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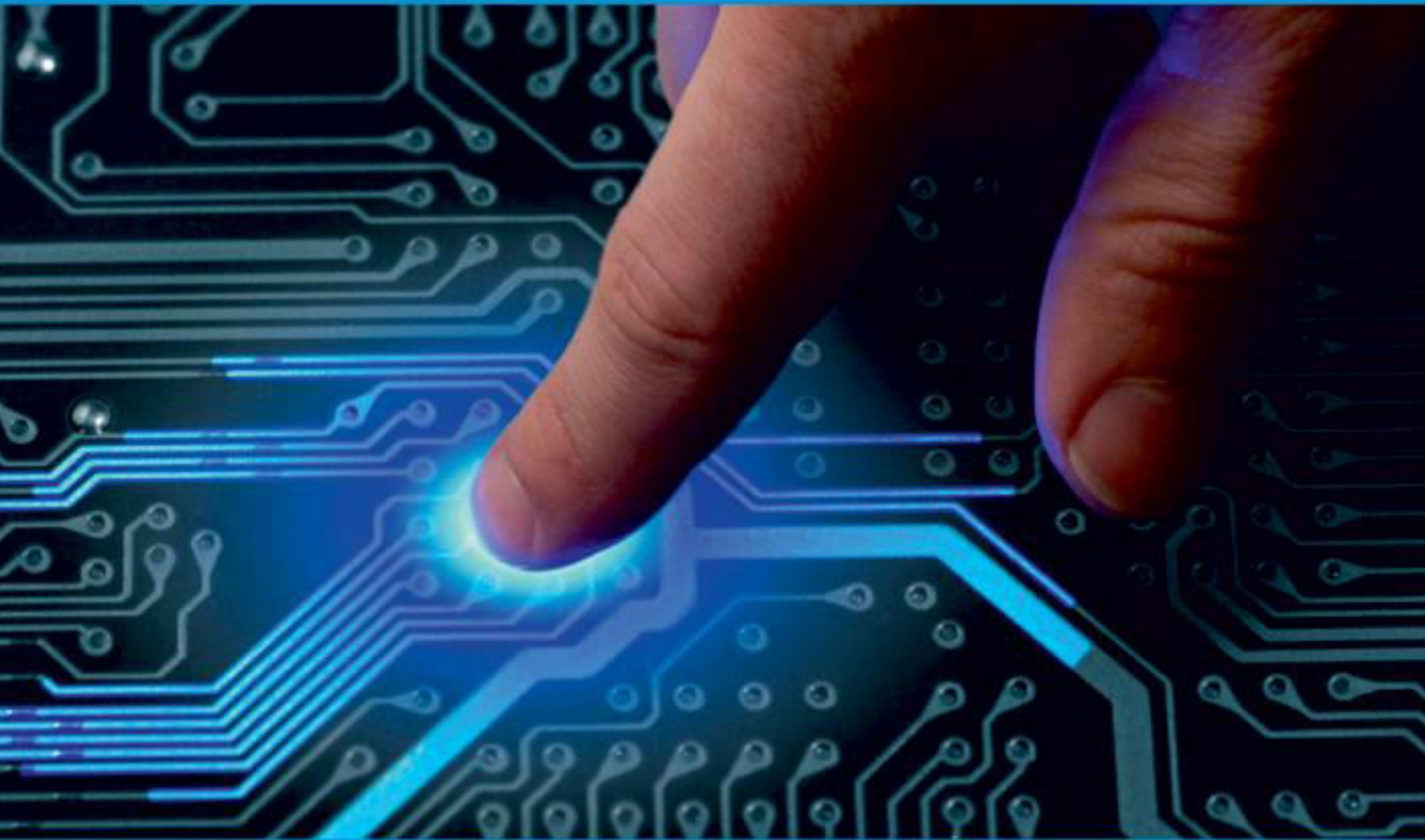

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IoT Based Antenna Positioning and Adjustment System

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ABSTRACT: In our increasingly connected world, the seamless exchange of data has become a fundamental requirement for communication, navigation, and the functioning of numerous industries. Antennas, the unsung conduits of these data flows, play an essential role in ensuring the reliability and efficiency of our wireless networks, satellite communications, and various other technologies. However, the optimal positioning of antennas has long been a critical challenge, requiring physical adjustments and often considerable human effort.

