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ANTENNA POSITIONING SYSTEM

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Abstract - In this project 4 Element Yagi antenna is used. It is useful for HF communication and it provide long range and global communication. As we know in 4 Element Yagi Antenna communication is only in single direction. HF radio communication offers global range. The description of HF radio communication has been presented in this paper. At the end HF radio communication planning algorithm was described for communicating in all direction, we must rotate the antenna in respective direction. To overcome this problem controller assembly is required. This paper proposes a review of a project named Antenna Positioning Assembly for heavy weight 4 Element Yagi Antenna.

Keywords- Yagi Antenna, PWM technology, Stepper motor, Dial indicator, Radio communication, Joystick.

1. Introduction

Wireless communication is termed as transfer of data between two or more points that don't use any conducting medium to perform the transfer. Radio waves are commonly used in wireless technology. Wireless communications are a type of data communication that is performed and delivered wirelessly.

Main function of antenna is to send and receive information or signal. Hence, the speed of this process is a challenging aspects. The Antenna positioning System is a project designed to enhance signal reception by dynamically adjusting the orientation of an antenna based on real time environmental conditions. This project is valuable for enhancing communication in various environments, ensuring a more reliable and efficient wireless experience for users.

Features of Yagi Antenna is beneficial in wireless communication.4 Element Yagi Antennas is unidirectional. The Yagi Antenna must be pointed in an exceedingly particular direction for error free communication. To supply antenna gain in an exceedingly particular direction, the Yagi Antenna incorporates a narrow frequency range. The gain of the Yagi Antenna is high in very single direction.

This Yagi antenna with such good features is the best suited to long-range communication. But the directional nature of the antenna restricts the communication in other directions. With the assistance of this project, ready to able to operate the Yagi antenna as a transmitting aerial. Hence, there's a necessity for this project

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2. Present Theories and Practices

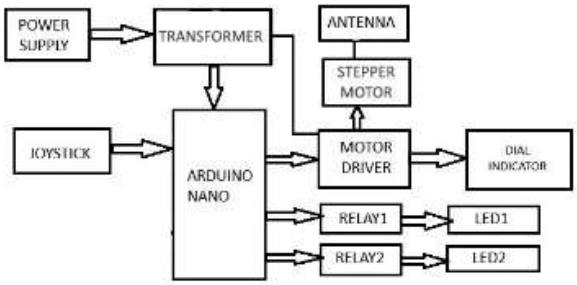
High Frequency is taken into account from the range of radiofrequency electromagnetic waves 3 to 30 MHz They're transmitted from the bottom unit or handheld transceiver into the earth's atmosphere. These radio signals strike the ionosphere and are available back to the and where they're received by another transceiver tuned into the identical radio band. The advantage of HF is sky-wave propagation where one link can span distances as great as 3000 km. 4 element Yagi antenna may be an aerial with multiple elements placed one after another. The Yagi antenna is having very high-gain and high frequency. The 4 element Yagi antenna have driven element, reflector on the left side, half-wave driven element at the center and the director at the right side. Yagi antenna acquires the unidirectional nature as a result of a phase difference between the reflectors and driven element and λ/10 spacing, it cancels the radiation of 1 side. The gain is high during a single direction.

Yuanhua Sun, Zhang Haobin, Wen G. Wang Ping proposed paper on a methodical review on Yagi uda antenna for broadcasting applications. A Yagi antenna is a simple directional antenna having more than two parallel resonant antenna elements in a linear array; these elements are made up of metal rods which will act as a half-wave dipole. A single driven element of Yagi uda antenna is connected to a radio transceiver (i.e. transmitter and receiver) through a transmission line. Driven dipole is slightly smaller than the reflector elements and it is located behind the driven element and opposite to the direction of transmission. These elements are typically short-circuited dipole elements. The radio waves from the driven element are received and reradiated in a different phase determined by their perfect length. This modifies the driven element's radiation pattern.

A study on the performance analysis of three-phase induction motors was proposed by Dinesh Kumar. When designing a drive system, electrical machine analysis and performance calculations are crucial. These converters give users more flexible speed control, but

they also increase the risk of harmonic difficulties and the diseases they cause, such as pulsating torque, distorted waveforms for current and voltage, rising losses, etc. The comparison was concluded based on a number of different parameters. The analysis is performed with MATLAB Simulink. The electromagnetic induction law of Faraday is the basis for how an induction motor operates. This research uses MATLAB-Simulink to study the behavior of an induction motor with or without a variable frequency drive. An optimum three phase ac source will enable very efficient three phase induction motor operation. The speed control is the only issue. Louis, Leo explored the working principle and applications of an Arduino board in Working Principle of Arduino. This explores on how it can be used as a tool for study. fast processing and easy interface are main advantages. Today, many people using open source software and hardware devices. Day by day, technology is forming a new dimension by making complicated things look easier and interesting. These open sources platform provide free, low costs, highly reliable and affordable technology. This paper gives us glimpse of type of Arduino boards, working principles, software implementation and their applications.

4. Design Methodology



The aim of this project is to design and construct a motor controller assembly to rotate the 4 element Yagi antenna in particular directions. This Yagi antenna is installed on a customized 3 phase ac motor at a large height to transfer and receive signals without any interference. We all know that the hardware system has a principal component (which is the brain of the system) that is used to control the system by giving a set of instructions. So as shown in fig. we have main components such as Arduino, 2-axis Joystick, AC motor, DC motor, motor driver, relay SPDT. Here, the Joystick is used to give input to the controller which will rotate the antenna either in a clockwise or anticlockwise direction. To indicate these rotations DC motor is connected to the dial indicator. Speed of DC motor is controlled by motor driver .The PWM technique is used to vary input voltage to control the speed of the motor while the H-Bridge circuit is used for controlling the rotation direction of the motor. In this we have to step down the voltage that's why we are using step down transformer, and that step down voltage is given to Arduino. 2 Relay circuits are connected to Arduino at pin D2 and D3. The joystick is connected at pins A0 & A1. Limit Switches are connected at pin D4 & D8.

The joystick will give analog input for anticlockwise rotation by moving towards the left direction. As it satisfies the condition controller will trigger relay circuit 1 which goes high (1) and relay circuit 2 goes low (0) and the motor driver's IN1 goes low and IN2 goes high. Because of that motor will start to rotate in an anticlockwise direction and hence, The Yagi antenna will rotate in that direction. Similarly, we have to move the joystick in the right direction for clockwise rotation. As the condition satisfies the controller will trigger the relay circuit 1 to low & relay circuit 2 to high and the motor driver's pin IN1 to high & pin IN2 to low. Therefore motor will rotate in a clockwise direction and hence the Yagi antenna will also rotate in the same direction.

The controller has a cut-off point set for 1 complete rotation in either of the directions. It means that if the joystick moves to the left and the antenna rotate by 360 degrees, then no further rotation will happen in that direction and compulsorily, we have to move the joystick in the opposite direction. It will prevent the feedline from getting broken and disrupting communication. This is a user-friendly controller.

4. Result

Table. 4.1 Result

Sr. No	Direction	Angle	Rotation
1	Clockwise	45	North-East
2	Anticlockwise	120	South-West

Fig4.1 Antenna Rotation 45

Fig4.2 Antenna Rotation 120

5. Conclusion

This controller can able to give an omnidirectional nature to the 4 Element Yagi antenna and it is used to communicate in all directions. So we designed a motor control assembly for that. It increases the efficiency of work and reduces our efforts. And now we can rotate the antenna by sitting in a room, there is no need to rotate it manually. By rotating the joystick we can rotate the antenna in a clockwise and anticlockwise direction

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