ARTIFICIAL INTELLIGENCE BASED TUNING OF SVC CONTROLLER FOR CO-GENERATED POWER SYSTEM

Carlos Aquino Ruiz[1], Celedonio E. Aguilar Meza[2], Dolores Zamorano Saavedra[3]

Telecommunication Academy, National Polytechnic Institute ESIME CU
Santa Ana Avenue #1000 Coyoacan, Mexico Federal District
[1]caquino@ipn.mx; [2]cele_ag@hotmail.com; [3]dzamorano@ipn.mx

ABSTRACT

Because of the tuning issues that face rural communities located in mountainous areas where TV signals and telecommunications infrastructure is poor, it has been chosen to design a system which may perform programmable automatic tuning. Now then, the TV channels will ensure the best signal for each, using the programmable rotating aerial. By including this device, programmable tuning the aerial swivel is intended to reduce waste of time in searching channels for the user, and to increase the comfort of the same, as it requires a remote control for tuning.
This system will benefit the general population, especially to the provinces which are usually far from the TV broadcast antennas.

Keywords: *Poor Reception Antenna, Programmable Antenna, Television, Remote Control, Sensor)*

INTRODUCTION

Among the major life activities of individuals are jobs and entertainment and in rural areas being the most common pastime is watching television, but this activity is affected by the poor reception of the signals communication. This is, because most of our national territory consists of mountainous areas, where the television transmission system lacks of an adequate infrastructure.

In the best of the cases with a dipole antenna the user can grasp one, two or three channels, but must manually orient it in such a way that it may allow it to receive the best signal for each channel. With the advent of an aerial or yagi antenna with improved receiving signals, although sometimes the user is on the need to manually orient it if the reception is not good.
With this; the user requires the support of another person in order to know the best channel signal to the antenna location. Currently there is a system that allows the antenna to rotate 360 ° but the problem that the user still faces is the loss of time searching for each channel as it is completely manual and the user therefore loses comfort.

FUNDAMENTALS OF ANTENNA

An antenna is a device which is intended to emit or receive electromagnetic waves into free space. A transmitter antenna transforms voltages into electromagnetic waves or currents, and a receiver performs the inverse function.
The Russian physicist Aleksander Stepanovich Popov (1859-1905) was the inventor of the antenna which consisted of a wire that allowed the transmission and reception of electromagnetic waves.

ANTENNA TYPES

A dipole is a center-fed antenna used to transmit or receive radio waves. These antennas are the simplest from the theoretical point of view.

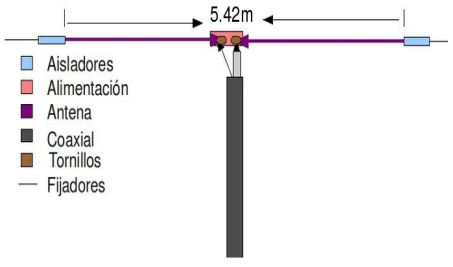

Figure 1 Dipole antenna

In the 30s, in Japan, Dr. Hidetsugu Yagi Tohoku Imperial University and his assistant, Dr. Shintaro Uda developed a new antenna design that combined a simple structure with high performance.

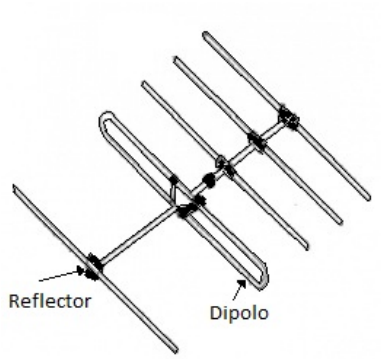

Figure 2. Yagi Antenna

It was a directional antenna made of parallel segments supported by a boom, and placed horizontally on the ground. It was designed for use in ultra short wave, as well as for HF and higher frequencies.

