# USMAN INSTITUTE OF TECHNOLOGY

Affiliated with NED University of Engineering & Technology, Karachi

## Department of Electrical Engineering

B.E. Electrical (Computer Engineering)

FINAL YEAR PROJECT REPORT

### Batch-2019

### HOME WATER CONTROLLING SYSTEM USING IoT AND ANDROID MOBILE APPLICATION

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# DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at USMAN INSTITUTE OF TECHNOLOGY or other institutions.

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# ACKNOWLEDGEMENT

# HOME WATER CONTROLLING SYSTEM USING IoT AND ANDROID MOBILE APPLICATION

## ABSTRACT

A project is completely automated system for controlling the water filling of homes, this system controls all the tanks filling automatically not just that but also checks line water whether it is coming or not, if it detects line water this will automatically turn on the section pump and start filling the water. It checks the level of upper tank and lower tank of house and for the need of refilling it automatically turn on the respective motor. This system is connected with the cloud, it sends all the data to the cloud and from the cloud all the data is available on android application. From android application user can watch its tank levels and line water level and user can also schedule the time of motors remotely.

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# CHAPTER#01
## INTRODUCTION

# 1.    Introduction

**Background:** We have made water tank controlling system using IoT which can be controlled by mobile application. Our project is all about automation and timed controlled management of water flow system for resident so that they can sleep in nights without taking too much worries of line water. Our project will provide comfort and relief to them and our mobile application would enable them to timely check the water flow system of their house and keep themselves up to date with line water.

We are making water controlling system which is fully automated and  it will check the line water and if it's coming it will turn on the pump and simultaneously it will also check the **level** of upper tank if it is less than the desired level our 2nd pump will on  and fill that upper tank at respective level. Our system also provides an android application by which we can make check and balance of our both tanks and turn on the pumps by inputting time on android applications if we wish to fill more levels of tanks. .Electricity bill calculation is another factor which our android application is providing that it will calculate units of our both motors consumes in order to fill both the tanks.

**Scope Of The Work:**

Our project can be implemented in every house through proper management and controlling thus our main key partner would be KWSB Karachi Water and Sewerage Board and another partner which can adopted this system is BAHRIA TOWN HOUSING AUTHORITY as they are making smart society so this system implementation in their society would be very effective for residents of their society.

**Karachi Water and Sewerage Board:**

KARACHI WATER AND SEWERAGE BOARD (KWSB) which is a service based consumer oriented organization responsible for supplying water to urban and rural residence of Karachi

.KARACHI WATER AND SEVERAGE BOARD {KWSB} can be our key partners as they have bad perception among peoples about their supply of water so they can adopt this model by purchasing us and supply this model to their clients in every house.

**Bahria Town Housing Society:**

Bahria town can be our key partner as they are making modern society which consists of modern technology so they can adopt our product to provide comforts to their residents

This problem is not limit to only some major areas of our city but it's widely spread across all over the country. The major city which affect by this problem is Karachi. Areas including North Nazimabad, Gulistan e Johar,as people needs to awake whole night in checking line water in the water line. Water Board supply water at uncertain time especially in midnight to these areas which makes unable for the residents to fill up their tanks. This problem is not only limited to middle class areas DHA is another area which is suffering from this problem. Tankers group makes their money in these areas by selling water at double rates.

Our homes need fully automated water flow system that will automatically refill their tanks and checks if the line water is coming. We are solving this problem. Our project is all about automated and timed controlled management of water flow system for resident so that they can sleep in nights without taking too much worries of line water. Our project will provide comfort and relief to them and our mobile application would enable them to timely check the water flow system of their house and keep themselves up to date with line water. Our system has the feature that it is connected to the cloud so that all the data about water flow, tank refilling, amount of water received would be available on mobile and peoples just customize all the settings on their fingertips with the use of android application. This mobile application will notify

user about water shortage and electricity bill calculation and amount of water that has been received from main line and all the customization options

**Significance of Research:**

This research will contribute in the improvement of major house problem of every residents. We hope that this research will encourage by different sectors of industries.

The outcomes to be considered consists of the following

- Automatic line water and storage tank management.
- Mobile application for real time tracking of home water condition.
- Can schedule motor timings using mobile application.
- Notification in mobile application if both the tanks have little or no water.
- Wireless communication between two tanks using Xbee.

## 1.1 Problem Statement

According to the Indus River System Authority (IRSA) Pakistan would be having a great shortfall of water in 2020-2025. Especially Punjab and Sindh would be having a water short fall of approximately 36 %. In Pakistan, there is a great shortage of water which leads to several other problems in the country. Every home in Pakistan has a problem of water management, they actually don't know when Water Board Supply water in the water lines so they have to awake whole night just to check whether the water is coming in the lines or not. Water Board supply water in many areas without equality like some towns receive excess of water and some did not get their proper rights of supply of water. Waking whole night for water is a huge problem

for peoples. We are trying to justify the problem using latest technology Internet of Thing.

