IoT Based Antenna Positioning System

ISSN 2395-1621

Sachin Kokane, Juilee Mandhre, Ekta Kumbhare, Avinash Biradar

ioitsachin@gmail.com
juilee2612@gmail.com
ektakumbhare3@gmail.com
avinashbiradar179@gmail.com

Department of Electronics & Telecommunication
AISSMS Institute of Information Technology Pune, India

ABSTRACT

Wireless communication frameworks utilizes receiving wires for gathering of signs. For powerful remote correspondence, the reception apparatuses must be situated toward transmitter. The framework proposed right now is an Internet of Things (IoT) framework that positions the antennas. In this system, ultrasonic sensor will be used to detect the direction of the antenna and it will be positioned by motors. The direction of the transmitting antenna must be altered when the course of a transmitting station changes over time. We will screen reception apparatus bearing and transmitting new facilitates to situate the antenna as needs be. This framework can be utilized to situate antennas in the ideal ways utilizing remote correspondence.

Keyword: Wireless communication, IoT, Antenna positioning.

ARTICLE INFO

Article History

Received: 8th March 2020

Received in revised form :

8th March 2020

Accepted: 10th March 2020

Published online :

11th March 2020

I. INTRODUCTION

In IoT (Internet of things), "things" are the gadgets used to detect the encompassing parameters and gather the ongoing information to do the procedures required for home robotization frameworks, different therapeutic applications and brilliant city ventures, etc. We can surmise that "things" are a "blend of gear, programming, data and
organizations.

The technology turns out to be amazingly effective when proper sensors and actuators are utilized alongside IoT. Such digital physical frameworks can likewise engird the advancements, for example, brilliant lattices, virtual force plants, savvy homes, astute transportation and shrewd urban communities.

The information request is expanding at a quick pace. By 2022, yearly worldwide IP traffic will arrive at 396 exabytes for each month. Existing systems administration foundation can't deal with the information request from the expansion in web empowered gadgets. This has prompted the need to structure remote innovation to satisfy the developing need for solid, rapid web get to. In the present occasions the innovation is expanding at a quick pace subsequently, remote correspondence framework needs to work at different frequencies without expanding the size of reception apparatus.

The position of the receiving antennas can be far separated from one another anyplace around the globe. This framework effectively positions the antennas over exceptionally long separations. The co-ordinates of the antenna's position are shown on the LCD screen.

Directional antennas like Yagi antennas are utilized to point the receiving antennas in course of closest cell towers. Changing the position of the reception antennas physically can bring about mistakes or errors in readings, which can result in inefficient Yagi antenna positioning and not exactly ideal execution. While positioning an indoor reception antenna we have to consider the format of the structure and the region we need to cover. So as to improve signal in a room, indoor reception apparatus situating must be contemplated.

This paper targets building up a antenna positioning framework which ceaselessly screens the direction of the antenna and positions the antenna towards satellite station.

II. LITERATURE SURVEY

[1] “IEEE paper of “Design of miniature antennas for IoT applications”, by L. Lizzi, F. Ferrero, P. Monin, C. Danchesi, S. Boudaud, Published in: 2016 IEEE Sixth International Conference on Communications and Electronics (ICCE). PIC microcontroller was designed to develop a satellite dish positioning system which can be operated by using a Bluetooth control. This project helps

in adjusting the position of the dish through a remote Control which acts as a transmitter whose data is received by a Bluetooth receiver which is interfaced to a Microcontroller of PIC 16F877A.

[2] "Implementing an IOT based Antenna Positioning System",by Pooja Revane, Shradha Salaskar, KomalShelke, Priyanka Tawar, Akshata Raut, published in International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 6 Issue IV, April 2018. In this system sensors will be mounted on the antenna to detect its direction and its direction will be changed by motors using IoT. When the direction of a transmitting station changes over time, the antenna direction must also be changed accordingly.

[3] "Antenna Positioning Based on IOT", by Khalid Makhdoomi, published by International Journal of Trends in Scientific Research and Development (IJTSRD), Volume 2, Issue 5, July-August 2018.This system uses sensors and mounts motors on each antenna to verify its facing direction transmitted over IoT. In case the direction of satellite or station changes with time the direction of antenna also changes accordingly. The antenna positions are visible to operator on the IoT GUI through the internet. The IoT Gecko is used to develop the GUI system for antenna monitoring. Our model allows for monitoring antenna direction as well as transmitting new coordinates to position the antenna and motor appropriately positions the antenna accordingly.

