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RESEARCH ON IOT-BASED ANTENNA ALLIGNMENT SYSTEM FOR SMA ANTENNA

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Abstract - *The directional arrangement of antennas is an important to achieving the best possible outcomes in remote communication areas. Exact positioning of antennas plays an important role. Situating of antenna or tuning is a vital aspect for receiving standard signals from a satellite. If the position of antenna arranged physically then it becomes too troublesome to arrange the antennas at the ideal position. Remote communication system mostly depend on antennas for signal reception. Right positioning of antennas is crucial for successful remote communication for the satellites. Sometimes manual antenna changes are more troublesome in order to meet mischances. The system mainly focuses on servo motor, DC engine and Node MCU.*

***Key Words*: IoT-Technology, 90[0] SMA Antenna, automatic antenna placement.**

1.INTRODUCTION

IOT is one of the recent and advancing technologies in 21st century. It has a prominent effect on remote communication. But each IOT device needs an antenna for communication. It is the primary component of IOT device. The antenna is used to receive signal for the effective wireless communication proper positioning of antenna matters. There is high possibility of breaking the communication in today's advancing world If antenna positioned in wrong direction. Antennas play a vital role in maintaining strong signal quality, and even small misalignments result to signal degradation, resulting in poor connectivity. SMA (SubMiniature Form A) antennas are a type of antenna used in RF (radio frequency) applications due to their compact size, durability, and reliable performance. They pointed a strung connector that make sure a safe and steady connection, which is fundamental for continuing signal integrity. SMA antennas are broadly utilized in many remote communication systems.

The project focus to deliver a comprehensive and versatile solution for arrangement of antenna, meeting the increasing needs of remote communication, observation, and monitoring systems allowing users to arrange antenna positions from remote areas web connectivity.

2. LITERATURE REVIEW

Surya Deo Choudhary et al. The system is mainly focus on the detection of signal source. The system will detect the signal and antenna will adjust the position according to the signal. In this project infrared source is used.[1]

Prajwal Basnet et al. The project is designed to adjust the position of dish antenna with the help of an android application. The dish is used for the proper transmission and reception of signal. To properly position the antenna for a particular frequency it needs to be adjusted manually.[2]

M.IIakkiya, et al. In this paper author uses ATmega328 as a microcontroller. The system mainly focus on the source of signal to detect a strong signal automatic antenna positioning is necessary. Antenna changes its position automatically with the strength of signal . It works on the RSSI value the direction of the servo motor is directed according the value receive from receiver. The output of the system is displayed on the LCD display.[3]

Rahane Suraj Dildar et al., In these paper advanced antenna positioning system is developed based on the microcontroller. It consist of transmitter, receiver and delay circuit. The microcontroller analyses the data and gives output according to motor driver. Position of antenna is decided by servo motor.[4]

Pooja Revane, et al. The project is developed to prepare an IOT- Based system for communication. In these system along IOT, sensors and actuators have used. The controller is used to handle the operation of antenna. To change the direction of antenna according to detected signal author used the antenna.[5]

Godse Sharayu Devidas. et al. In this paper, Dish is used to receive signal from broadcasting sources and satellites. Rather than adjusting the antenna manually this antenna positioning system help to position the antenna with the help of android application. For this the system uses a PIC microcontroller and LCD screen.[6]

Amritha Mary A. S., Divyasree M V, Jesna Prem, Kavyasree S M, Keerthana Vasu, In this paper, the author prepared a system based on android application and Raspberry pi. The android application controls the movement of dish antenna

in all direction. Servo motor is used to move the dish according to the signal detected.[7]

Amit Dvir, Yehuda BenShimol, Yoav Ben-Yehezkel, Michael Segal. This article focus on the communication channel at both the base stations and several sites. To fix this minimal set of fixed-access relay antenna sites were placed on the desired terrain. To reduce the number of relay antenna site is considered difficult because such sites has high cost of installation and maintainance. Eliminating single antenna site leads to cost saving opportunities and still a manual approach is used due to computation complexity problem.[8]

