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# IoT Based Antenna Positioning System

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**Abstract:- An IOT-based antenna's position system aimed at optimizing connectivity. Through IoT-enabled actuators, the system enables remote adjustment of antenna orientation, managed by a central control unit. Real-time monitoring ensures accurate alignment for optimal signal reception, enhancing communication reliability. Key advantages include remote accessibility, allowing users to control antennas from anywhere with internet connectivity, and scalability, facilitating seamless integration into existing infrastructure. By leveraging IoT technology, the system empowers users with enhanced control over wireless communication networks, offering efficient and reliable antenna positioning solutions across diverse applications.**

## I. INTRODUCTION

➢ *Introduction to Embedded System*

Different types of embedded systems can be seen when we look around. Each and every device such as mobile phones, washing machines, digital cameras etc., has a CPU inside it. The software that is connected to each of these CPUs is called embedded software. It acts as the heart of an embedded system while its processor functions as the brain. Embedded software is what makes them work; this is why they work and how they work are influenced by this single thing which is also known as main. Programs were mostly created using assemblers and burnt into EPROMs during the earlier days of microprocessor based devices but there was no way of tracking what the program does. LEDs, switches, beam lights etc., were used to know whether program was running okay or not because one could not tell what it's actually doing. A few people have been very fortunate indeed!.

➢ *Objectives*

- Adjusting the position of the antenna by using a simple software Program.
- Positioning of the antenna to exact angle to get the maximum signal of a particular frequency from antenna.
- To maintain the positioning of an antenna device which can be controlled by far away from the antenna.

➢ *Introduction of the IOT*

Networking scheme of an IoT is composed of the physical objects which are embedded with electronics that enable them to communicate and interact with their surroundings through detecting it. In the next few years, technology based on IoT will deliver almost all higher-level services hence transforming how people live each day. There are only several fields in which Internet of Things (IoT) applications have gained much ground and these are healthcare, energy, agriculture, smart cities, defense systems among others. The Internet of Things (IoT) refers to a network made up of computing devices which were fixed into ordinary things thereby enabling them send or receive data from any other point.

➢ *Sensor:*

Sensor is the main component in all IoT applications; it's a physical device that measures certain physical quantities and converts them into signals so that they can be fed into processing units for further analysis or control purposes.

➢ *Parabolic Antenna*

A focused antenna, which will make use of an parabolic reflector, which is a curved panel with a parabolic cross- section, which will use for directing the radio waves that is named as a parabolic antenna.

The most used thing about this type, which is bird-like, is a dish shape, also known as parabolic dish antenna. The parabolic antennas, at the SHF (microwave) and UHF frequencies where much smaller reflectors can be employed due to fact that the wavelengths will be in small. Among all the types of the antennas, the parabolic ones have been found to be produce the highest gains, thus, requires a reasonable beamwidth to enable the smallest beamwidth.

This is because of principle of projection of parabola's focus is relatively the greater of wavelength of the radio waves to narrow down of beamwidth. High-gain antennas based on parabolectron mirrors.

## II. LITERATURE SURVEY

- **An automatic 3D Positioning Control using Microcontroller** Being Designed as a By product of A. Amritha Mary. By S.1, Divyasree MV2, Jesna Prem2, Kavyasree SM2, Keerthana Vasu was pointed out that the main application of dish usage is to get transmission from a satellite or another broadcasting source. exact brand-name angle is of the dish to provide a maximum signal level of a particular frequency. In order to receive that it should be adjusted manually. So, as a solution to manual arrangement of the dish in a difficult way, this designed system allows an android based device, through which, we are able to adjust the location of the dish.

