

Automatic Tracking Antenna

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Abstract- The automatic tracking system primarily functions to identify the source of signal. The signal may be any type and any kind, it automatically identifies the presence of a particular signal and the antenna will remain in stationary position as long as the signal link is found out. Whenever the signal link break between the antenna and the satellite or source the antenna revolves continuously in search of the signal. In this project we have used IR source and IR receiver for detecting and receiving the signal. The controller circuit is made on a MCS-51-core microcontroller. Its main purpose is to search the signal and when it not found the signal it give signal to motor to rotate the antenna. There are different sections in this project such as Receiver section (using photodiode and IR sensor), Transmitter section (modulated), DC motor, motor driver and power supply. This system can be implemented in different way like it can be used in radar application and the receiver in the antenna can be changed and which can further be used in the detection of different types of signal.

Keywords- IR sensor, Not Gate, Antenna, Monostable Multivibrator.

INTRODUCTION

Automatic Tracking System means that system is capable of detecting various signal automatically without changing the system parameter every time. The benefits of satellite communication is huge like it's helpful in transmitting the information over a larger distance and it has high speed and reliable. In this project we have used a controller that will enable the system to search for the signal by sending instructions to the various component used in this project. The main aim of this project is to search for any type of signal automatically. For this we have used IR sensor whose function is to sense the certain characteristics of surrounding, antenna is used whose function is to convert electric power to radio waves and vice versa. Microcontroller is used whose function is to process the data and takes decision accordingly. Motor is used to move the antenna in search of signal. Modification can be done by making changes in different section according to our requirement.

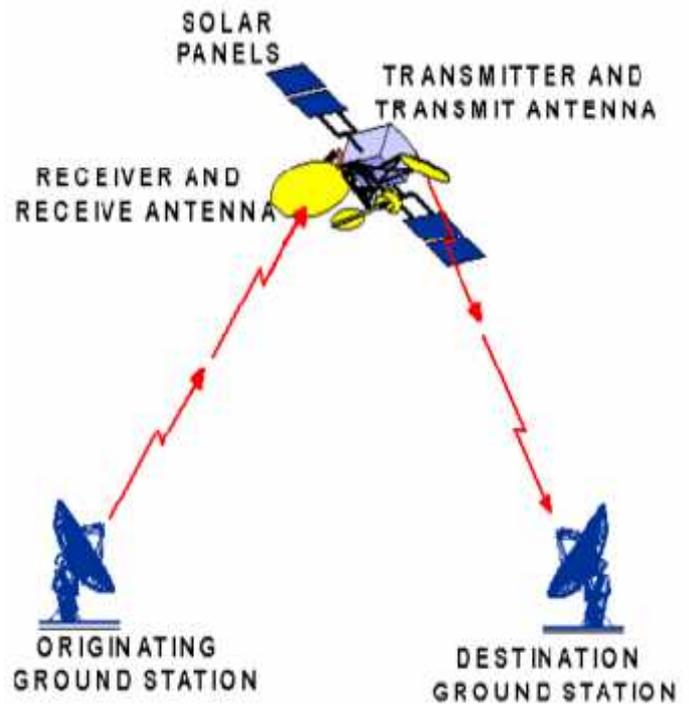


Figure 1.1 communication overview

I. HELPFUL HINTS

2. Important Component

2.1 Infrared Sensor

Infrared means below the energy level of the color red, and applies to many sources of invisible energy. It is an electronic instrument which is used to sense the certain characteristics of its surroundings by either emitting or detecting the infrared radiation. These are not visible to human eye its wavelength lies between 0.75 to 1000 micrometer [1].

2.2 Multivibrator

It is an electronic circuit used to implement multi state system such as oscillators, timers etc. There are three types of Multivibrator: - 1) Astable (in this circuit is not stable in either

state) 2) Monstable (one state of circuit is stable and one state is changes and external triggering is required) 3) Bistable (circuit is stable in either state) [2].

