**T.Y. B. Tech. MINI PROJECT REPORT**

**On**

# Wi-Fi Signal Strength Detector


Submitted by,

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# CERTIFICATE

This is to certify that the T.Y. B. Tech. Mini Project-II entitled

# INTERACTIVE AUGMENTED REALITY POSTER

Work has been carried out
successfully by

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during the Academic Year 2019-2020 in partial fulfillment of their course of Mini Project-II for Third Year Electronics and Communication Engineering as per the syllabus prescribed by the MIT World Peace University, Pune

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# CHAPTER 1:

# INTRODUCTION AND OBJECTIVE

## 1.1 Objective:

To remotely sense the radio-waves generated by a Wi-Fi hotspot using Node-MCU, an ESP8266 based microcontroller, and suggest the best possible Wi-Fi network to the user, based on the signal strength observed. This can be used to remotely find out the position of the origin of the signal using trilateration or to just suggest the presence of a network.

## 1.2 Introduction:

In the present day scenario, a lot of our devices use the functionality of radio-waves to communicate with each other. In this project we use a wi-fi module to detect the presence of the same, remotely. The project provides the approximate signal strength (RSSI), singal name (SSID), and the status of the network (secure/insecure). Using this data, further processing it yields the trilaterated position of that particular network. However, there is a need to filter the data substantially. The data collected is sent to a cloud database ‘Firebase’ where it can be accessed by those who are authorised.

# Chapter 2:

## Related work and Present Scenario.

## 2.1 Present Scenario:

Wireless Technology is a largely used service in a variety of applications. Sometimes just as an access point for your home network, to deep space satellite communications. The spectrum of EM waves used by this is classified into radio-waves. To provide an overview on the topic, usually these radio waves are used to communicate information via devices. By setting up a listener, we can detect the presence of such waves, if not the information carried by it.

To provide a few examples for the usage, we have,

i) Wireless Home Networks
ii) Walkie-Talkies
iii) Satellite Communications
etc.

By using a listener, the information can be obtained about the strength of the signal at that particular point in space. Using multiple points, we can then predict the position of the source of the waves using trilateration. Thus in this project, we deal with remotely sensing the environment by means of a wifi module to collect the data related to the strength of a particular signal, whose identity can sometimes be distinguished.

# CHAPTER 3:

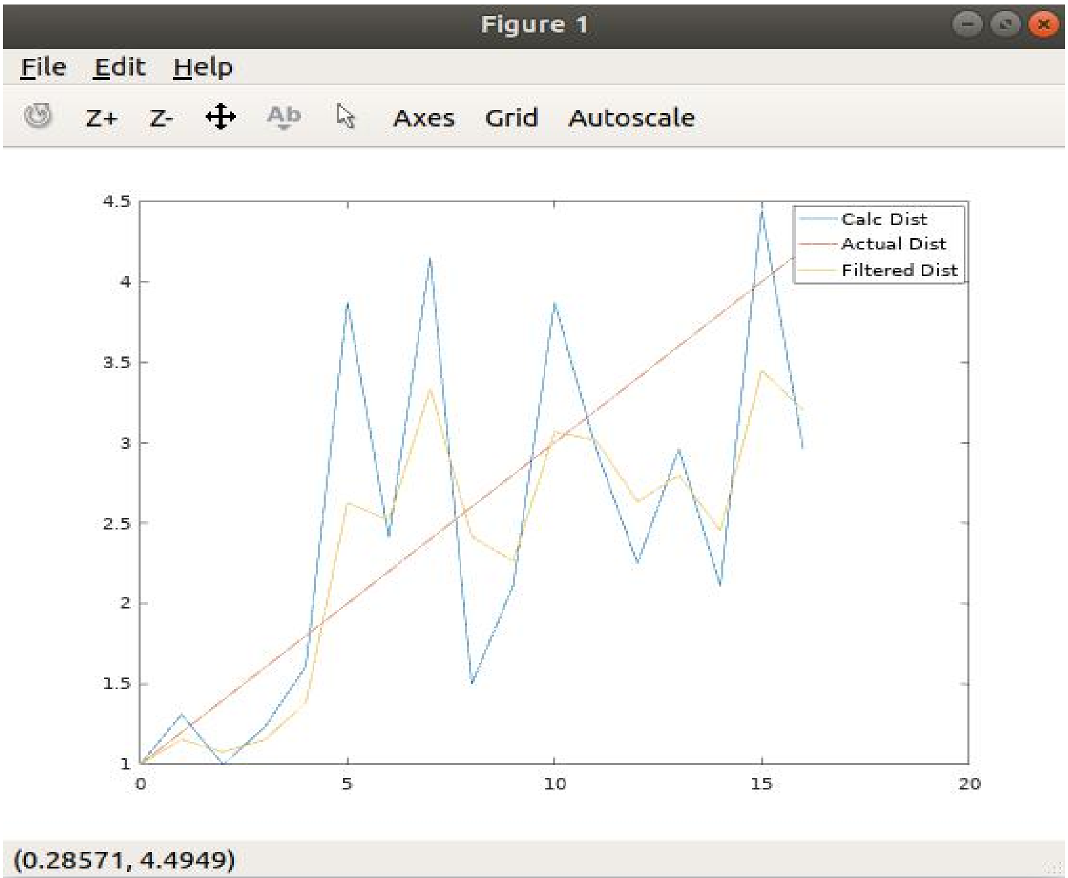
# System Schematic, Block Diagrams, Flowcharts and Complexities Involved