Prof. S. A Maske, Mr. Shelake Aniket V, Mr.Shinde Anup S, Mr. Mugade Nitin K. In this paper, author introduces a microcontroller which was designed to develop an automated dish positioning system that can be operated using a remote control. The reason of using a dish to receive signal from satellite and other broadcasting sources. Dishes are adjusted manually to get the correct angle of position.[9]

The motivation for this project is stems from the increasing need for reliable and efficient communication networks in today's connected world. Antennas play a crucial role in maintaining strong signal quality, and even minor misalignments can lead to signal degradation, resulting in poor connectivity. Traditional antenna alignment methods are sometimes manual, time-consuming, and prone to errors. By leveraging IoT technology and real-time control through the Blynk App, this project aims to provide a precise, automated solution for antenna alignment, optimising signal strength and enhancing overall network performance.

3. PROBLEM STATEMENT

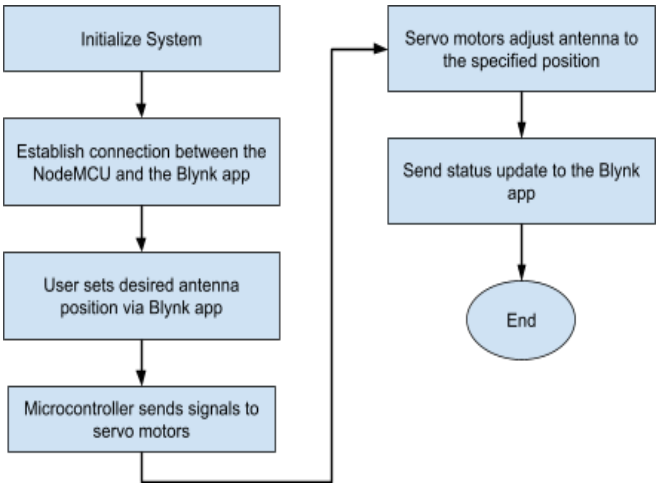
The problem statement for the IoT-based Antenna Positioning System project encapsulates a multifaceted challenge that has been long-standing in the field of wireless communication. In an era where reliable connectivity is a cornerstone of modern life, the efficient positioning of antennas has emerged as an indispensable requirement. However, conventional methods for adjusting antenna positions have proven to be cumbersome and impractical in several regards, necessitating a transformative solution. These conventional approaches often necessitate physical access to remote or hard-to-reach sites, entailing substantial logistical challenges, high costs, and significant delays. This approach, rooted in the limitations of manual intervention, inherently clashes with the dynamic and real-time demands of modern wireless communication systems. In this intricate landscape, the need for instantaneous adjustments to address signal fluctuations, interference, and network optimization further complicates antenna management. The inability to address these exigencies promptly can result in degraded network performance and unsatisfactory user experiences.

4.METHODOLOGY

Proposed System

The proposed system for an IoT-based antenna positioning system. We have used the SMPS Module as an input device connected to the Node MCU. Node MCU is used as microcontroller, which receives power from an SMPS (Switch Mode Power Supply). And in the output device we have used a DC motor, SMA Antenna, and a servo motor connected to the microcontroller. The microcontroller mainly used to controls two motors. For efficient radiation and direction SMA antenna is connected to system. And also, to show all the notification we have used the Blynk app. This system automates the antenna alignment process, reducing the risk of harm during manual positioning and improving the overall connectivity for IoT applications.

Flowchart



The flowchart provides a visual representation of the proposed system's operation. Here's breakdown of the steps involved.

1.Initialize System: The system is powered on and prepared for operation

2.Establish Connection: A connection is established between the Node MCU and the Blynk App.