2.3 IC 555 Timer

It is a single chip version of Multivibrator. It is used for basic timing function like turning a light on after a certain interval of time. It got its name from three 5 kilo ohm resistor in series employed in the internal circuit of the integrated circuit. It is also used to avoid interference and unnecessary triggering [3].

2.4 Bridge Rectifier Circuit

This circuit in the power supply circuit. AC supply is given to the transformer used and in order to convert ac to dc, bridge rectifier circuit is used. This circuit is a combination of four diodes at a time on two diodes will be in on state and the other diode will be in off state. This circuit converts into pulsating dc and by using a capacitor it gets converted into dc current [4].

3. Circuit Description

3.1 Power Supply Circuit

POWER SUPPLY (+VE)

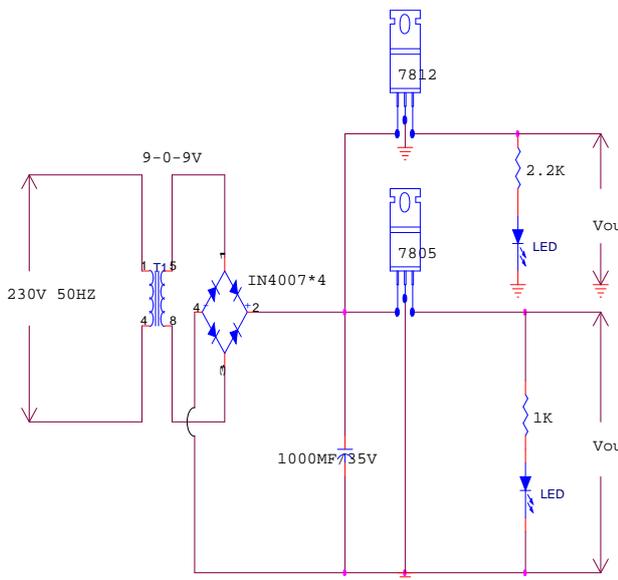


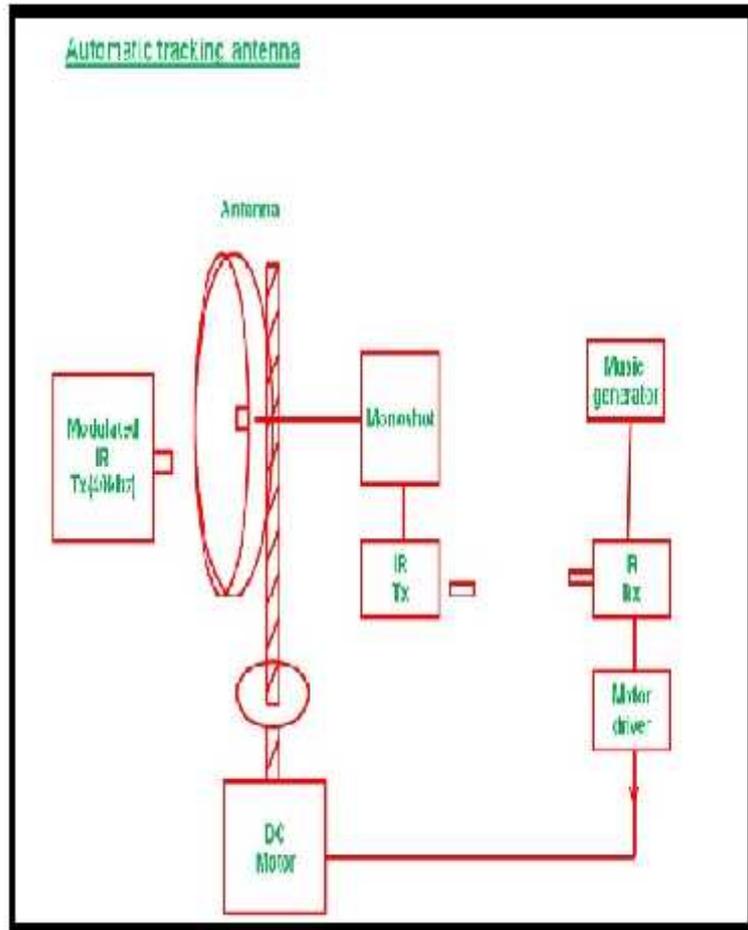
Figure 3.1 Power supply circuit

This circuit contains a step-down transformer, diodes, voltage regulator, capacitor, and light-emitting diode. Here 230V, 50Hz AC signal is given to a transformer and at the output of