FUNDAMENTALS OF TELEVISION

The beginning of television go back to the experiments of John L. Baird, in the late 20's. He Broadcasted images of 30 lines on radio medium wave. In 1936 the BBC TV started issuing, using mechanical and electronic systems that soon proved the superiority of electronic systems. . During the next decade the advantages of increasing the bandwidth and frequency (VHF) was demonstrated. From 1946 the great expansion of television had begun.

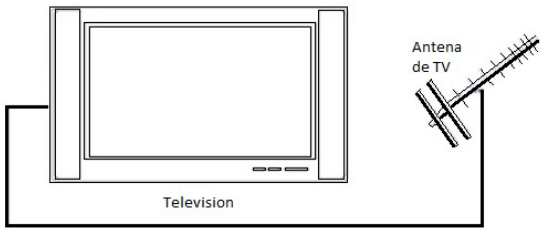

Figure 3 Diagram-TV antenna

The broadcast TV signals, operates as follows, in the broadcasting center are transmitted to the video and audio signals and to the main transmitters in strategic locations, usually at the top of some dominant mountain . These links are provided by microwave links point to point. The main transmitters cover a wide area, in cases where there is darkness, with relays. The transmission is in the UHF and VHF bands. The receiver serves to receive the video signal and audio, after some processes the receiver is able to reproduce the video signal and the audio.

INTRODUCTION TO PROJECT COMPONENTS

Remote Control: Remote control is used to control the system based on the signal emitted by it.
Receiver: Integrated Circuit TSOP 1738 which has the function of receiving the signal from the remote controls and to condition it in order to receive a proper voltage.
Power supply: Device Manager to provide the voltage to each of the parts that make the receiver circuit.
Microcontroller: PIC type Integrated circuit that stores the main program, which causes the system to function properly, it is responsible for receiving the signal from the control and process to activate devices such as LCD and gear motor
LCD: A device loaded displaying information provided by the PIC and each of the menus that the user can use for different functions you can perform such as to save system channels position. Sensor: This attachment is responsible for indicating the position that keeps the antenna with respect to two previously established benchmarks. Also indicate the maximum points in which you can rotate the antenna and thus avoid excessive twisting.

Power Circuit: Part of manager the system in charge of connecting the PIC and the gear motor, which allows us to move the gear motor in both directions and similarly isolate the PIC connection with motor.

Servo: This device is made up of the gear motor which is responsible for moving the antenna with enough force and the speed needed. It also has a proper size for mounting the device.

DESIGN AND IMPLEMENTATION

Transmitter

Considering that remote controls are used every day we chose the option to decode the signals it sends to a control already established in the market.

Based on the characteristics of the protocol used; which consists of the pulse width signal which is formed by 12 bits sent on a carrier wave of 40kHz. The code starts with a header of 2.4 ms or 4 times T, where T is 600µS. The header is followed by command of 7 bits and 5 address bits.

The address and commands consist of logical ones and zeros. A logical one is formed by a low level of 600µS or 1T and a high pulse or Q2 1200 uS. A logical zero is formed by a 600 uS low pulse height and the 600µS. . The space between two transmitted codes when a button is pressed 40ms. The bits are transmitted starting with the least significant bit. The total length of a bit stream is always 45ms.

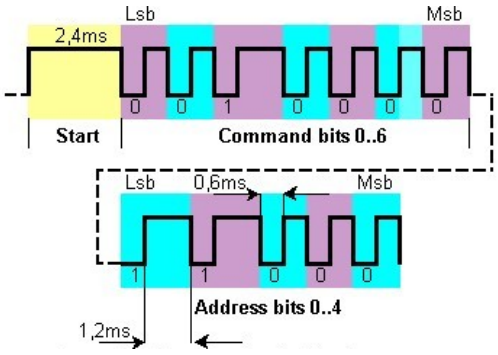

Figure 4 Signal delivered by the remote control

Considering this was a program for the PIC which was in charge of decoding the signals from the remote control.