3. User Sets Desired Antenna Position: The user utilizes the Blynk App to specify the desired antenna position.

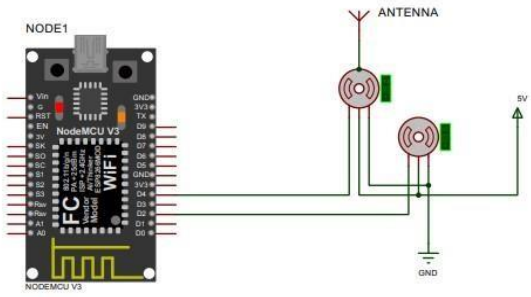
4.Microcontroller Sends Signal to Servo Motor: The microcontroller receives the users input and send signals to servo motor, instructing them to move the antenna to the specified position.

5.Servo Motors Adjust the Antenna to the Specified Position: The servo motor accurately adjust the antenna to the desired position.

6.Send Status Update to the Blynk App: The system send status update to the Blynk App, informing the user that antenna has positioned correctly.

7.End: The process concludes with the antenna in the antenna desired position and the system ready for further use.

Circuit Diagram



Working:

Using an Android-based Blynk application, users can remotely control the alignment of SMA antennas through a mobile interface. The system employs high-torque servo motors for precise movement along the X and Y axes, allowing for accurate antenna positioning. The microcontroller manages the servos' rotation based on user inputs, ensuring that the antennas are optimally aligned for enhanced signal reception. A stable SMPS power supply ensures consistent performance. This system reduces manual intervention and mitigates the risks associated with manual antenna placement, providing a safer and more reliable solution for the IOT applications.

5. SYSTEM REQUIREMENT

- Hardware Requirement
    1. Node MCU
    2. Servo MOTOR
    3. DC Motor
    4. SMPS Module
    5. SMPS Antenna
- Software Requirement
    1. Arduino IDE
    2. Proteus
    3. Blynk Application

6. EXPERIMENTAL SETUP & RESULT

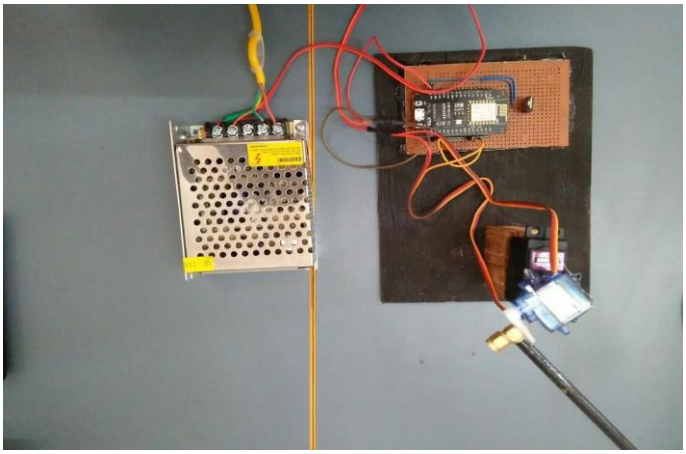


Fig shows the experimental setup of the proposed system

The project titled " IOT-BASED ANTENNA ALLIGNMENT SYSTEM FOR SMA ANTENNA" successfully implemented a precision alignment system using the Blynk App. By integrating servo motors on both the x-axis and y-axis, the system adeptly adjusted the antenna's orientation across various angles with precision and reliability. The Blynk App provided real- time feedback, displaying the current angle updates on the current angle positions of the antenna, facilitating seamless adjustments. This innovative approach significantly enhances connectivity by enabling precise antenna positioning, thereby optimizing both signal reception and transmission efficiency. The utilization of IoT-based control through a mobile application ensures remote operability, enhancing adaptability and user accessibility. This comprehensive system not only improves operational safety by automating the antenna alignment process but also demonstrates a robust solution for enhancing connectivity in IoT applications through efficient antenna management.

