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IoT Based Antenna Positioning System

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Abstract: Proper positioning of antennas is necessary for wireless communication. So herewe are giving a project on an IOT based antenna positioning system that allows for remotely positioning of antennas based over IOT. The method that is used here to control the antennas position is by using Arduino UNO R3 and Servo motors. The Blynk app acts as a remote and is used to send the signal to the Arduino through the internet. The project helps to control the antenna's positionby the user's command. If we have android mobile with internet connection, we can easily access the antenna position. Also to monitor the environmental conditions we have used temperature, humidity and raindrop sensors.

I. INTRODUCTION

A. Introduction to Embedded System

When we look around, we see that different kinds of embedded systems are all around us. Every device, whether it be a washing machine, a mobile phone, or a digital camera, has a CPU inside.

The embedded software is connected to each CPU. An embedded system's soul is represented by its embedded software, while its embedded processor serves as the system's brain. The main factor influencing how embedded systems operate is embedded software. Programs were created using assemblers and fused into the EPROMs during the early years of microprocessor-based devices. There used to be no way to track the program's activity. To verify that the programme was running properly, LEDs, switches, etc. were employed. Some people are "extremely lucky."

B. Objectives

1) To build a positioning antenna device that can be controlled from a remote location
2) To position the antenna to the exact angle to receive maximum signal of a specific frequency
3) To adjust the antenna position through a simple software.

C. Introduction To IOT

The Internet of Things (IoT) is the networking of physical items with electronics built into their architecture to enable communication and the detection of interactions between them or with the environment .The IoT-based technology will provide higher levels of services in the future years, effectively altering how individuals go about their daily lives. Just a few categories where IoT is well established include improvements in medicine, power, gene therapies, agriculture, smart cities, and smart homes. The Internet of Things (IoT) is a network of networked computing devices that are implanted in commonplace things and allow them to send and receive data.

SENSOR: The main component of all IoT applications is a sensor. It is a physical apparatus that measures and detects certain physical quantities and transforms them into signals that can be supplied as inputs to processing or control units for analytical purposes.

D. Parabolic Antenna

An antenna that directs radio waves using a parabolic reflector, a curved surface with a parabola-shaped cross-section, is known as a parabolic antenna.

The most popular type, which is fashioned like a dish, is known as a dish or a parabolic dish. Of all antenna types, parabolic antennas offer some of the highest gains, which enables them to create the smallest beamwidths. Parabolic antennas are used in the high frequency region of the radio spectrum, at UHF and microwave (SHF) frequencies, where the wavelengths are small enough that reasonably sized reflectors can be used.

This is because the parabolic reflector must be much larger than the wavelength of the radio waves used to achieve narrow beamwidths. High-gain antennas that use a parabola.

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II. LITERATURE SURVEY

1) "Positioning a satellite dish Antenna"

An antenna for a geosynchronous belt of satellites, which receives signals from an electronic compass to produce a magnetic direction signal through a receiver attached to the satellite dish antenna. an approximation the user of the system manually chooses the latitude and longitude coordinates that correspond to the location of the parked car once the system displays the latitude and longitude values of the parked vehicle. Based on the magnetic reading, the provided latitude and longitude values, and the receiver, the satellite dish antenna is first located. From an unsowed, the satellite dish antenna is shifted.

2) "Automated Antenna Positioning for Wireless Networks"

This article addresses the issue of establishing communication linkages across several base station sites, which is a real-world issue. A small number of fixed-access relay antenna sites are placed on a specific terrain to accomplish this. To reduce the quantity selecting relay antenna locations is seen as being challenging because to high installation and maintenance expenses. Despite the possibility for considerable cost savings by removing even one antenna site, a manual solution that is far from ideal is used due to the calculation difficulty of the issue.

3) "Satellite Antenna Positioning System"

The system for automatically situating an antenna orifice on a mobile platform in a manner to avoid blockages created by other factors/ subsystems on the mobile platform between the line of sight of the antenna orifice and a satellite and to avoid hindrance with other systems that partake the mobile platform. In one personification, one or further direct support rudiments are moved by one or further matching motors to allow the antenna orifice to bere-positioned between a pluralities of different positions.