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- " **AUTOMATIC ANTENNA POSITIONING SYSTEM"** by Surya deo Choudhary, Pankaj Rai, Arvind Kumar, Irshad Alam [3], an automatic Antenna Positioning system has been designed which is the main focus is the detection of signal source. The signal may be anything continuous and of any nature. And the antenna will only maintain the link as long as the signal link is connected; will remain static in the link with the signal.
- The "**Remote Alignment of Dish Positioning by an Android Application**" by Prajwal Basnet, Pranjal Grover, Preeti Pannu. The project creates the plate position system which can be managed by using an Android application. The key use of a dish is to get the signal from satellites and other broadcasting sources. In order to point the dish to exact angle to receive maximum signal from satellites and also from other sources that broadcast at a particular frequency it needs to be adjusted manually.
- '**Automated Antenna Positioning system for Wireless Networks'** by Amit Dvir, Yehuda BenShimol, Yoav Ben-Yehezkel, and Michael Segal. This documents focuses on the communication channels at both base stations and several types of sites. Therefore, a minimal set of fixed station relay antenna sites were placed on the desired terrain. To decrease the number of relay antenna sites is regarded difficult since such sites has high costs of installation and maintenance. Although the elimination of a single antenna site for sure brings some cost saving opportunities, still a labor-intensive manual approach is used because of the complexity of the computational problem.
- **'Dish Positioning Using IR Remote'** By Prof. S. A Maske, Mr. Shelake Aniket V, Mr. Shinde Anup S, Mr. Mugade Nitin K. This paper introduces an automated dish positioning system that can be operated using an IR remote'. The reason for using a dish is that they let in wave to signals from satellites and other sources of broadcasting. To conclude, we shall get the right angle.

In the aspect of channel width, it is required to manually adjust the dish for optimal signal. The major difficulty of adjusting it manually is solved by the paper by the remote control of the dish angle through the mobile telnet control.

Background Paper for the Mobile Devices" by Denis Huber (School of Electrical and Computer Engineering, Technical University of Berlin). This essay was about where to put mobile devices. Today amazing smartphones utilize these 3 angle-finding techniques to obtain their positioning. Satellite Positioning, WIFI Positioning and Cellular Positioning by Pankaj Rai, Arvind Kumar, Irshad Alam and Surya deo Choudhary is utilized in making the automatic Antenna Positioning system. The primary function of the system is to detect the signal source. The antenna could have any sort of signal and any time, it will recognize the signal automatically and will lock as long asthe link is maintained.

## III. TOOLS DESCRIPTION

➢ *Arduino UNO R3(ATMEGA328P)*

Arduino UNO R3 which is a Type of microcontroller which is a ATMEGA328P. which will provide with everything that should support the microcontroller we need to do here is use an USB cable and connect it to the computer and by using the AC-DC adapter provide the power or use a battery which make it work. A "Italian" language converts "Uno" to "one." This has to be chosen to commemorate a debut of an Arduino IDE software. The new version of Arduino Uno is called as R3 which is also called as third version. The versions of the Arduino uno and IDE software were being updated in now a days . The Uno-board was the first in the USB-Arduino boards, and it will serves as a platform's standard design.

Fig 1 Arduino UNO R3(ATMEGA328P)

➢ *MCU Node ESP8266 Wi fi Module*

It is an microcontroller which is integrated with the 32-pin IC and an WiFi module which is known as Node MCU. The microcontroller will serves as a system's central interface. Its is in charge of making those system work. The latest Wireless NODE MCU is in order to meet demands of the future, The IoT Board was well developed based on the integrated chip. This Module will holds the capacity to offload all Wi-Fi network operations to another application processor or to host an application. SPI and UART

Fig 2 MCU Node ESP8266 Wi fi Module

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➢ *ESP8266 Wi fi Module*

In SOC(system on a chip) a microprocessor will be used or also denoted as the ESP8266 Wi-Fi module, these were commonly used for the development of a end-point IoT applications. It's a transmitter and this is the cost effective appliance. It serves as the vessel for transmission of internet to a broad spectrum of embedded appiled. Whereas the ESP8266 module by System-Express Company is purpose-built to have both TCP/IP functionality as well as microcontroller access to all the WiFi networks under presence. It gives the necessary support features satisfying the market for cost, power, performance and design to name few of them. It can also play the role of a slave or a stand-alone program. Bluetooth model ESP8266 is a WiFi adapter to any microcontroller type if it does not act as a master WiFi device.