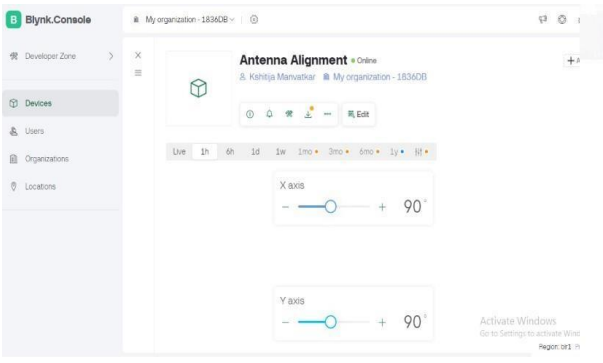


Fig : Shows 90 degree angle on both axes

The fig. shows the Blynk app interface for controlling an antenna alignment system. The user can adjust the antenna's position along the X and Y axes using sliders. The current angle of the antenna on both axes is displayed, allowing for precise control and real-time monitoring.

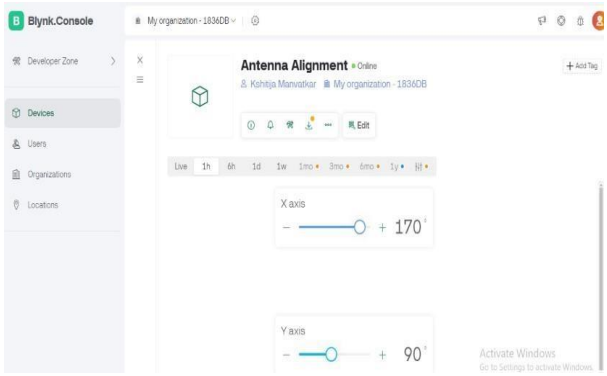


Fig : Shows +170 on X-axis & +90 on y-axis Degree Angle of antenna.

The fig. shows the Blynk app interface for controlling an antenna alignment system. The user has adjusted the antenna's position to +170 degrees on the X-axis and +90 degrees on the Y-axis. The sliders and numerical values on the screen indicate the current angle settings, allowing for precise control and real time monitoring.

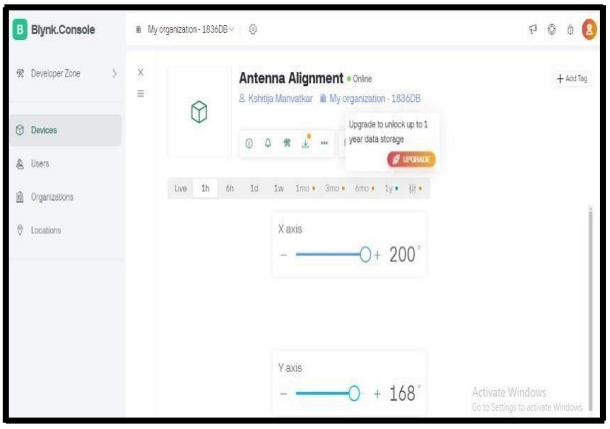


Fig : Shows +200 on X-axis & +168 on y-axis Degree Angle of antenna.

The image shows the Blynk app interface for controlling an antenna alignment system. The user has adjusted the antenna's position to +200 degrees on the X-axis and +168 degrees on the Y-axis. The sliders and numerical values on the screen indicate the current angle settings, allowing for precise control and real-time monitoring.

7. CONCLUSIONS

The " IOT-BASED ANTENNA ALLIGNMENT SYSTEM FOR SMA ANTENNA " system represents an important step towards ensuring safe, efficient, and automated antenna positioning. Based on the input signal receives from the Blynk app this IOT based antenna positioning system is utilised the position of the antenna without handling manually, eliminating the risks associated with manual adjustments. The position of antenna is mostly dependent on the accuracy of servo motor, which can rotate either in clockwise or anticlockwise direction. In conclusion, the IoT-based Antenna Positioning System offers a convenient and automated solution for precisely adjusting antenna positions based on input signals received from the Blynk app. Not only it is a cost-effective and compact solution, but it also boosts user-friendly remote accessibility, making it a versatile and efficient choice for antenna positioning needs.

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