4) "Microcontroller based wireless automatic antenna positioning system"

The main purpose of a wireless automatic antenna positioning system powered by a microcontroller was to locate the signal's source. The signal might be of any sort and could be used to automatically detect the presence of any as long as the signal link is active, the antenna and signal could stay put. The antenna rotates continuously in pursuit of the signal if there is a chance that the link between it and the satellite or source could break. In order to display the antenna position, this system also had advanced communication with the monitor or LCD screen.

5) "Design of Advanced Antenna Positioning System"

The plan was to create a system that could direct the antenna's movement in every direction. This suggested system aids in altering the antenna's position to get over the challenge of manual adjustment. Remote any smartphone with an android OS can operate. Two servomotors, one moving in the vertical direction and the other in the other direction, are used to move the dish in its various directions. The microcontroller directs the movements of the servo motor.

A. Exsisting Method

The most recent project involved implementing an IOT-based antenna positioning system that would remotely position antennas based on IOT. Antenna positioning has been done in the past in elaborate ways.

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Also, based on the most current prototype used Wi-Fi routers for communication, which rely on the mobile network to receive commands and need a solid network to operate. It is commonly known that weather variations, such as intense rain, can also influence wireless communication. Therefore, in such circumstances, unneeded delays brought on by unreliable networks may have an impact on the prior project. The Android application makes it easier to do this by allowing users to send commands to turn the antenna to the appropriate places, although in this mode, a technician is still needed.

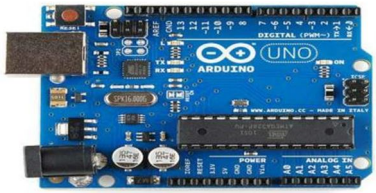
B. Advancement From The Recent Project

In the most recent project, DC motors were used. DC motors can only rotate in specific angular directions, so getting them to bend at small angles is difficult. Consequently, servo motor are well known for providing theassurance of accuracy that surpasses that of a typical DC motor.The weather can have an impact on wireless communication, such as strong gusts and rain. Therefore, numerous sensors are added to the system in order to avoid such circumstances. The location of the antenna is done in accordance by computing the meteorological condition beforehand.

III. TOOLS DESCRIBTION

A. Arduino UNO R3

One type of ATmega328P-based microcontroller board is the Arduino Uno R3. It comes with everything needed to support the microcontroller; all you need to do is use a USB cable to connect it to a computer and provide power using an AC-DC adapter or a battery to get things going. In the "Italian" language, the word "Uno" refers to "one." It was chosen to commemorate the debut of the Arduino IDE 1.0 software. The third and most latest version of the Arduino Uno is called the R3.The reference versions of the Arduino board and IDE software are currently being updated. The Uno-board is the first in a line of USB-Arduino boards, and it serves as the platform's standard design.



B. Node MCU ESP8266 Wi fi Module

A 32 pin microcontroller IC with an integrated WiFi module is called Node MCU. This microcontroller serves as the system's central interface. It is in charge of making the system work. The Newest Wireless NODEMCU In order to meet the demands of a new linked world, IoT Board was developed based on an integrated chip. This Module has the capacity to offload all Wi-Fi networking operations to another application processor or host an application. SPI and UART protocols can be used to address this wireless module in full. Consequently, it permits you to directly connect your project's sensors or GPIO to it.

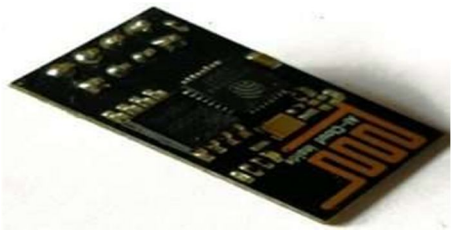


C. ESP8266 Wi fi Module

A SOC microprocessor called an ESP8266 Wi-Fi module is mostly utilised for the creation of end-point Internet of Things (IoT) applications. It is known as a standalone wireless transceiver and is very inexpensive. It is used to enable the internet connection for a number of embedded applications.