the transformer we get 12V AC signal. Now in order to get the DC signal a bridge rectifier circuit is used. Bridge rectifier circuit is made by using diodes. The output of the rectifier circuit is not in pure DC form, in order to get DC form a capacitor is used. Voltage Regulator is used to supply constant voltage irrespective of changes in load current. The output of the IC regulator (7805 and 7812) is given to the light-emitting diode for indication purposes.

3.2 Signal Transmitter and Receiver Circuit

This circuit consists of a Monostable Multivibrator, 555 timer integrated circuit, motor driver, motor, antenna, signal receiver. Monostable Multivibrator is used to generate a square wave and the time during which the output will be either high or low is decided by the 555 timer circuit. After receiving the signal, the signal will be sent to the motor driver which will turn on the motor and the antenna which is attached to the motor will start rotating in search of a signal and when it finds the signal it will stop. Antennas are mainly used for coupling the transmitter with the medium. Signal receiver is fixed in the antenna which will detect the corresponding signal from the signal transmitter and when the receiver detects the signal the antenna will stop rotating [5].



4. Working

The aim of this project is to search for infrared signal. The antenna will keep rotating until it finds the signal [6]. Here infrared signal is being detected, for this an infrared receiver is fixed on the antenna. The block diagram is shown in the figure Supply is given from the step down transformer which will convert the 220V ac to 12V ac and the output of this is given to the bridge rectifier circuit. In this circuit, for particular cycle like positive or negative half cycle two diode at a time will be conducting and other two diode will be in off state. A capacitor is attached with the bridge rectifier circuit. Bridge rectifier circuit is used to convert alternating current to direct current, but the output of this circuit is not pure direct current (pulsating dc), so in order to get pure direct current wave form we have used the electrolytic capacitor which is connected to bridge rectifier circuit. An alternative full wave rectifier can also be used in place of bridge rectifier circuit but it would have made the circuit complicated and costly due to the involvement of center taping [7].



Figure 4.1 Actual view of the project

Voltage regulators IC 7805 and IC 7812 are also used in the power supply circuit which will give fixed voltage regardless of change in its input voltage or in load conditions. The output of the bridge rectifier circuit is given to voltage regulator through capacitor with respect to ground and thus, fixed voltage is obtained. The output of the IC regulator is given to the light emitting diode for indication purpose through resistor. This will indicate whether we are getting the required voltage from the regulator to the motor driver section or not. When the remote is pressed the infrared signal is transmitted which will be received by the receiver which is located on the antenna. At that time logic 1 is passed to the 555 timer which is connected with a Monostable Multivibrator [8] and a Not

gate is connected between timer and the motor. When logic 1 is passed to the 555 timer then it signifies the availability of signal, at that time logic 0 is passed to the motor due to the presence of not gate and the motor will not rotate. When logic 0 is passed which signifies absence of signal, at that time due to the presence of not gate logic 1 is passed to the motor driver and the antenna will start rotating in search of signal. In this way the entire process of searching the signal will continue. The actual view of the project is shown in the figure 4.1.

5. Conclusion

This project worked satisfactorily in the laboratory condition. The following points are concluded from the operation of the project,

1. The antenna movement depends on the precession of the stepper motor. In this case the stepper motor used is having a step size of 8.5 degree. So the precession is not that accurate but it is quit below the experimental acceptance level.
2. The antenna detects an object from a distance of 10 ft. Adjusting the transmitter and receiver power can increase range of detection.

5. References

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