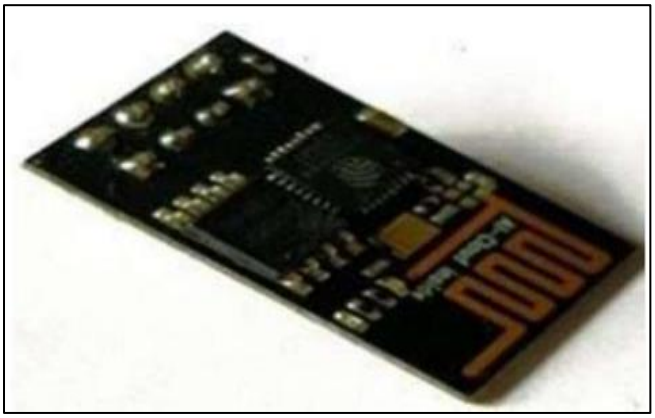

Fig 3 ESP8266 Wi fi Module

➢ *Servo Motor (MG996R)*

A servo motor is a type of motor which is most commonly used in IoT-based antenna positioning systems. It will allows precise control of the antenna's direction and angle ofthe antenna, enabling it to track signals or adjust its position of antenna according to the given input commands from IoT devices or by the sensors. This will ensures the optimal reception or transmission of the signals, enhancing the efficiency and performance of a antenna system in various applications such as weather monitoring, communication networks. or remote sensing.

Fig 4 Servo Motor (MG996R)

➢ *Liquid Crystal Display (LCD)*

The Polarized LCD displays adopt the two layers of a polarization by using the liquid solution which will be connecting them. The LCD displays are the type of a display which will be used in digital watches and in many portable computers. The crystal in LCD will align as much as an electric current will be supplied to the diffusion by blocking the light from passing through. Back then, LCD has been around in existence for the number of years, more than ten is used in laptop computers, we have seen the tremendous change in the technology. These benefits involve more efficient products such as brighter replacements, higher resolutions, fast answer times, and more accessible procedures which are all results of technology.

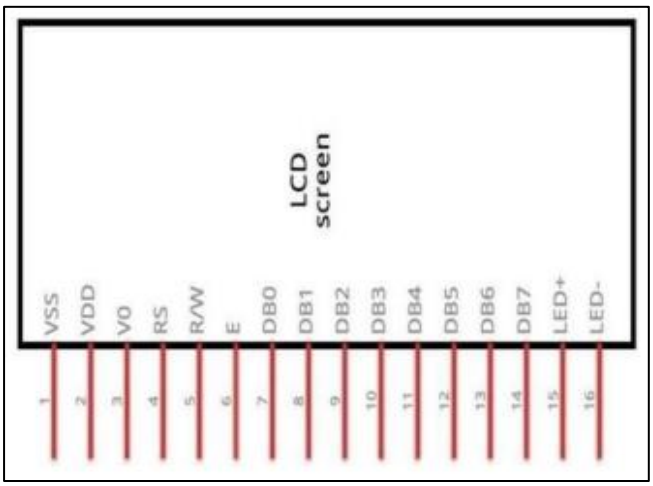


Fig 5 Liquid Crystal Display (LCD)

➢ *LM2596 Modulo Dc-Dc*

DC-DC Buck Converter is a Buck Converter Type of the Converters Subfamily, LM2596 Power Supply is a step-down(buck) switching regulator, which can be loaded up to 3 Ampere with an amazing linear and load regulation. That will be the type of devices we will have with pre-selected fixed output voltages.of 3.3 V, 5 V, 12 V, and adjustable output.

Fig 6 LM2596 Modulo Dc-Dc

The LM2596 series will utilize the switching frequency of 150kHz, hence which leads to a design of the filter components by using a smaller sizes than what would be experienced with the low frequency switching regulators.