This paper introduces an innovative solution that bridges the gap between traditional antenna positioning systems and modern technology. By integrating Light Dependent Resistors (LDRs) and temperature sensors, this paper empowers users to remotely control and optimize antenna orientation, thus addressing the challenges of signal interference, signal quality, and adaptability to varying environmental conditions. The core objective of this paper is to create an automatic Antenna Positioning System that can dynamically adjust the antenna's orientation based on changes in ambient light and temperature. This system utilizes a combination of sensors, a microcontroller, and an actuator to streamline the antenna management process. Let's dive into the essential components, objectives, and potential applications of this innovative technology. This paper represents a significant step forward in antenna positioning technology, where the fusion of sensors, a microcontroller, and an actuator creates an intelligent and adaptable system capable of optimizing signal quality and reception in various environments. It offers a cost-effective solution to the challenges of antenna management and addresses the growing need for reliable and efficient data transmission across multiple industries.

I. INTRODUCTION

The "Antenna Positioning System Using DHT11 sensor" paper pioneers a versatile approach to optimizing antenna performance across diverse applications. By harnessing the DHT11 sensor's real-time data collection capabilities, this system empowers users to finely tune antenna positioning through the intuitive Blynk mobile application. Central to its design are sensors for ambient light detection, DHT11 sensors for environmental data, a microcontroller for processing, and an actuator for physical adjustments. Key objectives include user-controlled antenna adjustments, signal optimization, adaptability to environmental changes, and data logging for analysis. With applications ranging from satellite dish alignment to precision agriculture, this paper offers a comprehensive solution for enhancing connectivity and data transmission. Its versatility, energy efficiency, and potential for future innovation underscore its significance in advancing antenna management technology.

II. PROBLEM STATEMENT

In the era of seamless connectivity and precise data transmission, the efficient positioning of antennas is paramount. Traditional manual antenna adjustments often fall short in adapting to changing environmental conditions. The need for a robust Antenna Positioning System that can intelligently respond to variations in temperature and humidity, without reliance on light conditions, has become increasingly evident. Weather conditions, atmospheric changes, and moving objects (e.g., vehicles) can affect signal quality, requiring continuous adjustment of antenna positions. Antennas can receive signals from multiple sources, and sometimes these signals interfere with each other, leading to weaker or distorted signals, Buildings, trees, hills, and other physical obstacles can block or weaken wireless signals, making it challenging to find the best antenna position ensuring that antennas are correctly aligned and calibrated initially and over time can be a challenge, as misalignment can lead to signal degradation.