[4] "Microcontroller Based Wireless 3D Position Control for Antenna", by Amritha Mary A. S, Divyasree M V, Jesna Prem, Kavyasree S M, KeerthanaVasu proposed a system, this system is based on android application and Raspberry pi. This system controls the movement of the dish antenna in all direction through an android application. It uses the servo motor to move the dish in desired direction. Raspberry pi is the main controlling element in this system. The disadvantage of this system is we have to enter the angle for the rotation.

[5] "Remote Alignment of Dish Positioning by Android Application", by Prajwal Basnet, Pranjal Grover, PreetiPannu. The proposed system helps in adjusting the position of the dish through an Android application device.

[6] "Compact Low-Profile Dual-Band Tag Antenna for Indoor Positioning Systems", by Wenxing An, Zhongxiang Shen, and Jun Wang, DOI 10.1109/LAWP.2016.2581182, IEEE. Compact low profile dual band tag antenna can be easily integrated onto targets of indoor positioning system due to its backing ground plane substrate used in this project reduces the fabrication cost. In order to obtain a wideband and stable radiation performance in upper band, a novel differential feeding structure is proposed to excite the eclipse shaped dipole that exhibits good impulse performance. Measurements of this prototype show stable radiation patterns at both bands which in turn is potentially useful for indoor positioning system.

[7] "Design of Advanced Antenna Positioning System", by Rahane Suraj Dildar, Mhaske Shital Arun, Shingate Sujata Rajendra and Prof. S. B. Mandlik, published by International Journal of Research in Advent Technology, Vol.6, No.3, March 2018. Design of advanced antenna positioning system consists of various transmitters, a delay circuit & a receiver which is placed at the centre of antenna. When a signal is received at receiver, it provides adequate strength and gets transferred to an Analog to Digital Converter and the converted data is sent to a microcontroller. The microcontroller analyzes data and gives output accordingly to the motor driver which is connected to servomotor. In this way servomotor gets the adequate data or information required for correct positioning of receiving antenna.

[8] "Microcontroller Based Wireless Automatic Antenna Positioning System", by Surya D. Choudhary, Pankaj Rai, Arvind Kumar, Irshad Alam, published by International Journal of Electronics, Electrical and Computational System (IJEECS), Volume 3, Issue 6, August 2014. The automatic Antenna Positioning System primarily functions to identify the source of signal .In this project Infrared source (IR) is used as a source signal and IR receiver is used for detecting the signal .Microcontroller-51-core is used to develop the project. The controller searches the available signal.Whenever , the signal is found to be absent the DC motor rotates till the signal is not found at the receiver .Interfacing between transmitter and receiving unit is done through DTMF encoder and decoder which helps in encoding and decoding of the signal .It is mainly used in telephone communication technology.

[9] "Automatic Dish Antenna Positioning System", by Jadhav Seema, Shejwalkar Rakshanda, Andhale Jyoti, published by JournalNX - A Multidisciplinary Peer Reviewed Journal, ISSN No: 2581-4230, 21st - 22nd February, 2018. Dish antenna positioning is used to get broadcast signals from the satellite. The aim of this project is to control the dish automatically, which will be capable of receiving the broadcast signals from the satellite. It will rotate horizontally and vertically. The position of the dish is adjusted by an android application or Bluetooth. Power meter is used to measure the maximum signal strength. This system uses two stepper motors which helps it top move horizontally and vertically.

[10] "Wearable Antenna Integrated into Military Berets for Indoor/Outdoor Positioning System", by Heejae Lee, Jinpil Tak, and Jaehoon Choi, published by IEEE Antennas and Wireless Propagation Letters, VOL. 16, 2017. A wearable antenna integrated into a military beret for an indoor/outdoor positioning system is proposed. The antenna consists of a truncated patch and a circular ring patch with four conductive threads. The truncated patch antenna is designed for the Global Positioning System (GPS) L1 band for use in outdoor situations, and the circular ring patch antenna with four conductive threads operates at the TM41 higher-order resonance mode (915 MHz) with a

monopole- like radiation characteristic for indoor positioning systems.