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➢ *7805 IC Voltage Regulator*

A 7805 voltage regulator is a regulation device which was integrated in one. It will provide constant output voltage though the input and the load will undergo changes. To be in more precise, the 7805 is positive voltage regulator which will ensures stable of theoutflow of the +5V needed for powering various electronic stuff, including broad-range circuits. The 7805-voltage regulator is ideal and most commonly it used to give out a standard+5V (+5V) output. To impart the transformer for fulfilling its function we must necessitate the given input voltage to be a higher than the required output voltage with small overhead voltage for regulator circuit to operate properly. Usually the input voltage can go from 7V to 35V, and it will makes the tolerance of the 7805 to input voltage wide in the scope while its output voltage is held constant as +5V

Fig 7 7805 IC Voltage Regulator

➢ *IOT Control (Mobile Telnet App)*

The IoT-controlled mobile Telnet application will be revolutionizes remote management of the IoT devices, and empowering the users to control their devices which were connected by their smartphones. With sleek and the intuitive interface, users can be effortlessly and easily send the commands, and can easily adjust the settings, and receive real-time updates regardless of their location, leveraging the power of a Telnet protocol. This app will eliminates the constraints of a physical proximity, enabling a seamless management of the IoT infrastructure from anywhere with the internet connectivity. Advanced security measures the ensure encrypted communication, safe guarding sensitive data and bolstering the user trust. From monitoring the environmental conditions to the controlling industrial processes, the mobile Telnet app will offers a unparalleled flexibility and convenience in the managing diverse IoT applications. It optimizes efficiency, enhances the productivity, and simplifies the troubleshooting, making it an indispensable tool for IoT enthusiasts and professionals alike.

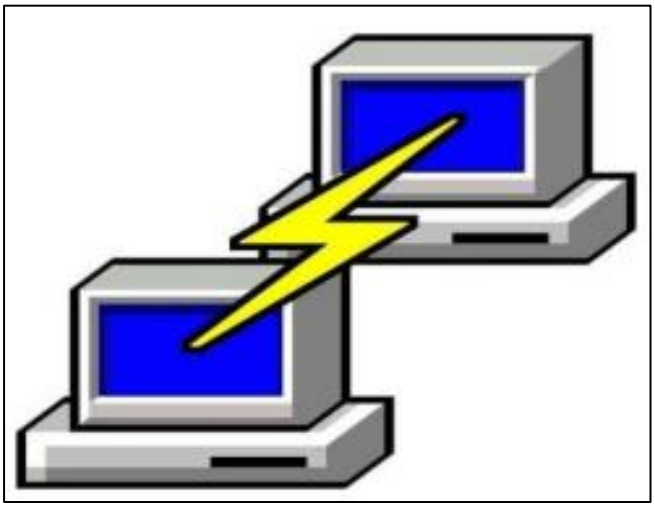

Fig 8 IOT Control (Mobile Telnet App)

## IV. SOFTWARE DESCRIBTION

➢ *Embedded C*

By the function, we mean to a group of statements that can be run to do a certain activity; the programming language, will refers to the group of one or more functions. Each language was composed by using the various elements and grammar that become the basis for communication. The C language has many basic features such as character set, data types, keywords, variables, expressions, and the other constructs of programming.

➢ *Power Supply*

Regulated current will be going through a circuit of a potential control. Power supply of an AC input through only the mains supply which is of 230V which will be reduced by the transformers to 12V and it will be supplied to the rectifier. And the dc voltage value will be continuously changing in the sinusoidal rectifiers but they are pleasingly. Therefore, the rectifier's output is pure dc that got ac components even after the direct current rectification. Filters are used to remove those. Now, the move to the voltage regulator with this voltage to get homogeneity.

The input of the circuit will be applied from the regulator.