## 1.2 Literature Review

### 1.2.1 Automatic water level monitoring and controlling system using IoT:

Automatic water level monitoring and controlling system using IoT.I have reviewed this article which is related to the water level monitoring and controlling the system. In the article or project they have used the Arduino microcontroller through which they are controlling the level of water. There is condition like when the level of water in tank is less or minimum to some extent then the motor will be automatically turn on and when the level of tank is maximum according to condition then the motor will be automatically off and there is ultrasonic through which we would know the level of water. The ultrasonic sensor will be placed at the top of the tank and it will sense the level through the ultrasonic waves by sending and receiving data and for that there is particular pins Eco and Trigger and they are using LCD and buzzer in the project as well in LCD it shows the value or reading on the LCD and there is buzzer which generates the sound when the level of water in the tank is less to some extent according to condition so then it will automatically turn off the pump.

**Reference:**

https://geoithub.com/water-level-monitoring-system-using-arduino/

### 1.2.2 IoT Based Water Level Monitoring System with an Android Application:

I have reviewed this article in which water level is controlling through microcontroller which is Arduino and in this project they are using cloud and android

application and they will be measuring the level of water through ultrasonic sensor which must be placed at the top of tank which measure the level through ultrasonic waves and there would be condition which follows by the system like when the level of water is less than to some value so it will automatically turn on the motor and if the level of water in a tank is maximum so it will automatically turn off the motor and the most important part of this project is that they are using cloud platform and android application and for cloud they must be using external WiFi because in Arduino there is no WiFi so through Cloud service they will be sending the value of ultrasonic sensor for that they will be using write API keys and there is android application as well so for user interface there is application and by using the cloud read API key the ultrasonic value would be send to application and user could see the current status of both tanks and user can turn on and turn off the motor by clicking one button In an application and through programed in Arduino that can happen like on and off the motor but that system is wired.

**Reference:**

**https://www.slideshare.net/rahulmonikasharma/iot-based-water-level-monitoring-system-with-an-android-application?from_action=save**

## 1.3.**Aims and Objective**

Our main objective is to make water tank control system using IoT which can be managed and controlled by mobile android application. This system will automatically sense when the water is coming in the line and automatically turn on water sucking pump and refill automatically lower and upper tank which are inside home and this system will send all information related to water refilling and water supply to the resident on their android mobile application so that residents would be aware of their water controlling system.

We are using water flow sensor for line water detection and ultrasonic sensor for checking levels of both the tanks upper and lower. If upper tank level is less than the desired level which we set motor will check the level of tank of lower tank. If it has desired set level motor will turn on and fill the upper tank. Otherwise after 1 minute it will turn off automatically for motors controlling we are using contactors. We are using thing speak cloud platform for uploading data of both the tanks to cloud from where we can use these values in our mobile application. We are using microcontroller node MCU for controlling programming part of these devices.

# CHAPTER#02
## METHODOLOGY

## 2.1. Hardware Detail

### 2.1.1. List of Hardware Components

We are using following components which are given below:

- Water Flow Sensor

- Ultrasonic Sensor

- Microcontroller

- Relay & contactors

- Xbee Module

- Motor

- Batteries & Solar

- Water Tanks

- Cloud Service Thingspeak

- Android Application

### 2.1.2 Nodemcu (MICROCONTROLLER) :
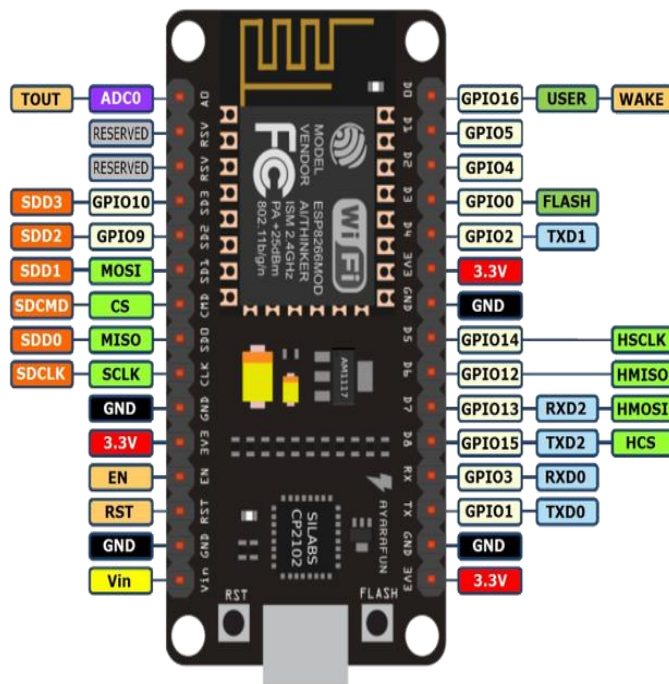


It is used for controlling end devices. We have connected our RTC clock, relay, water flow sensor, ultrasonic sensor through our NodeMCU pins. Power of NodeMCU

would be given through adopter which gives 5V output. We prefer NodeMCU over other microcontroller as it have more digital I/O pins and language which it uses is similar to C language. We have 13 digital pins of NodeMCU including 2 Rx and 2 Tx pins for transmitting and receiving data. We have 1 analogue pin .Digital pins of NodeMCU have been utilized by water flow sensor (1 digital pin) ultrasonic sensor utilized (2 digital pins) as trigger and echo pins for transmission of sonic waves. We have used Two  ultrasonic sensors thus total of 1 ultrasonic pins  would be used by NodeMCU for checking of level of tanks.2 of the digital pins of  NodeMCU have been utilized by relays which we uses for operating motors and pump on respectively. NodeMCU is utilized by RTC Clock as well as.5V or VV pin of NodeMCU has been shared between water flow sensor and Relay.2 Ground pins are utilized by giving sensors and Relays ground path.