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III. BLOCK DIAGRAM

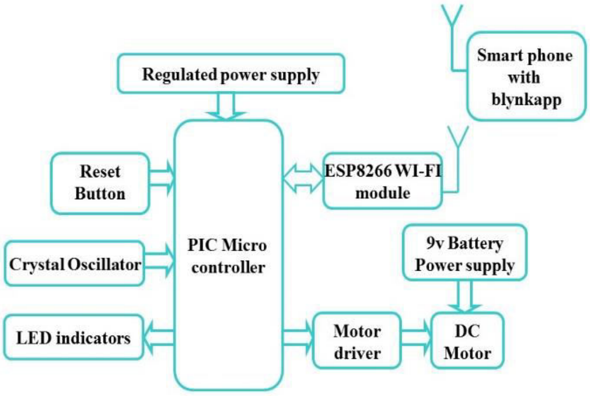

Fig no 1 Block diagram of the system

The block diagram consists of several types of sensors that are used for monitoring and tracking the different environmental parameters. The DHT11 sensor is used to monitor the temperature and humidity of the surroundings and these values are displayed on the LCD and real-time reading graph on the IOT platform. This system consists of two motors that enable the dish to move both in horizontal and vertical directions. The Blynk mobile application device acts as a transmitter whose data is received by an esp8266 Wi-Fi device which is interfaced to a microcontroller. The Wi-Fi device sends data to the microcontroller which is transmitted from the Blynk mobile application. Pic Microcontroller is the main controlling device of the whole system. ESP8266 WI-FI module and DC motors are interfaced to the Microcontroller. The data received by the ESP8266 WI-FI module from smart phone is fed as input to the controller. The micro controller works accordingly on the DC motors which are attached to the antenna. Users can control the position of the antenna from anywhere in the world. In achieving the task of the controller is loaded with a program written using Embedded 'C' language.

IV. LITERATURE SURVEY

1. **Sachin Kokane, Juilee Mandhre, Ekta Kumbhare, Avinash Birada, IoT Based Antenna Positioning System, International Engineering Research Journal (IERJ) 11 march 2020**
   A wearable antenna integrated into military berets for an indoor/outdoor positioning system is proposed in this IEEE paper. The antenna is made up of a circular ring patch with four conducting threads and a truncated patch. The truncated patch antenna is designed for the Global Positioning System (GPS) L1 band for outdoor use, while the circular ring patch antenna operates at the TM41 higher-order resonance mode (915 MHz) for indoor positioning. The system utilizes a Raspberry Pi controller, LCD screen, and ultrasonic sensor for antenna angle control. The proposed system aims to improve antenna positioning accuracy and performance for reliable and efficient indoor/outdoor positioning.

2. **Khalid Makhdoomi Assistant Professor Department of Computer Science and Engineering, SSM college of Engineering and technology Baramulla, Jammu and Kashmir India**
   The given Paper discusses the implementation of latest technologies in antenna positioning, specifically focusing on the use of IoT (Internet of Things) and sensors. The main objective is to develop a dynamic model for antenna positioning that can automatically change the direction of antennas based on the changing direction of transmitting stations. The model utilizes sensors mounted on the antennas to detect the proper direction and motors controlled by IoT to adjust the antenna position. This technology has significant implications for wireless communication systems and can improve the effectiveness of signal reception. The Paper describes the implementation of IoT and sensor-based antenna positioning technology. The model allows for automatic adjustment of antenna direction based on the changing direction of transmitting stations. Sensors mounted on the antennas detect the proper direction, and motors controlled by IoT change the antenna position accordingly.

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3. **Murugasamy R, Abirami P, Aruna P , Dharani S, Divyasri M, IoT Based Antenna Positioning System, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 11 Issue III Mar 2023**

The Paper discusses an IoT-based antenna positioning system that allows for remote control of antennas. The system uses an Arduino UNO R3 microcontroller and servo motors to control the antenna's position. The Blynk app is used as a remote control to send signals to the Arduino through the internet. The paper also includes sensors to monitor environmental conditions such as temperature, humidity, and raindrop. The system aims to provide accurate antenna positioning for wireless communication. The IoT-based antenna positioning system allows for remote control of antennas. The system uses an Arduino UNO R3 microcontroller and servo motors for antenna positioning. The Blynk app acts as a remote control to send signals to the Arduino through the internet.

Sensors are used to monitor environmental conditions such as temperature, humidity, and raindrop**.** The system aims to provide accurate antenna positioning for wireless communication.

4. **Godse Sharayu Devidas, Khatale Priyanka Prakash. Nimgaonkar Komal Kailas, Prof. L.P.Bhamare, Android based antenna positioning system,Vol-4 Issue-2 2018 IJARIIE**

The given Research paper provides information about a paper that involves adjusting the position of a dish antenna using a remote control. The system uses a wi-fi receiver to receive commands from an Android application, which are then processed by a microcontroller. The antenna is rotated based on the commands received, and the frequency of different companies, such as Videocon, Tata sky, and Airtel, is displayed on an LCD screen. The paper aims to accurately capture signals by pointing the antenna towards the sending signal device. The paper involves adjusting the position of a dish antenna using a remote control. Commands are received through an Android application and transmitted to a microcontroller via a Bluetooth receiver. The antenna is rotated based on the commands received to capture signals properly. The frequency of different companies, such as Videocon, Tata sky, and Airtel, is displayed on an LCD screen. The main goal of the paper is to accurately capture signals by pointing the antenna towards the sending signal device.