III. PROPOSED SYSTEM

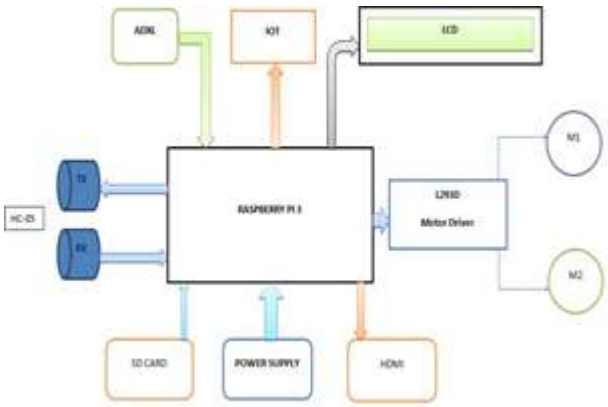

Figure 1: Block Diagram of the proposed system

Fig. 1shows the block diagram of the proposed system. This is a smart IoT Based Antenna Positioning System which positions the receiving antenna towards the transmitting station. This empowers the reception antenna to point straight towards the transmitting gadget so as to catch the signal.

A. Raspberry Pi

Raspberry Pi 3B is utilized as microcontroller in our proposed framework. This is multiple times quicker than the original Raspberry Pi. It has remote LAN and Bluetooth Connectivity making it a superb answer for some associated structures. This is worked with 5.1V small scale USB supply. For the most part it utilizes in the midst of 700- 1000mA relying upon what peripherals are connected.The Raspberry Pi works on 2.5Amp maximum power.

Technical Specifications

- Broadcom BCM2837 64bit ARMv7 Quad Core Processor powered Single Board Computer running at 1.2GHz
- 1GB RAM BCM43143 Wi-Fi on board
- Bluetooth Low Energy (BLE) on board
- 40 pins extended GPIO
- 4 x USB 2 ports
- Full size HDMI
- CSI camera port for connecting the Raspberry Pi camera
- DSI display port for connecting the Raspberry Pi touch screen display
- Micro SD port for loading your operating system and storing data.
- Upgraded switched Micro USB power source (now supports up to 2.4 Amps)

B. Ultrasonic Sensor

The HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are VCC, Trigger, Echo and Ground respectively. This sensor is used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver.

Figure 2: HC-SR04 Ultrasonic (US) sensor

Technical Specifications:

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

C. L293D Driver IC

L293D is an average Motor driver or Motor Driver IC which permits DC engine to drive on either course. L293D is a 16- pin IC which can control a lot of two DC engines at the same time toward any path. It implies that you can control two DC engines with a solitary L293D IC. Double H- connect Motor Driver coordinated circuit (IC). The L293D can drive little and calm large engines also.

It takes a shot at the idea of H-connect. H-connect is a circuit which permits the voltage to be flown in either course. As you most likely are aware voltage need to alter its course for having the option to turn the engine clockwise or anticlockwise way, subsequently H-connect IC are perfect for driving a DC engine.

In a solitary L293D chip there are two H-connect circuit inside the IC which can pivot two dc engine freely. Due its size it is especially utilized in automated application for controlling DC engines.

D. D.C. Motor

At the point when a current conveying conductor is put in an attractive field, it encounters a torque and tends to move. At the end of the day, when an attractive field and an electric field associate, a mechanical power is created. The DC engine or direct current engine takes a shot at that head. This is known as motoring activity.

The heading of revolution of a this engine is given by Fleming's left hand rule, which expresses that if the pointer, center finger, and thumb of your left hand are stretched out commonly opposite to one another and if the

forefinger speaks to the bearing of attractive field, center finger shows the course of current, at that point the thumb speaks to the bearing where power is experienced by the pole of the DC engine.

IV. SYSTEM IMPLEMENTATION

All the activities of the proposed framework are performed by a Raspberry Pi controller. The LCD screen is utilized to display the angle of the antenna. It comprises of an Ultrasonic sensor (HC 04) to identify the position of the antenna.