### 2.1.3 XBEE:

 It is wireless networking protocol used for making wireless network for sending and receiving sensors data for longer distances (100m).The module which we are using is ZIGBEE S2C.

**2.1.3.1 Pin Outs of Zigbee S2c Module**
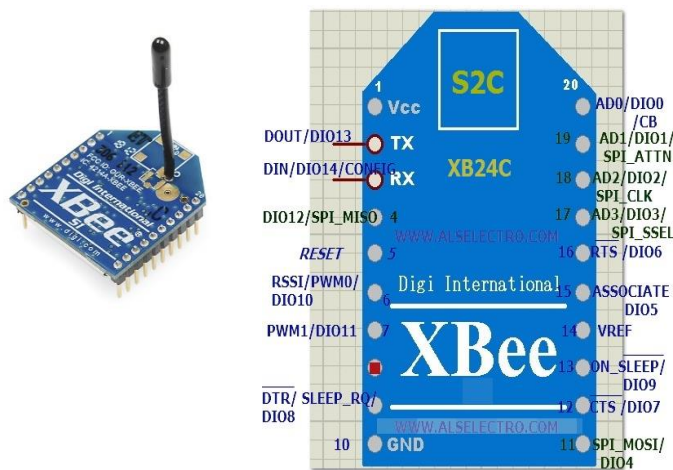
Zigbee s2c is RF module which is used for wireless communication and for data exchange and it works on mesh communication protocol which is IEEE 802.15.4.PHY.This module provides wireless connectivity between devices. ZigBee is the name of the protocol followed by XBee modules for establishing wireless communication.

## 2.1.3.2 Zigbee S2c Pin Configuration

| Pin | Name | Description |
|-----|------|-------------|
| 1 | VCC | Power supply |
| 2 | DOUT/DIO13 | UART data out pin (TXD)/GPIO |
| 3 | DIN/CONFIG / DIO14 | UART data in pin (RXD)/ GPIO |
| 4 | DIO12/SPI_MISO | GPIO/ Master Input-Slave Output pin of SPI interface |
| 5 | RESET | Module Reset pin |
| 6 | RSS PWM /DIO10 | RX Signal Strength Indicator pin / GPIO |
| 7 | PWM1/DIO11 | Pulse Width Modulator/GPIO |
| 8 | RESERVED | Do not connect |
| 9 | DTR/SLEEP_RQ/ DIO8 | Pin Sleep Control line /GPIO |
| 10 | GND | Ground |
| 11 | DIO4/ SPI_MOSI | GPIO/Master Output-Slave Input pin of SPI interface |
| 12 | CTS/DIO7 | Clear-to-send flow control/GPIO |
| 13 | ON_SLEEP/DIO9 | Device status indicator/GPIO |
| 14 | VREF | Voltage Reference for ADC |
| 15 | ASC/DIO5 | Associate Indicator/GPIO |
| 16 | RTS/DIO6 | Request to send flow control/ GPIO |
| 17 | AD3/DIO3/SPI_SSEL | Analog input/GPIO/SPI slave select |
| 18 | AD2 /DIO2/SPI_CLK | Analog input/GPIO/SPI clock |
| 19 | AD1/DIO1/SPI_ATTN | Analog input/GPIO/SPI attention |
| 20 | AD0/DIO0/C | Analog input/GPIO/ Commissioning button |

### 2.1.3.3 Features Of Zigbee Module S2c

- Featured with UART (250 Kb/s maximum) and SPI (5 Mb/s maximum) interface

- Featured with software adjustable transmitting power

- Indoor/Urban Range: 200ft

- Outdoor RF line-of-sight Range: up to 4000ft

- Transmit Power Output: 6.3mW (8dBm) in Boost mode,2mW (3dBm) in Normal mode

- RF Data Rate: 250,000 bps

- Receiver Sensitivity: -102dBm in Boost mode, -100dBm in Normal mode

- Supply Voltage Range: +2.1V to +3.6V

- Operating Current: 33mA (at3.3V, for Normal mode) , 45mA (at 3.3V,for Boost mode)

- Idle Current: 9mA

- Maximum output current on all pins together: 40mA

- Power-down Current: <1uA @25C

- ESD protection: 3000V

- Operating Temperature: -40℃ to 85° C

- Transmission Frequency: 2.4GHz to 2.5GHz

- Number of Channels: 16 Direct Sequence Channels

### 2.1.4 RTC Clock (Ds-3231)

To input real time we have used RTC clock which is connected with GPIOs pin D4 &D5 respectively to our NodeMCU. Operating voltage of rtc clock is 3.3V.power of RTC would be supplied by NodeMCU



