Advanced User Controlled Roof Top Antenna Signal Tracking System Using AT89S52 MCU

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Abstract- *A rooftop antenna tracking system is designed to track the signal. Roof top antenna better suits in all the areas for tracking signals from a distant place. Here in this project the S antenna is fitted with DC geared motor and to control its operation we are using AT89S52 as controller. In this project we are using AT89S52, DC Geared motors, IR sensors, FM radio is used to track Radio signal. In this project, L293D H-Bridge is used to drive the geared DC motor.*

In this project antenna is placed at an altitude to track various frequencies emitted by radio stations. The system is provided with control switches. If user presses one switch, antenna tracks for corresponding radio signal. The rotation of antenna is based on the signal tracked by a pair of infrared sensor. Once the signal is matched antenna bowl will stop in that particular direction it indirectly turns ON the relay to switch ON the particular FM radio. In this way we can track the signal and can switch ON the particular desired frequency channel.

This project uses regulated 5V, 750mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/18V step down transformer.

Keywords- AT89S52, DC Geared motors, IR sensors, FM radio, L293D H-Bridge

I. INTRODUCTION

In telecommunications and signal processing, frequency modulation conveys information over a carrier wave by varying its instantaneous frequency. This contrasts with amplitude modulation, in which the amplitude of the carrier is varied while its frequency remains constant. In analog applications, the difference between the instantaneous and the base frequency of the carrier is directly proportional to the instantaneous value of the input-signal amplitude. Digitaldata can be sent by shifting the carrier's frequency among a range of settings, a technique known as frequency-shift keying. FSK (digital FM) is widely used in data and fax modems. Morse code transmission has been sent this way, and FASK was used in early telephone-line modems. Radio teletype also uses FSK. FM modulation is also used in telemetry, radar, seismic prospecting and newborn EEG seizure monitoring. Frequency modulation is known as phase modulation when the carrier phase modulation is the time integral of the FM signal. FM is widely used for broadcasting music and speech, two-way radio systems, magnetic tape-recording systems and some video- transmission systems. In radio systems, frequency modulation with sufficient bandwidth provides an advantage in cancelling naturally-occurring noise.

Frequency Modulation (FM) means varying a radio signal's frequency (instead of amplitude) to transmit useful information. Some assistive listening devices, ALDs, and some assistive listening systems, ALSs, use FM to transmit the signal representing sound from a transmitter to a receiver. Many movie theaters now transmit the soundtrack of the movie in a low powered FM signal throughout the theater. The theater will loan hard of hearing people a special receiver they can use to receive that FM signal and therefore to hear well. You can buy personal FM systems that you can use at home, in restaurants or in the car to hear someone you are with better ... or even to hear the television at home[11].

Now, even some hearing aids can receive FM with an integrated (built-in) or boot receiver. There is even a special frequency ranges that are assigned for use by assistive listening systems.FM has advantages and disadvantages. It can be used outdoors, and it can transmit through walls -- there is an alternative transmission method, IR that uses infrared light to transmit the signal that has different advantages and disadvantages. Whether the signal is transmitted via FM or IR, the advantage of using an ALD to transmit the signal is that it overcomes distance and can eliminate background noise.

II. LITERATURE SURVEY

Although the principle of frequency modulation has been known for a long time, the advantages for broadcasting were not generally realized until the 1930's largely as a result of extensive FM development work done by Major Edwin H.Armstrong. Among the advantages of FM are freedom from static and fading, and the ability of an FM receiver to capture

the stronger of two signals transmitted on the same carrier frequency.

James Clerk Maxwell showed mathematically that electromagnetic waves could propagate through free space. Heinrich Rudolf Hertz and many others demonstrated radio wave propagation on a laboratory scale. Nikola experimentally demonstrated the transmission and radiation of radio frequency energy in 1892 and 1893 proposing that it might be used for the telecommunication of information. The Tesla method was described in New York in 1897. In 1897, Tesla applied for two key United States radio patents, US 645576, first radio system patent, and US 649621.Tesla also used sensitive electromagnetic receivers, that were unlike the less responsive coherers later used by Marconi and other early experimenters. Shortly thereafter, he began to develop wireless remote control devices.