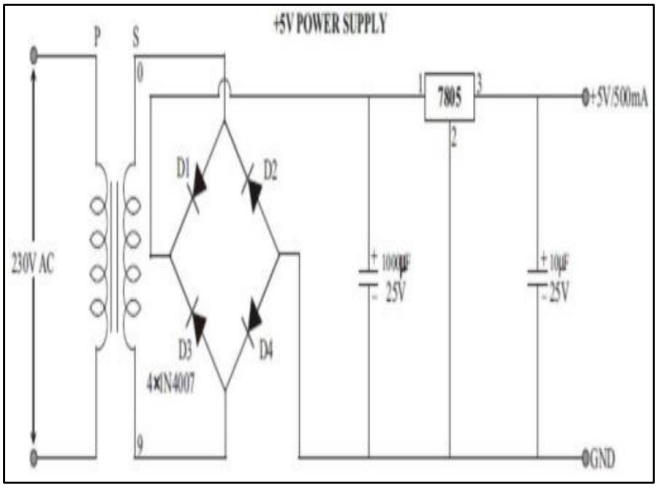


Fig 9 Power Supply

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➢ *WiFi*

Radio waves can be used to set up a wireless network which is just like cell phones and televisions that are across a wireless network, one believes that the communicating two-way radio is just like the setup two-way radio transmits wired.

A small gizmo that serves as the hub, or a wireless transmitter receives your home broadband connection and this gizmo broadcasts an encrypted signal for your smart-devices to connect. hence, the information will then be carried by the radio waves, and is used to create the local area not only for the device to receive the wireless signal but also for the cells to migrate towards the circulation of its blood and lymphatic systems. This is how WLAN (Wi-Fi, if spelled in short) came to be known. The transmitted radio signals do not travel far although they can cover the length of a street typical smart homes houses side by one else one wireless network is ordinarily connected to the internet using one hub even the furthest room of premises.

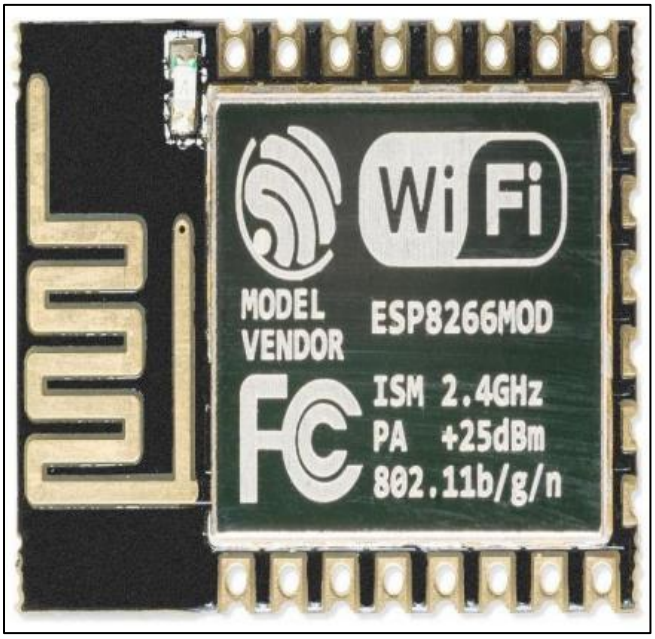


Fig 10 WiFi

## V. IOT (INTERNET OF THINGS)

In the year 1999, the RFID (radio frequency identification) community was formed, it was a concept of Internet of Things (IoT) which is recently being considered more significant growth of mobile devices extracted from the cloud technology in which IoT is being used in a real world., communication etc. imagine billions of people using information sharing which will make it very easy to access various information where all are connected to internet protocol (IP) these networks are mostly interconnected to each other to share the information with everyone. This is a world of IOT(internet of things) its defined as network of physical objects the internet has evolved in various ways connecting various devices of various shapes and sizes vehicles smartphones instruments industrial systems, all.

This is the IOT (internet of things) world it is constitute the network of a physical devices forms the part of internet and evolved fast fastely. These are different types of devices with the various type of sizes such as vehicles, smartphones, instruments, industrial systems and among others which were interconnected hence they can communicate send this through communication very easily or share the information in a structured way and also using the navigation protocols to reorganise and properly position themselves. Information processing, exactly leads to telecommunication capability, as well as monitoring ability even in real-time. We define IOT as below:We define IOT as below:

Internet of things People to people connected machines to machines through internet and it's very complex and siloed all torther the web. Smart vision is abridge and an ideology that is aware of surrounding objects, availability of their variety and the ways that to be connected by wired or just wireless.communication and sharing information based on the stipulated bases and the protocols in order to achieve the smart reorganizations, positioning, Tracing, safe & control & even personal real time online monitoring. We define IOT(Internet Of Things as below: Internet of things People to people to machines things to machines interacting through internet. Things vision is the concept and a paradigm which will consider pervasive environment of all variety of things and the objects which are though wireless and wired connections.