### 2.1.5 Contactors

The operation of a contactor is somehow similar to that of a relay but contactor carry much more amount of current than relays. We cannot use relays directly in those circuits where current is in large amount (more than 20Ampere). In such conditions contactors can be used. Contactors are available up to the ampere rating of 12500A. Contactors cannot provide short circuit protection but can only make or break contacts when excited.
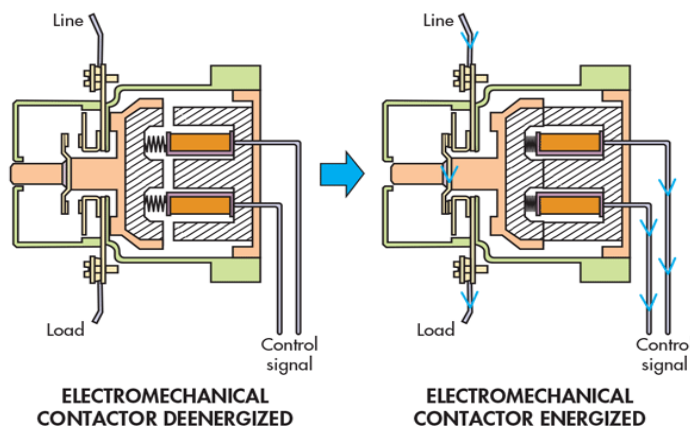
### 2.1.6 Relays:

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current used to control sensors and end devices.



### 2.1.7 Ultrasonic Sensor (Hc-Sr04):

It used for checking the level of water in tank. We have fitted ultrasonic sensor at the top of both the lower and upper tanks. Ultrasonic sensors work by emitting sonic waves at a very high frequency which is difficult for humans to hear.
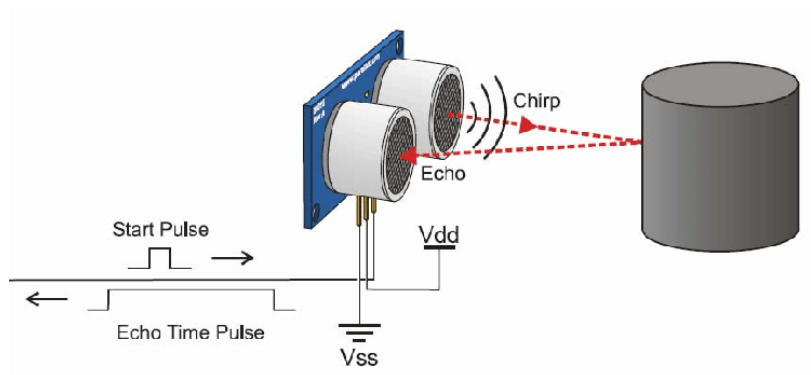


### 2.1.8 Flow Sensor:

It is used to detect the flow of water in main line. Water flow sensor consists of plastic body, water rotor, and a hall-effect sensor.
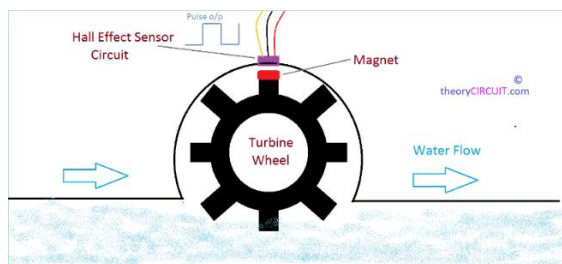
## 2.2. Software Detail

**2.2.1 Arduino IDE:** We have used arduino IDE for writing and burning the code to our microcontroller (nodemcu). It is an open source IDE which can be easily downloaded from Arduino.cc website. This IDE provides end user ability to use several libraries.

