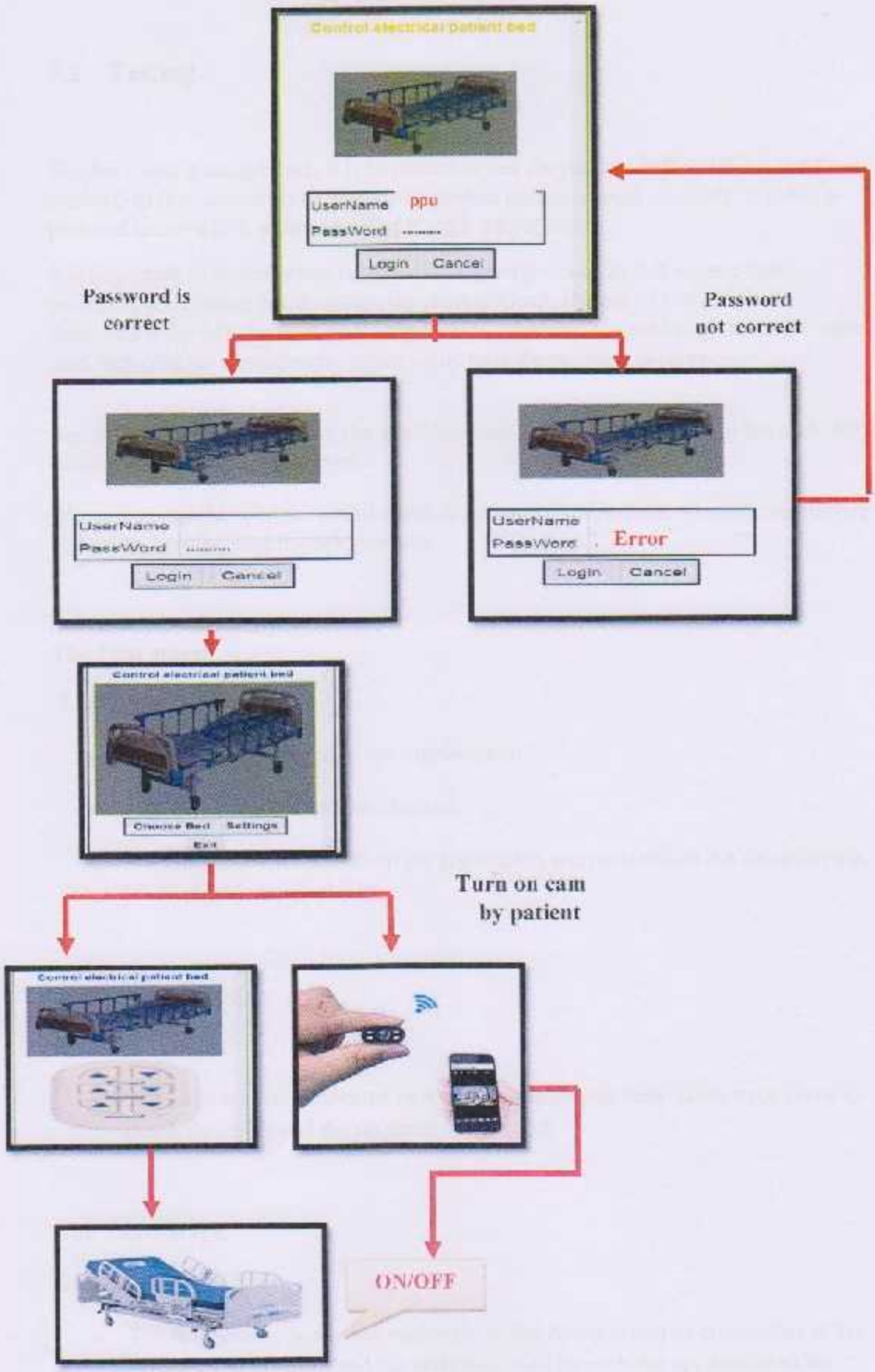


Figure 5.4 Sequence Diagram

5.2 Testing

To give a user good product, it is important to test the product before offer it is a final product, so this section about testing the project testing is work correctly, it is has a problem to solve it, it work correctly, it work a long time.

It is important to do many test to give user a good product, in this project many problems was appear, but it solved, the most difficult The use of non-original ,how stop it ,by edit the code and electronic components is used to give a valid value and buy original components. make many tests the problem is solve

Another problem how display the graphical into to Arduino, by editing the code and make tests the problem is solved.

We have tested the remote control which connected with Arduino to move the electric bed using Arduino, and it work correctly.

The First stage:

Testing the application:

- A user has been added to the aapplication.
- The Wi-Fi connection was checked.
- Wi-Fi signals were sent from the application and received on the computer via Wi-Fi shield via serial ports.

The Second Stage:

Check the Arduino:

- The LED set was connected to Arduino outputs and then orders were given to check the result and the response was correct.

The Third Stage:

Check Wi-Fi shield:

- The Wi-Fi component was connected to the Arduino and its connection to the network was checked and the calls were sent through the application to the Wi-Fi shield and the results appeared on the LED.

The Fourth Stage:

Check Wi-Fi camera:

- The camera is wirelessly connected to the network and the image is opened through the application

The Fifth Stage:

- All components were connected with each other and with the bed to control. The result was that the bed was controlled in six different movements.

CHAPTER SIX

CHALLENGES, CONCLUSION AND FUTER WORK

6.1 Challenges and Solutions

6.2 Conclusion

6.3 Future Work and Recommendations

This chapter provides three section. First talk the challenge in the project, after that talk about the conclusion the system, and finally talk the future work and Recommendations, future work are any work can added in the system .

6.1 Challenges and Solutions

In this section a contain a challenges and problem see it with making the problem and contain the solve of problems. The problem and solves are:

- The first challenge is the programming language (C) because you learn this language by yourself, we solve it by learn the language and read books,also we watch many videos in YouTube.
- Read a lot of codes about the wi-fi and arduino , we solve it by using many step in Arduino and Wi-Fi data sheet , and we try many experiment to know the true codes.
- We had a problem for searching the electric bed ,we found it at Al-Hilal Hospital and we make a contract with them to exchange of interest.
- The availability of components in the market, we wait four week to arrive the all components.
- Some of components are fake and do not give the valid values.

6.2 Conclusion

In our project, we have controlled the hospital bed using mobile application ,by sending commands for arduino via wifi ,then the arduino receives this commands and moves the bed in many axis .We made the project application to reduce the effort of doctors and the time in response to all patients .In addition to help the bed syndrome, when made the project we seen many problems, but we solve it .Finally, can add many application in the project , refer to chapter six and read the future work, in the future work can anyone Connecting many hospital beds, by using new technology.

6.3 Future Work and Recommendations

After completing the hardware design of the project successfully, we suggested some of recommendations for future that following bellow:

- Connecting many hospital beds, it by using new technology.
- Using the principle of this project in other idea or application.
- Add another application not just to use the Wi-Fi.
- Add more service.

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[13] https://www.security-camera-warehouse.com/cctv.../ethernet-cable/
[14]^ "WiFi isn't short for "Wireless Fidelity" - Boing Boing".
[15]http://www.instructables.com/id/Arduino-Ethernet-Camera/

Appendix