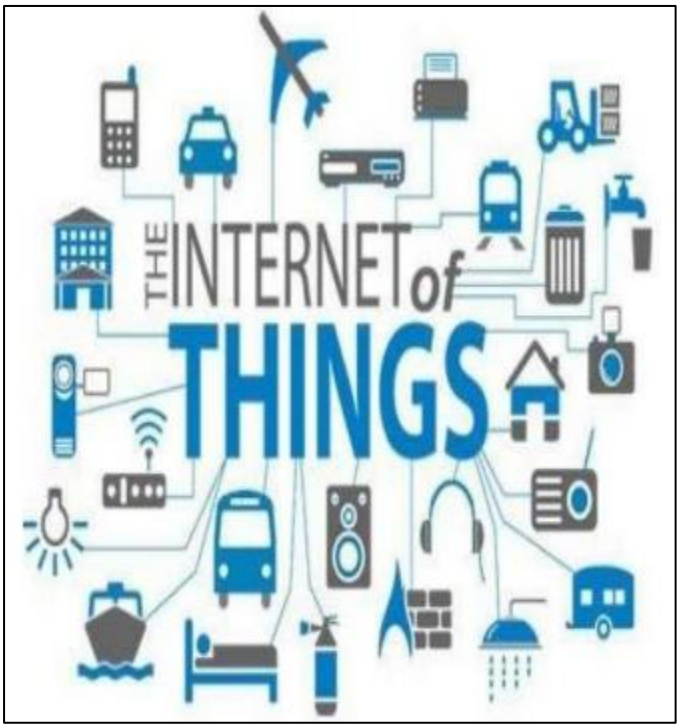


Fig 11 Internet of Things People to People Connected Machines

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## VI. PROPOSED SYSTEM

### A. Introduction to the Proposed System

Due to notable potential for the non anticipated, mishaps which will occur during the positioning of the antenna by manually , there will be an important thing needed for the devices which are automatic which will be performing the same type of the function very easily and very safely. A normal type of the automatic device which is based on the android application including the rotation of the servo motor which is connected to a microcontroller which is used for controlling , an antenna position system can be helpful in making of the position of antenna correctly.

### B. Working

Power supply will be given to device setup of IOT based antenna position. In this major microcontroller component used in this system is called as ARDUINO UNO third version which is programmed in C Language by using the embedded C Language which acts as the input required for the servo motor to rotate the motor in the desired angle as required.

Here, the LCD was connected to A4 and A5 PINS and SCL, SDA, pins to the micro controller (Arduino UNO R3) in circuit., Humidity Sensor DTH11 will be connected to the A2 PIN

Servo Motor which was connected to the 3.3V PIN AND Reset PIN and WIFI MODULE ESP8266 was connected to the PINS TX and RX of micro controller ( Arduino UNO R3 controller).

Antenna will be mounted on the Servo Motor respectively to rotate the antenna as per received input.

Here the Servo motor will turns in the direction of the clockwise and anticlockwise as per the received commands from the user.

User command is., the input which was given by user by using the mobile telnet application.

The IoT and the main microcontroller (Arduino UNO R3 ) will be interlinked by ESP8266 (WIFI Module) which will acts as a communication platform between Iot control and microcontroller. Hence after getting the inputs from the user by using the mobile telnet application which is IOT control application for which the microcontroller will be activated and the process will be done and will give result in change of the position of the antenna by using the direction of the servo motor. So, by the usage of the given inputs form user so that the antenna angle will be positioned.

For circumvent the cause of environmental and also to get amplify of reliability of the network, this system will be included with various types of sensors like raindrop sensors, temperature sensor, humidity sensor.