In 1895, Marconi built a wireless system capable of transmitting signals at long distances (1.5 mi. / 2.4 km). From Marconi's experiments, the phenomenon that transmission range is proportional to the square of antenna height is known as "law". This formula represents a physical law that radio devices use [13].

c) British Marconi

Using various patents, the British Marconi company was established in 1897 and began communication between coast radio stations and ships at sea. This company, along with its subsidiaries Canadian Marconi and American Marconi, had a stranglehold on ship to shore communication. It operated much the way American Telephone and Telegraph operated until 1983, owning all of its equipment and refusing to communicate with non-Marconi equipped ships. In June 1912, after the RMS Titanic disaster, due to increased production Marconi opened the world's first purpose-built radio factory at New Street Works in Chelmsford, and in 1932 the Marconi Research Laboratory.

d) Telefunken

e) Charles David Harold

In April 1909 Charles David Harold, an electronics instructor in San Jose, California constructed a broadcasting station. It used spark gap technology, but modulated the carrier frequency with the human voice, and later music. The station "San Jose Calling" (there were no call letters), continued to eventually become today's KCBS in San Francisco. Harold, the son of a Santa Clara Valley farmer, coined the terms "narrowcasting" and "broadcasting", respectively to identify transmissions destined for a single receiver such as that on board a ship, and those transmissions destined for a general audience. (The term "broadcasting" had been used in farming to define the tossing of seed in all directions.) Charles Harold did not claim to be the first to transmit the human voice, but he claimed to be the first to conduct "broadcasting". To help the radio signal to spread in all directions, he designed some omnidirectional antennas, which he mounted on the rooftops of various buildings in San Jose.

f) Edwin Armstrong

Inventor Edwin Howard Armstrong is credited with developing many of the features of radio as it is known today. Armstrong patented three important inventions that made today's radio possible. Regeneration, the super heterodyne circuit and wide- band frequency modulation or FM. Regeneration or the use of positive feedback greatly increased the amplitude of received radio signals to the point where they could be heard without headphones.

The purpose for an FM transmitter is to allow you to listen to any external audio source played through a car stereo, or any radio with an FM band. An FM (Frequency Modulated) transmitter, which is also called an RF (Radio Frequency) modulator or FM modulator, is an aftermarket device that you connect the audio from the earphone jack of a portable audio device, such as an iPod, a Zune; an MP3 enhanced cell phone, an MP3 player, and a CD player or satellite radio system, into the FM transmitter. The sound from the portable audio device is then broadcast through the FM transmitter as an FM radio station, and is picked up on your car radio as an FM station and played through the FM band out through the speakers.
Looking at how the FM transmitter works in a stage-by-stage description, the first stage is the converter that takes in the audio output from the external audio source and converts it into analog audio within the FM transmitter. In the second stage, the now converted analog audio signal is converted again into an FM signal by modulating the audio using FM modulation. This FM modulated signal is then laid onto an RF transmitter signal from the FM transmitter on a specific frequency as an FM radio station signal in the final stage. You can then tune your car's radio to the specific FM station frequency that the FM transmitter is set to transmit on and listen to the audio in your car on the FM band as an FM station. It doesn't matter if the FM transmitter is advertised as "new and Improved" or "brand new technology" or whatever. If it takes in external audio and you have to tune your car's FM radio to an FM radio station in order to listen to it, then it's an FM transmitter and the operational description in the above paragraph is how it works [12].

III. THEORY OF SYSTEM

If you live in the United States and you're one of the 19 million people who still prefer to pull their signals out of the air rather than pay a cable company to deliver them, you may already know that this month the vast majority of analog television broadcasts in the United States are scheduled to end and most free, over-the-air signals will be transmitted only in the new digital Advanced Television Systems Committee (ATSC) format. A massive advertising campaign is now telling people who get their signals from the ether that they'll need a radio with a built-in ATSC tuner or a digital converter box to display their favorite programs.

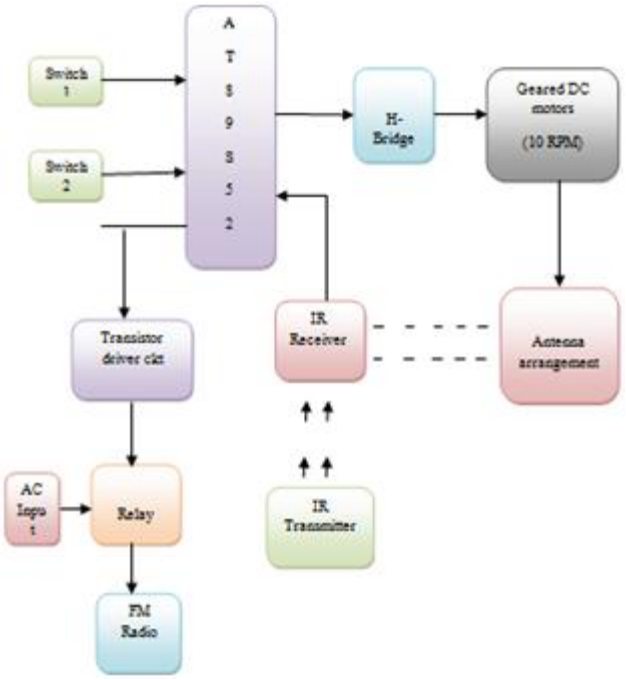

Fig.2: Block Diagram of System

What the ads don't mention is that most of those people will also need a new antenna. For the vast majority of you out there in Broadcast- Land, the quality of what you see—or even