5. **Himmanshu Didden, Yashvi Sikka, Misha Kakar, Android based wireless communication system, IEEE 2020**

The given paper contains extracted parts from various conferences and publications related to cloud computing, data science, engineering, and wireless and optical communications networks. It includes information about the conferences, authors, titles, and some content snippets. The document includes information from the 10th International Conference on Cloud Computing, Data Science & Engineering (Confluence).It also mentions the International Conference on Wireless and Optical Communications Networks and the the Convergence of Information and Communication Technology International Conference (ICTC).

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V. METHODOLOGY

The system architecture is meticulously designed to define the overall structure and functionality. This involves specifying the components involved, including two motors for horizontal and vertical movement, a microcontroller, an ESP8266 Wi-Fi module, and sensors, as well as determining the interconnections and communication protocols between these components. The physical layout of the system is also planned to optimize size, weight, and accessibility considerations. Hardware implementation follows, where appropriate components are carefully selected based on paper requirements and compatibility. These components are then interfaced with the microcontroller according to the system architecture design. Rigorous testing and debugging are conducted to ensure the proper functionality and reliability of the hardware components, addressing any issues that arise during the process

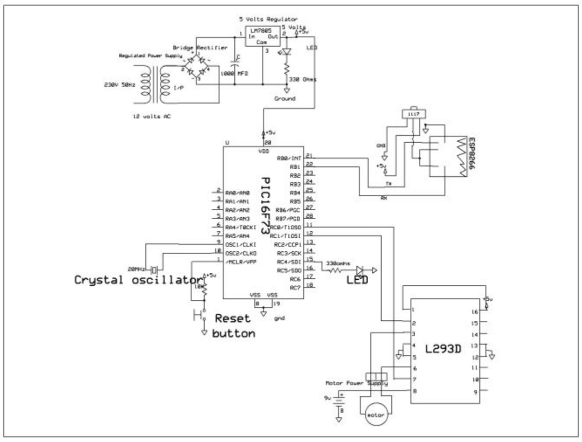

Fig no 2 Circuit Diagram of the system

Next, software development takes center stage, with firmware developed for the microcontroller using Embedded 'C' language. Communication protocols between the microcontroller and ESP8266 Wi-Fi module are implemented to facilitate data transmission, and algorithms are devised to interpret commands received from the Blynk mobile application and translate them into motor movements. A user-friendly interface is designed on the Blynk mobile application to enable intuitive control of the antenna positioning system.

Testing and validation are critical phases of the methodology, encompassing various assessments to ensure the system's accuracy, adaptability, and robustness. Thorough testing of the hardware components is conducted to verify functionality, and the accuracy of the antenna positioning system is validated by comparing commanded positions with actual positions. Testing is performed under diverse environmental conditions to assess the system's performance across different scenarios, with feedback gathered from users to identify any usability issues or areas for improvement. Performance evaluation is another integral aspect of the methodology, involving the measurement of power efficiency, responsiveness, and reliability. Comparative analysis against existing antenna positioning solutions is conducted to demonstrate the effectiveness and advantages of the developed system.

VI. RESULT

The "Antenna Positioning and adjustment System Using DHT11 sensor" paper yields promising results, demonstrating the successful integration of hardware and software components to create an efficient and user-friendly antenna positioning system. The system achieves precise control over antenna orientation, enabling seamless adjustments via the Blynk mobile application as well as it provides real-time readings of the temperature, humidity and light intensity of the environment by using thingspeak platform.