The ESP8266 Wi-Fi module was created by Systems Express of Systems to provide both TCP/IP functionality and microcontroller access to any Wi-Fi network. It offers solutions to satisfy IoT industry needs for cost, power, performance, and design. It can function as a slave or a stand-alone program. The ESP8266 Wi-Fi can be used as a Wi-Fi adaptor to any type of microcontroller if it runs as a slave to the host microcontroller.

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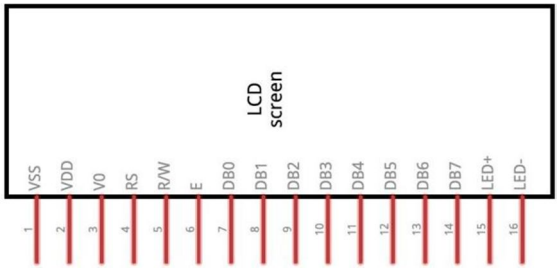
D. Servo Motor (MG996R)

The MG996R Continuous Rotation has the capacity to constantly rotate 360 degrees. This servo motor is therefore ideal for robotics or even rotating camera sliders.



E. Liquid Crystal Display (LCD)

LCD displays use two sheets of polarising material with a liquid crystal solution in between them. LCD displays are a type of display used in digital watches and many portable computers. The crystals align when an electric current is supplied through the liquid, blocking light from passing through. LCD since it was first invented more than ten years ago for use in laptop computers, technology has moved incredibly quickly. Brighter displacement, higher resolutions, faster response times, and more affordable production processes are all products of technological advancements.



F. Temperature Sensor

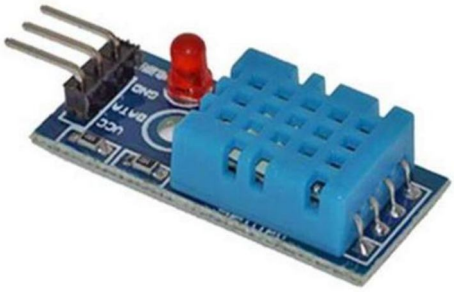
A tool used to measure temperature is called a temperature sensor. This might refer to the temperature of the air, a liquid, or a solid.



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G. Humidity Sensor

An electronic device known as a humidity sensor monitors the humidity in its surroundings and then transforms the data into an appropriate electrical signal. Size and effectiveness of humidity sensors vary greatly; some humidity Some sensors are built into smaller embedded systems (like air quality monitoring systems), while others are included in handheld devices (like smartphones). In the meteorology, healthcare, HVAC, and manufacturing sectors, humidity sensors are frequently utilised. Absolute humidity (AH) and relative humidity (RH) sensors are also used. Relative humidity (RH) sensors and absolute humidity (AH) sensors are two categories of humidity sensors that employ distinct methods to determine humidity.



H. Raindrop Sensor

The term "raindrop sensor" refers to a sensor that detects rain or water drops. This type of sensor functions as a switch. The sensing pad and the sensor module are the two components of this sensor. When rain drops hit a surface an alert pad The sensor module then reads the information from the sensor pad, processes it, and outputs it as either an analogue or digital signal. Consequently, this sensor's output is both analogue (AO) and digital (DO).



I. IOT Control (Blynk App)

You may build smartphone applications using Blynk that make it simple to communicate with microcontrollers or even complete computers like the Raspberry Pi.

The Blynk platform's primary goal is to make it incredibly simple to construct the mobile phone program. You'll learn in this course that creating a mobile application that can communicate with your Arduino is as simple as dragging a widget and setting up a pin. With Blynk, you can operate an LED or a motor with essentially no programming from your smartphone. Actually, the first experiment I'll show you in this course is this one. However, don't let this ease of use fool you into thinking that Blynk is only appropriate for simple tasks. But a private Blynk server offers you other advantages, complete command over your data. You can manage your users carefully, store your own backups of your private server, move it to a new host, and use any security measures you like.