**2.2.2 Android Studio:** We have used android studio for the development of android application

# CHAPTER#03
## IMPLEMENTATION

## 3.1. Details of Hardware Implementation

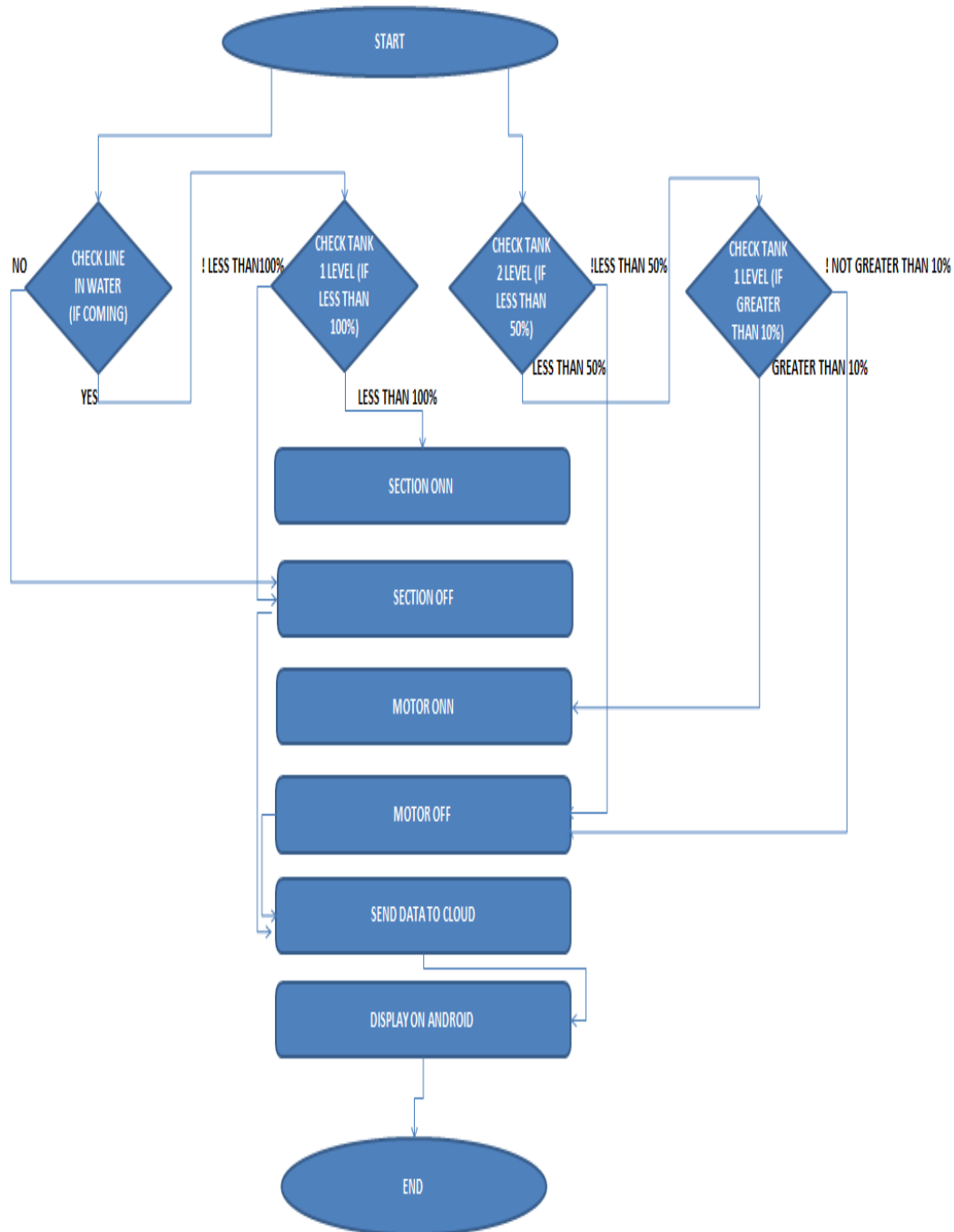### 3.1.1 Flow Diagram Of Water Management



- **Condition 1**

In condition 1 we will check the line water in the main line if the main line water is

coming pump will turn on otherwise if main line water id not coming pump will on

for 1 minute to wait for water to come in line if it is not coming pump will turn off.

- **Condition 2**

At the same time if condition 1 is true which mean line water is coming in line at that time our $2^{nd}$ condition will be checked by checking the level of water in the lower tank through ultrasonic sensor if the level of water in the tank is less than 100% the pump will turn on otherwise it will turn off the pump.

- **Condition 3**

In our $3^{rd}$ condition our motor will check the level of upper tank through ultrasonic sensor if the upper tank level is less than 50% 3rd condition will be true and then it will check $4^{th}$ condition.

- **Condition 4**

If our $3^{rd}$ condition is true and level of upper tank is less than 50% at that time it will check the level of water in the lower tank if it is greater than 10% motor will turn on to rise up the level of upper tank by filling it.