### C. Methodology

- The system is composed of two types of components:
- Antenna and motor controlling circuit.
- The user commands are given using mobile telnet application.
- The circuit used in this project includes sensors, servo motor and wifi module were connected to the micro controller (Arduino UNO third version).
- Then the servo motor will be arranged by using an micro controller (Arduino UNO third version) .
- Then the servo motor will will the direction to the desired angle when the controller receives any input from the user by using mobile application that is mobile telnet application and WIFI module.
- The user will receive the current position antenna's and the angle of the antenna will be positioned according to the required or given commands from the user.

## VII. RESULT AND DISCUSSION

Movement of the Antenna will be controlled by using the user commands which were sent via the mobile telnet application. Then the signal will be transmitted through the online by using wi-fi module to the micro controller (Arduino UNO R3 controller) by using the mobile telnet application. Then the antenna will be pointing in the directions in response to the directives from the given application. servo motor will be used to change the direction in the particular direction. This will lead the position of antenna to the antenna being placed in the required position. The antenna will be positioned by using an exact measurement of the rotational velocity of the antenna to get the point its angular location and will give to user the strongest signal which can be possible.

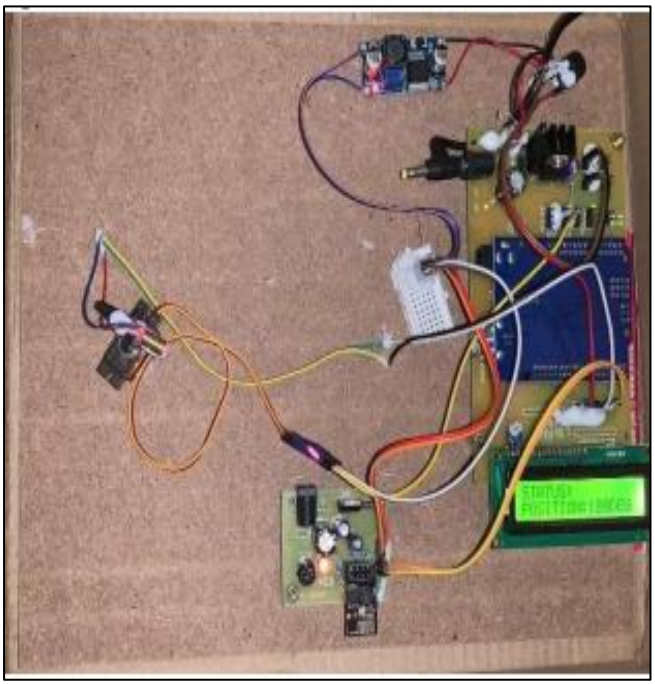

Fig 12 Here Antenna is Replaced by LED Light

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## VIII. CONCLUSION

➢ *Conclusion*

The given input signal will be taken by using the Mobile Telnet application and it will be used by this Network Based on the Antenna Position system antennap lacing system.looking into the antenna, instead of touching it manually. We can program the walking direction of the motor either forward or backwards based on the signal from the mobile app. The antenna position will be mostly dependant on the precision of the servo motor and it will be more efficiently rotated in the direction of either clockwise or anti-clockwise direction due to its gear mechanism. I will say this leads to an situation where the person can change the locations manually of the mobile antenna using the location-based system of IoT which will end the issues which have been caused before by misalignment which might happen when manually this position of the antenna is made. The main advantages of them is: the price is relative low, small size, and straightforward and simple operation. with the IoT integrated antenna being used. In the position tracking, the system can be applied in locations away from the site. This works specifically for the tracking of angles of the antenna.

➢ *Future Enhancement*

The future modifications for the given Iot Bases Antenna positioning system design would be accommodate the implementation of surveying cameras to capture pictures of the tower antennaswhich are communicated to the management. For this purpose the project may suggest or not to detect any alterations in the set angles team getting a critical evaluation of the direness of correction made to the antenna orientation. The future development of IoT-based positioning system might introduce a placement system that maintains the preset settings and reports any changes of angle to the management group.At present only the system can be remotely operated to alternate the modes of operation, automatic position restoration of the antenna mode, for example, is detected by the system.

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