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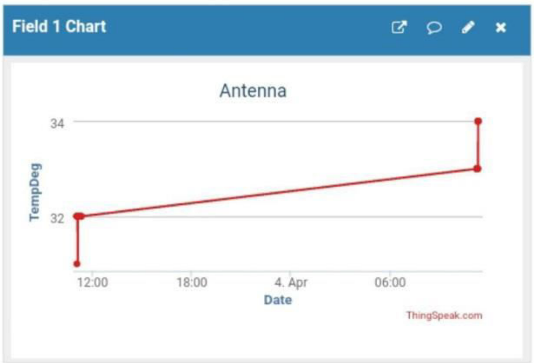

Fig no 3 Time v/s Temp

As a result, we observed real-time temperature data over time and generated a graph on the Thingspeak platform. In conclusion, we can state that the temperature of the environment increases over time in the range of 32 to 34 degrees Celsius.

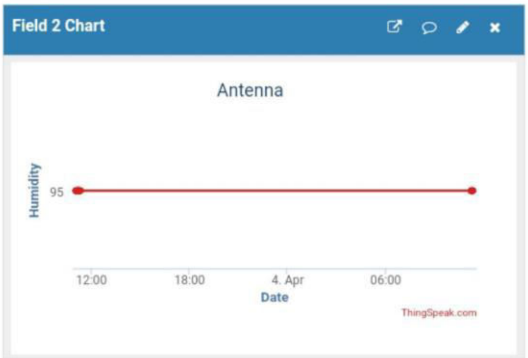

Fig no 4 Time v/s Humidity

As a result, we observed real-time humidity data over time and generated a graph on the Thingspeak platform. In conclusion, we can state that the humidity of the environment remains constant at 95% over the period of time.

Fig no 5 Time v/s Light intensity

As a result, we observed real-time light intensity data over time and generated a graph on the Thingspeak platform. In conclusion, we can state that the light parameter of the environment declines with time in the range of 70% to 60%.

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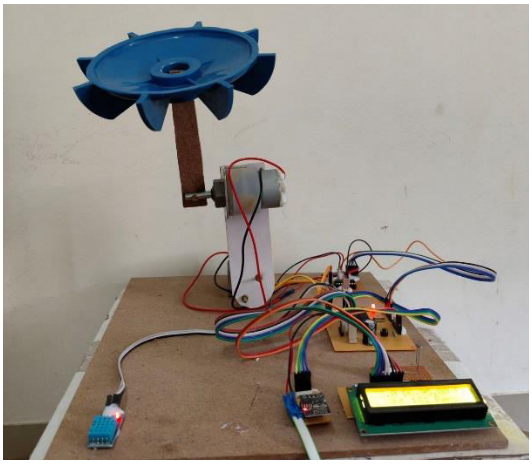

Behold the culmination of precision engineering and technological innovation: this working model of the Antenna Positioning System Using DHT11 sensor. With sleek design and seamless functionality, this system epitomizes the future of antenna management, offering precise control and enhanced connectivity at your fingertips. Witness firsthand the convergence of hardware and software expertise, revolutionizing how we optimize antenna performance for diverse applications. Step into a world of seamless communication and unparalleled reliability with our cutting-edge antenna positioning solution.

VII. CONCLUSION

In conclusion, the IoT-Based Antenna Positioning System we are going to a significant achievement in the realm of Internet of Things (IoT) applications. This paper will successfully design and implement a system that provides precise antenna positioning, real-time environmental data monitoring, and remote controls capabilities. The advantages offered by this system are evident, from enhanced antenna precision to the convenience of remote monitoring and control. Incorporating the DHT11 sensor, not only contributes to more accurate environmental data collection but also showcases the system's versatility across multiple domains, including telecommunications, meteorology, and environmental research. The paper's emphasis on energy efficiency, user-friendliness, and scalability reinforces its readiness for a wide range of applications. The minor connectivity challenges faced during development further demonstrate the team's problem-solving skills and dedication to system optimization. As a result, the IoT-Based Antenna Positioning System stands as a robust, adaptable, and versatile solution.

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