## 3.2. Details of Software Implementation

### 3.2.1 Android Application

## 3.2.1.1 User Interface of Android Application
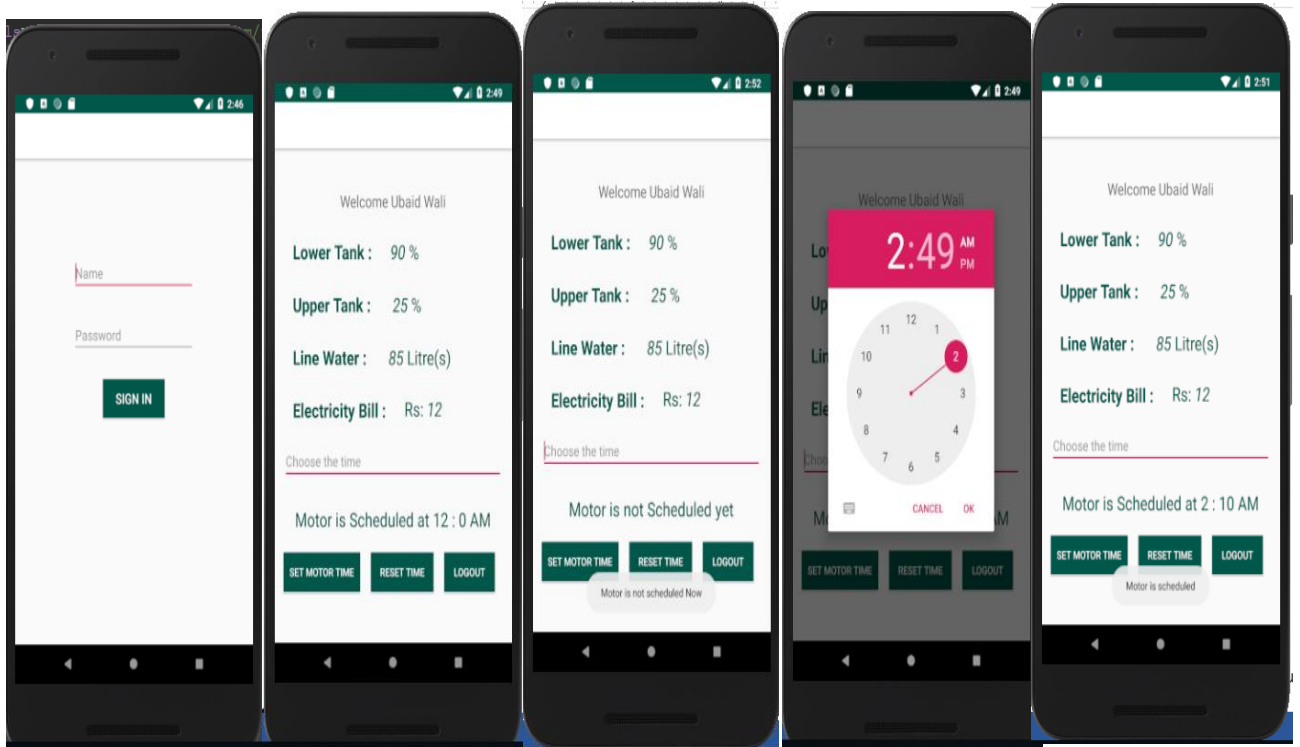


### 3.2.1.2. Manifest File

Manifest file is the most important file which contain the information about the compnents of android application like Activities, Broadcast receivers, services, and contents. It also contains permissions for using android services like camera, Bluetooth, GPS and much more. It is xml format file.

It is the launcher file from where the metadata of all activity must be written. When compiler compiles this file, this tells compilers which activity to launch first the complete series of parent and child activities. If you want to create a child or parent activity you have to mention in this file.

As we want to do API calling and internet access, we have used, android permission for internet

**3.2.1.3 Android Activities**

Activity is an interface that will be visible on the mobile screen, in android application user only see the activities. Activity is a combination of two files, Extensible markup language (XML) file where the interface and visual component of the application resides, and a Java Class where the back-end of the application is made. UI of android application is usually made using XML, as we have used android studio which has built-in visual editor so instead of writing xml we have used visual editor which is very easy and helpful in creating user interface components and activities.

I have made 2 activities in the application

- **Main Activity**—having two files (MainActivity.java and activity_main.xml)
- **SuccessActivity**—having two files (SuccessActivity.java and activity_success.xml)


- **Main Activity**

This is the first java class that I have made, it is the main entry point of the application from where the user first interact with the application. When user launch the app, the android launcher will trigger this activity and user will see **activity_main.xml** file on the screen.

In our application, we have design login page as the first page that will be visible to the user when user wants to use application.

- **Success Activity**

This is the second activity I have made. When user login successfully then this activity will triggered and android launcher will launch Success Activity and user will see

activity_success.xml. It is basically the dashboard where user can see different fields and data about his water tanks, motors, electricity bill and scheduled motor time, it also provides motor time setting and resetting options.

This interface is composed of several text fields. Many text fields are showing parameters and others values. These values will change dynamically when it fetches data from the cloud to stay user up to date. This interface also has buttons for setting time, resetting time and logout and one edit text field. When user click over the edit field a little intuitive pop-up will open up where user can schedule the motor time.

### 3.2.1.4 Java Classes

In Android development when you want to implement certain kind of activity or thread then you need to make new class for that particular activity. I have created several classes for API calling to run these processes in background to avoid giving poor user experience.

Other than activity classes, I have made four more Java classes to carried out other functions.

- **FETCH DATA:** for fetching data from remote cloud which extends the AsynTask class of android for working in background to avoid your application from crash. AsyncTask class in android studio environment is usually use for API calling and data fetching whenever user start the success activity this class started fetching data. User don't have to refresh the app or anything like that. This class will automatically fetch data every time new value updated on the fields of thing speak cloud.

- **SHARED PREFERENCES CONFIG:** in this class we have just used Shared Preferences interface for storing user password and login id. Whenever user input user id and login password this class will check authenticity of the password and then allow user to navigate to the other activity.

- **timeData:** for uploading user time input to the cloud. This Java class also extends android AsyncTask to run the code in the background to avoid loading time and crashes in the android application. When user press the set motor time button available on success activity then the time created on edit field of motor time will be uploaded to the time field of thing speak cloud.