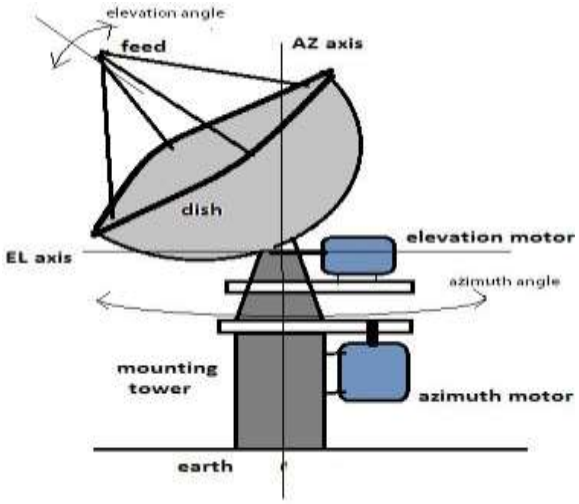

Figure 3: Antenna angle control

The framework utilizes stepper motor to move the antenna in the desired direction. Client directions are gotten by the Raspberry Pi controller through the Bluetooth recipient in-built in the Raspberry Pi and the antenna is positioned appropriately. The antenna moves onward the premise of input parameters given by the user. Whether the antenna must be turned clockwise or anticlockwise way is indicated by the input parameters.

A 12V transformer powers the whole framework. Accordingly, the antenna would now be able to be situated so as to point legitimately towards the transmitting station in order to catch the signal effectively. Wi-Fi module which is in-built in Raspberry Pi, moves the information from controller on the web. The values of x and y co-ordinates will be moved on a cloud web administration which will create a graph of the position of the antenna with respect to time using IoT. A direction will be given to the DC motor so as to turn the antenna. So as to drive the DC motor, LN293D is utilized as a driver IC. To deal with the x and y directions, two DC motors are utilized.

We have along these lines built up a framework in which the antenna can be positioned in the desired direction utilizing sensors, actuators and motors.

V. EXPECTED RESULTS

On completion of this project we will have a system to position the antennas based over IoT. It will be an efficient system that monitors change in the direction of the antenna. We have developed a system that is able to transmit new coordinates to position the antenna.

REFERENCES

[1] R.L Sturdivant, “Systems Engineering of a Terabit Elliptic Orbit satellite”, published in IEEE, volume 4,pp 9941-9949 Sep 2016.

[2] BekirSaitCiftler& Abdullah Kadri, “IoT Localization for Bistatic Passive UHF RFID Systems With 3-D Radiation Pattern”, published in IEEE, Vol no4,pp 905-913,August 2017.

[3] S.Katoch, H.Jotwani, S.Pani, A.Rajawat, "A Compact Dual Band Antenna for IoT Applications", published in IEEE,pp1594-1597, 2015.

[4] Alan Bensky, “Wireless positioning and applications (Third edition)”, British library Publications.

[5] Prajwal Basnet, Pranjal Grover, PreetiPannu “Remote Alignment of Dish Positioning by Android Application”, published in IEEE, pp1594-1597, 2015.

[6] Wenxing An, Zhongxiang Shen, and Jun Wang, “Compact Low-Profile Dual-Band Tag Antenna for Indoor Positioning Systems”, DOI 10.1109/LAWP.2016.2581182, IEEE.

[7] Rahane Suraj Dildar, Mhaske Shital Arun, Shingate Sujata Rajendra and Prof. S. B. Mandlik, “Design of Advanced Antenna Positioning System”, published in International Journal of Research in Advent Technology, Vol.6, No.3, March 2018.

[8] Surya D. Choudhary, Pankaj Rai, Arvind Kumar, Irshad Alam, “Microcontroller Based Wireless Automatic Antenna Positioning System”, published in International Journal of Electronics, Electrical and Computational System (IJEECS), Volume 3, Issue 6, August 2014.

[9] Jadhav Seema, Shejwalkar Rakshanda, Andhale Jyoti, “Automatic Dish Antenna Positioning System”, published in JournalNX - A Multidisciplinary Peer Reviewed Journal, ISSN No: 2581-4230, 21st - 22nd February, 2018.

[10] Heejae Lee, Jinpil Tak, and Jaehoon Choi, “Wearable Antenna Integrated into Military Berets for Indoor/Outdoor Positioning System”, published in IEEE Antennas and Wireless Propagation Letters, VOL. 16, 2017.