## 3.1 Softwares and Services

- Arduino IDE
- Firebase DB
- Visual Studio.

## 3.2 Complexities Involved:

The RSSI data as provided by the nodemcu microcontroller is highly unpredictable and keeps on fluctuating. To overcome this, an averaging filter along with a prediction filter, the kalman filter to some extent, smoothen out the values and thus, predict more accurately. However, the filter does not account heavily for reflection of the waves based on the surroundings, but provides the best estimation for the same .



On the Arduino Side We also Face Issues of sending Multiple Data through Serial Communication.To Tackle with this issue we have implemented 2 possible approaches : approach 1) By Converting Data(Whole) into String 2) By Converting Data in Json format (Best Approach).

## 3.3 System Schematic:

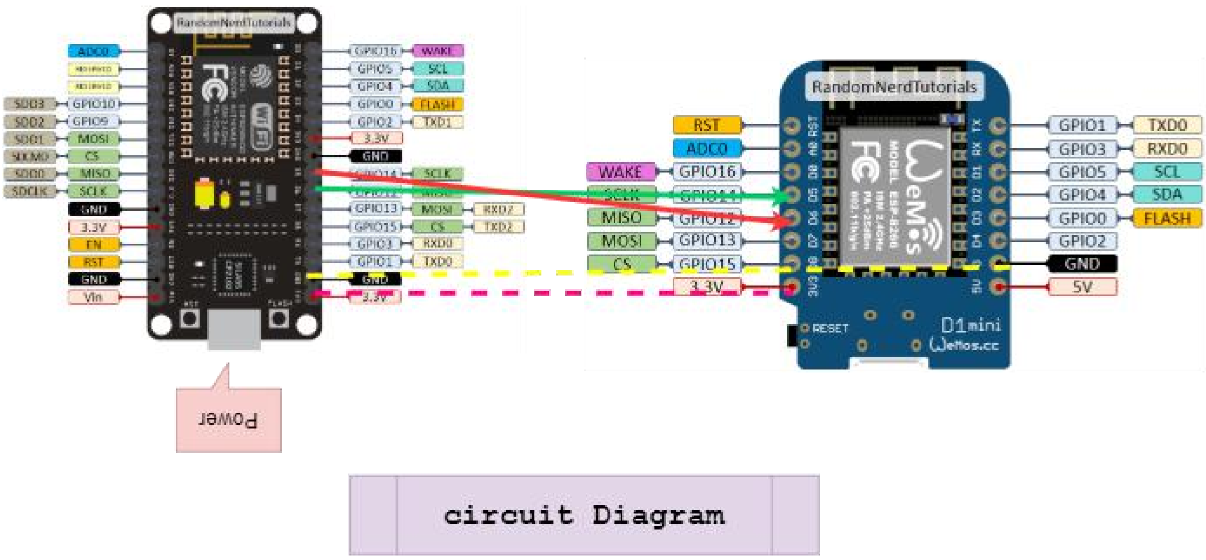



**Fig 3.3.1 Schematic of the system**

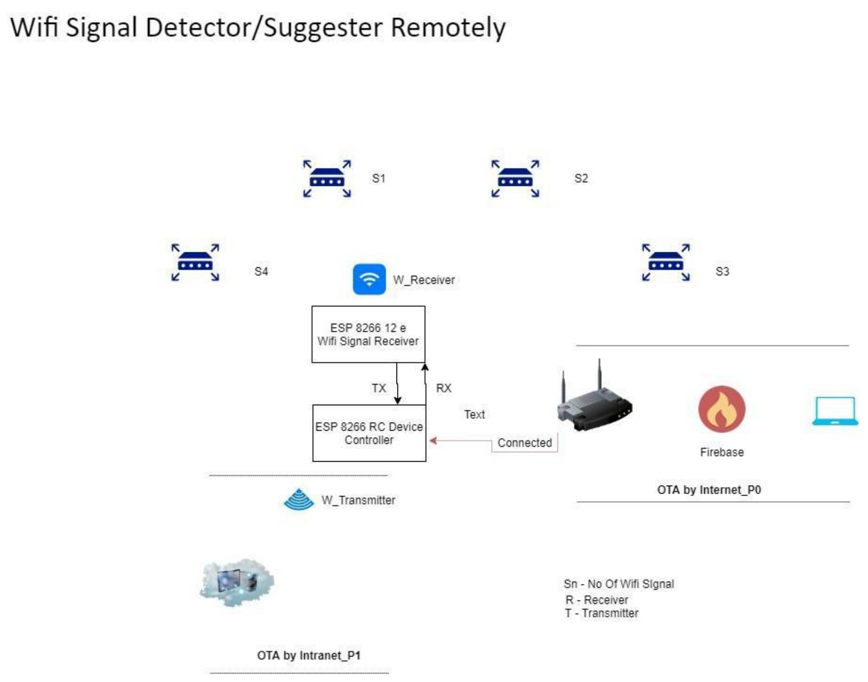



**Fig 3.3.2 Basic Application Diagram**

# 3.4 Flowchart:

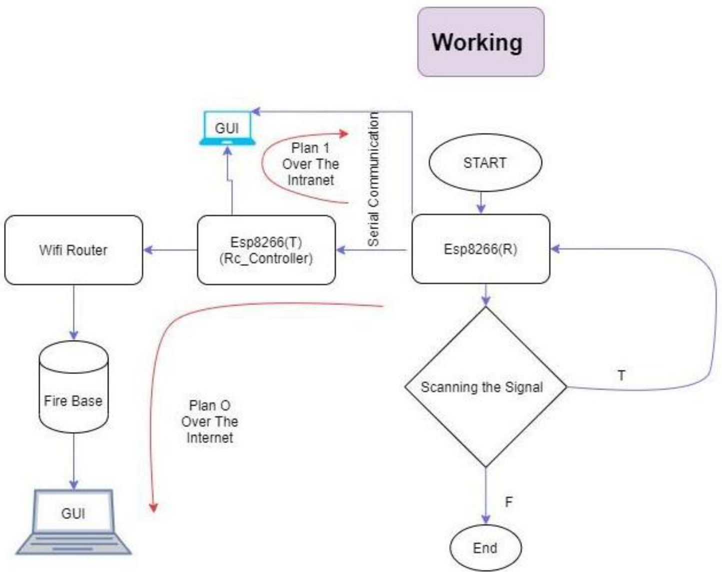



**Fig 3.4.1 Flowchart**

# CHAPTER 4:

# System Design and Methodology and Implementation

## 4.1 System Design and Methodology:

## System Design:

**Hardware :**

- 5 Signal Sources
- 2x ESP8266 - nodemcu (1x receiver, 1x transmitter)

All signals provide -77dBm at 5 meters and -70dBm at 4 meters

ESP transmits data to firebase OTA

**Software :**

- Scanning Signal (Searching all AP(Access Point)) in Json format

- Sending details of all Access Points to firebase Db

- Data retrieval by calling db api on Html by means of js, and combining it with chart.js for aesthetically pleasing formations.

## Factors:

RSSI stands for Received Signal Strength Indicator. It is an estimated measure of power level that a RF client device is receiving from an access point or router. At larger distances, the signal gets weaker and the wireless data rates get slower, leading to a lower overall data throughput.

Signal is measured by the receive signal strength indicator (RSSI), which in most cases indicates how well a particular radio can hear the remote connected client radios.

BSSID is the MAC address of the wireless access point (WAP) generated by combining the 24 bit Organization Unique Identifier (the manufacturer's identity) and the manufacturer's assigned 24-bit identifier for the radio chipset in the WAP.

This ID is used to identify the network present in the area along with its signal strength at various points.

For our application, Firebase cloud database by Google was chosen to store the data received from the microcontrollers. It has numerous applications.

The data received can be further processed and sent to user’s device providing information about the network present

Hence, the nodemcu was chosen which has the required functionality.