- **ResetTime**—for resetting the scheduled time on cloud. This class is also extending the AsyncTask class of android for calling API and resetting the time on the cloud. When the user click over the Reset button on success activity it will set the value of hour's field to 30 which will indicate that user requested to reset the schedule for motor.

### 3.2.1.5 API Calling for Data

We have used httpurlconnection for http API calling and fetching and uploading data to the cloud. it fetches little amount of data at one time and stores In the buffer to avoid load on memory. As we have used thing speak as a cloud service, thing speak provides API by using that API we can fetch our data in array of JSON object.

### 3.2.2 Cloud Connection (Thingspeak)

By using thingspeak APIs we have uploaded the data of lower tank, upper tank, electrictiy bill, and motor schedule to thingspeak. We have created 6 fields in the channel at thingspeak as follows

**Field 1**

It shows the data of Upper tank.

**Field 2**

It shows the data of Lower tank.

**Field 3**

It shows the data of Line Water

**Field 4**

It shows the data of Electricity Bill

**Field 5 & 6**

These two fields are used for motor schedule time, field 5 for hours and field 6 for minuts

**Data Uploading**

We have uses the cloud service of thingspeak as it is open source IoT application and API to store and retrieve data from things using HTTP protocol.It enables the creation of sensor logging applications.It also supports most of the MATLAB supportive functions.

Thus  to upload the level of tank data to our android application we have used this platform.

# CHAPTER#04

# PROJECT CHARACTERIZATION

## 4.1. Results

The result of our project is that it will automate the water system whenever water will come in line the relay will automatically turn on the motor and it starts filling the tank and after the lower tanks will be filled then the other motor will be automatically turn on to fill the upper tank and that will automatically turn off after the tank will be filled and it will calculate the electricity bill of both lower and upper motors, bill calculation would be calculated  from when the motors starts to the ends of the motors that will calculate the hours or minutes or seconds from start of motors to end of motors and then will give the electricity bill of both motors. We have android application as well where user or customer can check the current or recent status of the system like the level of both upper and lower tanks and the electricity bill of the motors as well and they can schedule the lower tank from the mobile application as well.

## 4.2. Analysis

We analyze that this is the major problem of every house without this system It would be very difficult for the people to fill their tanks because they had to wake up whole night for the sake of water to fill their tanks so that's very difficult job for anyone to check the water after every hours in the line whether it's coming or not so that's why we have made this home water automated system to make it easy for the people so whenever water will come in the line the system will automatically turn on motor so it will start filling the tank and when the lower tank will be filled then the other motor which is for upper tank will automatically be turned on and tank will start filling and it will stop before overflow. The water is a big problem in Karachi every single person is facing this problem and they really want to solve that issue so the automation of water system will really solve their that problem whenever water

will come in their line that will indicate the motor through controller which will turn on the motor and tank will be filling and that system will really solve the problem of citizen of Karachi there will be no more need of any person to wake up whole night for the sake of water so this automation system will overcome their problem.

## 4.3. Conclusion

We are making this system to solve the problem of citizen of Karachi because in Karachi there is lots of problem of water people of Karachi faces so many other problem as well but the problem of water is really big problem for them so that' why this automated home water system will help them to overcome their problem so whenever water will come it will automatically turn on the motor to fill the both tanks according to given condition and it will turn off the both tanks before overflow and user can also check the status of their home like how much water is in the tanks so they can check it in mobile application where they can check every time the status of their tanks from the mobile application and they can schedule the tanks as well. The biggest problem is water in Karachi so that's why we are solving that problem because being a citizen of Karachi we know the problem which people faces. It's not easy to wait for whole night to check the water whether it's coming in the line or not so it's really spoil the mood of any person and very toughest job to wake up whole night for the sake of water. The automated system will help them whenever water will come in the line the controller will automatically turn on the motor the lower motor which will fill the tank and according to given condition when he lower tank would be filled the controller will automatically turn on the upper tank which will fill the tank and both tank would stop before overflow so this system will really help any citizen of the city to fill their tanks without bothering anything even they can check the status of their tanks in the mobile application and they can check how much units

are being consumed by the both motors. So user can estimate the bill calculation of both motors as well. The system which we are using to implement is basically wireless so it would reduce the cost of the user as well and wire connection is also look messy as compare to wireless and now a days it's wireless time so everyone refer to wireless as compare to wired connection so our home water automation system is wireless connection because we are using zig bee which is wireless technology and better to use as well.

## 4.4. Future Recommendation

We are just only automating the home water system using IoT like whenever water will come in the line and if there is no water in the tank so there will be microcontroller which will turn on the lower motor which will fill the lower tank and after the lower tank will be filled with water the microcontroller will turn on upper tank which will fill the upper tank. So in future recommendation we can involve the water board in this project so according to them we can aware the peoples about the project so they can implement this project at their homes and they can get rid of water problem at their homes after implementing this project and they can calculate the electricity bill of their motors as well.