whether you get a voice at all—will depend not on your radio or converter box but on the antenna that brings the signal to them. If you have a cable or satellite hookup, you might think that this antenna issue is irrelevant—but think again. Some owners of high-end systems complain that the signals coming from their satellite or cable provider aren't giving them the picture quality they expected. That's because cable and satellite operators often use lossy compression algorithms to squeeze more channels, particularly local channels, into their allotted bandwidth. This compression often results in a signal with less detail than the corresponding terrestrial broadcast signal provides. For voice that has already spent a fortune on their home-theater systems, a couple of hundred dollars more for a top-of-the-line antenna obviously makes sense. And of course, antennas are also good backup for the times when the cable gets cut or the satellite system fades out due to rain or snow. In addition, they serve second radio sets in houses not wired to distribute signals to every room.

The decades-old designs of most radio antennas on rooftops and in the market today are typically configured on a horizontal

IV. CIRCUIT DESIGN AND HARDWARE

A. Microcontroller

Fig.3: Microcontroller AT89S52

fish bone, with arms of varying lengths to handle a broad range of frequencies. Though the engineering of antennas in other spheres has advanced radically over the years, manufacturers of television equipment have stuck pretty much with the old designs for economic reasons. Traditional antennas were good enough for analog television, and the shrinking customer base for broadcast reception didn't offer much incentive to plow money into new designs.

The transition to digital has changed all that. Most digital channels are broadcast in UHF, and UHF antennas are smaller than those used for analog signal, where most broadcast signals were VHF. Also, the multipath problem, arising from signals that reflect off buildings and hills, which may have occasionally caused ghosting on analog signals, can completely destroy a digital picture [5].

radiation travels by means of oscillating electromagnetic fields that pass through the air and the vacuum of space. Information, such as sound, is carried by systematically changing (modulating) some property of the radiated waves, such as their amplitude, frequency, phase, or pulse width. When radio waves strike an electrical conductor, the oscillating fields induce an alternating current in the conductor. The information in the waves can be extracted and transformed back into its original form.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high- density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in- system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

C. DC Motor

Fig.4: FM Radio

B. FM Radio

Radio is the transmission of signals through free space by electromagnetic waves with frequencies significantly below visible light, in the radio frequency range, from about 3 kHz to 300 GHz. These waves are called radio waves. Electromagnetic

A DC motor in simple words is a device that converts direct current (Electrical Energy) into Mechanical Energy. It's of vital importance for the industry today and is equally important for engineers to look into the working principal of DC motor in details that has been discuss in these article. In order to understand the operating principal of DC motor we need to first look into its constructional feature.

The very basic construction of a DC motor contain a electrical current carrying armature which is connected to the supply end through commentator segments and brushes and place within the north south poles of a permanent or un electromagnet as shown in the diagram below:

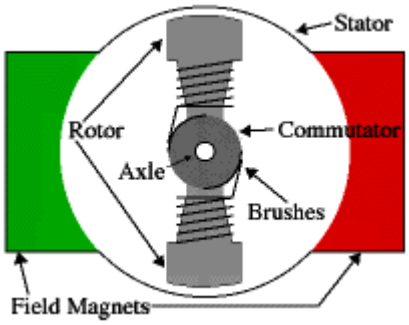

Fig.5: DC Motor

V. RESULTS

This syXtem is designed to track the signal and better suits in all the areas for tracking signals from a distant place. In this project antenna is placed at an altitude to track various frequencies emitted by radio stations.

The initial stage of this project is to provide power supply. The whole circuit operates on 5vsupply.

Fig.6:Initial position of the circuit

After giving power supply all the LEDS will glow because of parallel connections. The step-down transformer is used to convert 230v ac supply to 9v.Then the rectifier converts ac into pulsating dc.AT89S52 microcontroller is the heart of this project. There is a reset button for initial position of the circuit.

By default "signal tracking" message will be displayed on the LCD. There are two switches, one for clockwise and another for anticlockwise .when signal gets detected, antenna will stop and FM will get ON. At that time relay will be ON. This is the final output.

Fig.7: Final output.

VI. CONCLUSION

This proposed project presents an implementation of Advanced User Controlled Roof Top Antenna Signal Tracking System using AT89S52 MCU using IR sensor.

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