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SOFTWARE DESCRIBTION

1) EMBEDDED C

A function is a group of statements used to carry out a particular activity, and a programming language is a group of one or more functions. Each language is made up of fundamental components and grammatical rules. The C Writing a C program requires the use of variables, character sets, data types, keywords, expressions, and other language programming constructs.

IV. PROPOSED SYSTEM

A. Proposed System Introduction

Due to the significant potential for unanticipated, harmful mishaps that can occur during the manual antenna placement procedure, there is an urgent need for automatic devices that can perform the same function safely. a cheap automatic android-based Using rotating servo motor connected to the microcontroller, an antenna positioning system can assist in modifying the sector antennas' positions.

B. Methodology

1) This system's two components are as follows:
a) Antenna and motor control circuit.
b) The user commands app Blynk.
2) The circuit in place is made up of various parts, including sensors and servo motor connected to an Arduino UNO R3.
3) The motor positioning is done by the Arduino UNO R3 controller.
4) The motors move to the desired position after the controller receives input from the user via the Blynk app and WIFI module.
5) As a result, the user will receive the antenna's current position and the antenna will be positioned in accordance with user commands.

C. Working

The power supply is given to the device setup. The main controller of the system i.e., Arduino UNO R3 is programmed by using embedded C which is saved and it act as a input for the servo motor to turn in the desired position as programmed in the controller. Here, LCD(IPS-In Plane Switching) is connected to the SCL, SDA, A4 and A5 PINS in Arduino UNO R3. Temperature Sensor (LM35 used) is connected to PIN A1, Humidity Sensor (DTH11 used) is connected to PIN A2 and Raindrop Sensor is connected to PIN A0 in Arduino UNO R3.Stepper Motor is connected to PIN RESET AND PIN 3.3V and NODE MCU(ESP8266 WIFI MODULE) is connected to TX and RX PINS of Arduino UNO R3.Antenna is get mounted to the Servo Motor. The Servo motor turns in clockwise and anticlockwise direction as per the user command given. User command i.e., the input which is given through the IoT control that uses the BLYNK application. Here the IoT control and the main controller Arduino UNO R3 is interlinked by NODE MCU ESP8266 WIFI Module which act as a communication platform. Hence by receiving the inputs from the user i.e., IoT control application the Arduino get processed and resulting in the changing of the position of the antenna by servo motor. So by using the user command the position of the antenna can be changed as required. Here to avoid environmental causes also to enhance the network reliability, the system get added with various sensors like temperature, humidity and raindrop sensors.

V. RESULT AND DISCUSSION

Antenna movement is controlled by user commands sent via the Blynk app. The signal is transmitted online to the Arduino UNO R3 using the Blynk app.The antenna will point in the following directions in response to directives from Blynk: servo motors can be set to change in the specified direction. This will lead to the antenna being placed in the proper location. The antenna device is positioned using an exact measurement of the antenna's rotational velocity to pinpoint its angular location and give the user the strongest signal possible.




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VI. CONCLUSION

A. Conclusion

Based on the input received signal from the Blynk app, this Internet of Things (IoT) based antenna positioning system is utilised to position the antenna without handling manually. The direction of the motors can be changed based on the signal received. The positioning of the antenna is mostly determined by the accuracy of the servo motor, which can rotate either clockwise or anticlockwise. As a result, we can manually adjust the antenna's location to point in the appropriate direction utilising IoT-based antenna positioning. This technique resolves issues such as misalignment that arose from manually adjusting the position of antennas, which was previously employed. It is affordable, small in size, and simple to operate. using an IoT antenna. A locating system is useful in far-off places.