## 4.2 Implementation:

### 4.2.1 Firebase

To start using Firebase, we just need to log in to the service and grab the authentication token associated with it. This token is then further used to link the database with the projects.

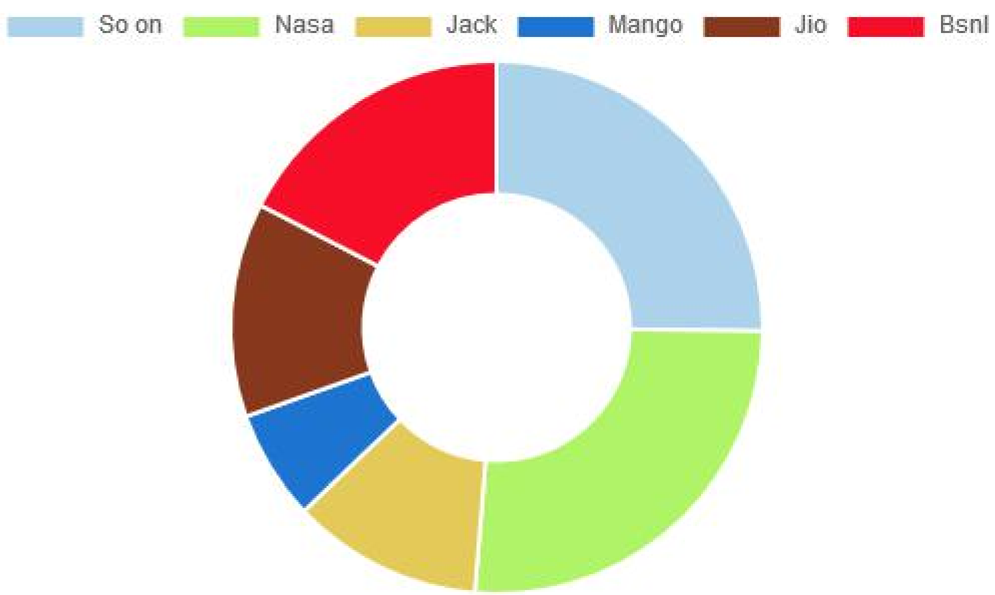



**Fig 4.2.1 Real-Time data obtained as per the test scenarios**

### 4.2.2 Setting up NodeMCU

Download the required library for the mcu from the Arduino IDE's library manager and include them in the sketch. Upload the code normally.

### 4.2.3 Circuit

The circuit was created as per the diagram in figure 3.3.1. Both the MCUs were powered up and the data received was sent to the cloud DB.

### 4.2.4 Data Filtering

The data collected in the DB was then subject to a predictive kalman filter. Using these values, further implementation can be performed.

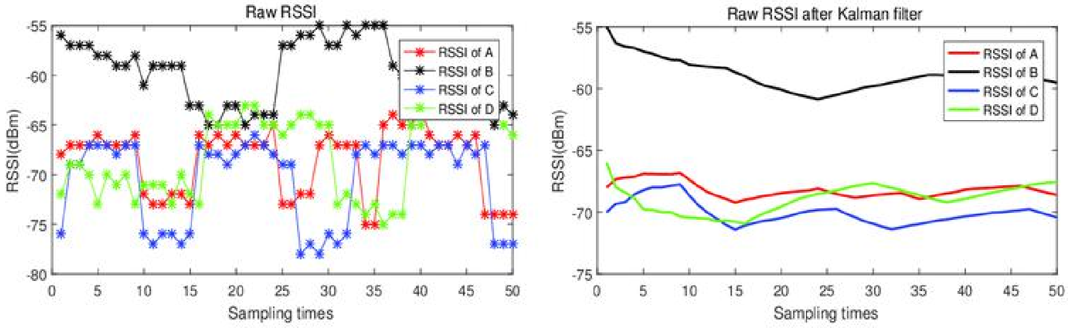



**Fig 4.2.2 Kalman Filter**

## 4.3 Pros and Cons

**Pros :**

- Remote sensing possible
- Data available over all devices with internet access
- Cheap to make
- Reduced Complexity
- Crude results can be obtained

**Cons :**

- Too much variance in unfiltered outputs
- Separate methods need to be implemented in order to read useful data

## 5.1 Result

Data was obtained by the MCUs and was updated real-time in the database. This data was further grabbed to display on a GUI making it more aesthetically pleasing.

## 5.2 Conclusion

Thus, by this project, we can successfully find out the signal strength of the source at a location, and by repeating the process, the position of the source by trilateration.

## 5.3 References

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