## 4.5.References

[1] https://components101.com/wireless/xbee-s2c-module-pinout-datasheethttps://mounishkokkula.wordpress.com/how-the-5v-relay-works/ (Relay picture)

[2]https://www.machinedesign.com/motion-control/engineering-essentials-relays-and-contactors (For contactor picture)

[3]http://www.electronicspro.com.pk/product/ds3231-real-time-clock-rtc-module-in-pakistan/ (RTC clock  picture)

[4]http://www.theorycircuit.com/water-flow-sensor-yf-s201-arduino-interface/ (Flow sensor)

[5]https://blog.seebo.com/iot-ultrasonic-sensors/ ( Ultrasonic sensor)

[6]https://www.jameco.com/jameco/workshop/circuitnotes/cn-arduino-uno.html (Arduino picture)

[7]http://owlcircuits.com/projects/under_development/personal_weather_station/personal-weather-station-XBee-intro.htm (Zigbee router end devices image)

[8]https://alselectro.wordpress.com/2017/01/23/zigbee-xbee-s2c-how-to-configure-as-coordinator-router-end-device/ (Pin outs of zigbee s2c)

[9]https://www.sparkfun.com/products/retired/8665 (Zigbee)

# APPENDIX A: Complex Engineering Problem

## Appendix A1: Range of Resources

Using different kind of resources and innovation in any kind of project makes is the important part. In this project we are using different resources such as internet, human resources and previous literature.

Human resources can be required to understand the problem of the system and make it in a better way.

Internet is used to understand the specification, connection and interface between sensor and other important information about sensors or system.

Literature review is one of the most important resource because reviewing the previous literature it helps us in our project because we think one step forward from their and makes it better project then the previous one.

## Appendix A2: Innovation

We are automating the home water system using IoT. There will be no need of any person to wake up whole night or spoil their night only for the sake of water

whenever water will come in the line or the tank would be unfilled so then there is microcontroller which will automatically turn on the motor which will fill the both lower and upper tanks according to given condition and turn off the motors before overflow.

There is android application as well where user can check the status of their home water system and even can check the electricity bill of both motors as well so we are bringing innovation in our system because we know the problem of home water in Karachi peoples use to wake up whole night to fill their tanks so that's why we are making this project or system and innovating as well.

**Appendix A3: Level of Interaction**

We have faced some problem while making or implementing this project like we were using IoT platform so for that it was very difficult to connect or interface ESP8266 Wi-Fi module with Arduino so for uploading data to cloud (Thing speak) we used Nodemuc microcontroller for uploading and other problem which we faced during interfacing was Zigbee technology which we were using if for wireless communication so it was toughest job for us to interface Zigbee with our sensor like ultrasonic sensor which we were using to check the level of tanks.

**Appendix A4: Consequences to Society and Environment**

We are making this project for the sake of those peoples who wakes up whole night for the sake of water to fill their tanks so this project is totally for the society to solve their water problem which they are facing in their society so we came to solve their home water problem as we know that water problem is one of the biggest problem in our society so we try to solve their problem whenever water will come in their line the microcontroller will automatically turn on their motors to fill their empty tank so

it's great step towards success in innovation in our society and that would definitely influence our society and peoples will enjoy this system after implementing it in their homes

**Appendix A5: Familiarity**

As we know that we have studied many courses in our university and the purpose of this Final Year Project (FYP) is that what we have really studied in that whole courses we are the student of Computer Systems Engineering which means we should know about both hardware and software so now we have to implement or apply both hardware and software in our project which would mean that we are implementing whatever we have studied in that whole courses in the four years so in our project we have both parts like one part is hardware where we are using Arduino and Nodemcu microcontroller and other usable sensors which are using in our project and other part is software in which we are using Arduino language or Android Application which is the parts of software. So basically we are implementing our whole knowledge which we have learned in all courses to make our FYP more valuable and feasible.

# APPENDIX B: TURNITIN REPORT

How to Interpret Originality Report (Guidelines).

1. Similarity index of the originality report is showing matches of submitted work with internet content. It is not verdict that document with high similarity index is plagiarized.

2. Similarity index is based on percentage of matched text out of total number of words in the document.

3. Instructor/Faculty member has to verify each and every similarity index for potential clue of plagiarism.

4. If similarities in the document are significant then scholar/student may be guided accordingly or case may be reported on the basis of that evidence.

5. The similarities in the document may contain matches with author's previous work; it may be ignored if it is the same work.

6. Bibliography and quoted material may be excluded after verifying. It is important to note that too much quoted material is not desired as per policy.

7. Common phrases and proper nouns also appear as similarities in the report, therefore every instructor/faculty member should ignore matches returned from them.

8. Originality report will show similarities from three major sources: internet, periodicals and student repository. Similarities returned from student

repository may be ignored if it is authors own same work. Similarities from Student repository helps in detecting collusion in the documents.

9.    The graphs, tables, formulae and other pictorial material is not matched through the service therefore, it will only offer similarities with only text.

10.    The instructor/faculty member supervising students/scholars can give verdict of plagiarism after interpreting report. The report will be used as evidence of the report.