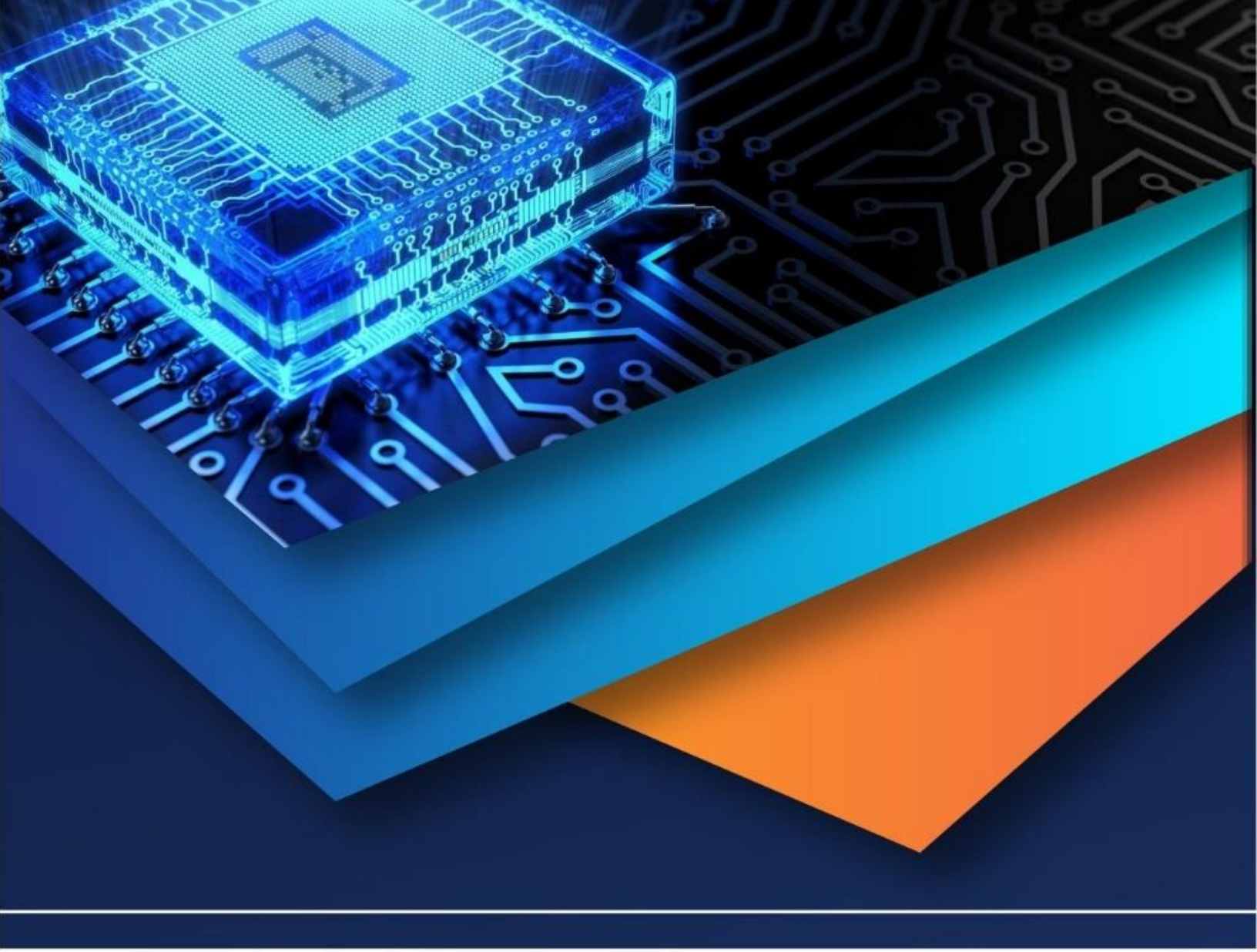
B. Future Enhancement

Future iterations of this project's design could incorporate the next features.Utilizing the cameras to take pictures of the tower antennas and communicate them to management, the project may be able to detect changes in the preset angles team for a critical evaluation of the direction adjustments. To relieve the stress of tilt adjustment during antenna setup, synchronous communication of the antenna positions is used with wireless control of the mechanical down-tilt. The IoT-based antenna placement system might be developed in the future so that it keeps track of preset settings and continuously reports the reason behind angle changes to the a management group. As a result, the system can be remotely controlled to switch between operational modes. For instance, in automatic mode, the system will automatically restore the antenna position if it detects angular changes.

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