Receiver

The receptor is composed and mainly designed for TSOP receiver 1738, a LCD 20 x 4 and a microcontroller 16F877A specifically as shown in Figure 5.

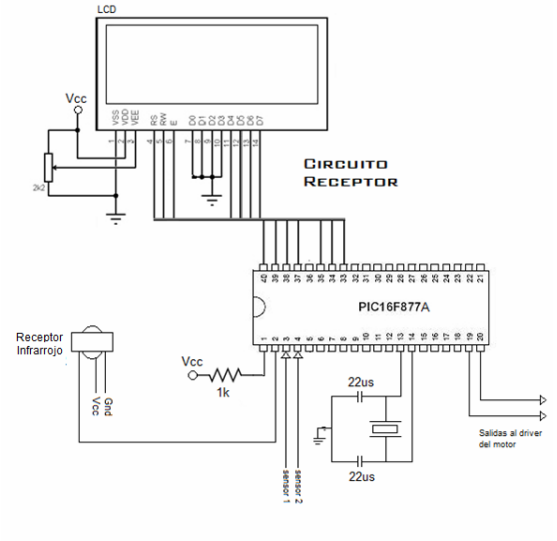

Figure 5 circuit receiver

The function of the circuit in Figure 5 is received from a control signal, decode and presented on the LCD with different menus which give different options for positioning the antenna and storing the position of each channel.

PIC

This PIC 16F628A is responsible for receiving the signal sent by the infrared signal and detects the code for the button pressed to activate the LCD and then the desired message

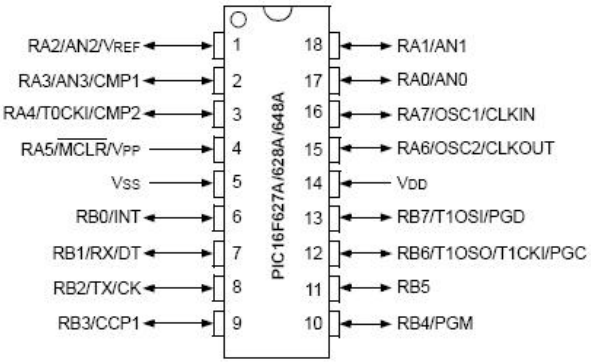

Figure 6 PIC receiver

After the PIC receiver decodes the signal sent by the transmitter the PIC shall show the selected key on the keyboard matrix, 10 of the 16 keys are used to display the registration number, the rest of the keys will be assigned to the spin antenna, save or delete the record of the position of the antenna and extra keys.

LCD

The LCD is responsible for rendering the user with information on the key pressed or position records.

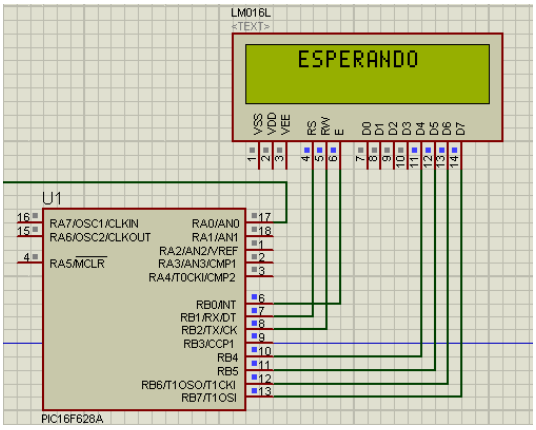

Figure 7. Circuit LCD Operation

When you turn the device to send a message to the user to perform some operation. As shown in Figure 7.

Position Sensor

Encoder will use a sensor which has the following characteristics:

• Provides a digital code for each different angle
• It is based on the interruption of an infrared beam light

For this reason a single encoder type sensor wasdesigned with two contacts for each of the limits (left limit and right limit). Figure 8 shows the electronic diagram of the designed sensor.
This sensor is responsible for giving the PIC to the reference position when the antenna is at 0 ° and the maximum position is 359 °.

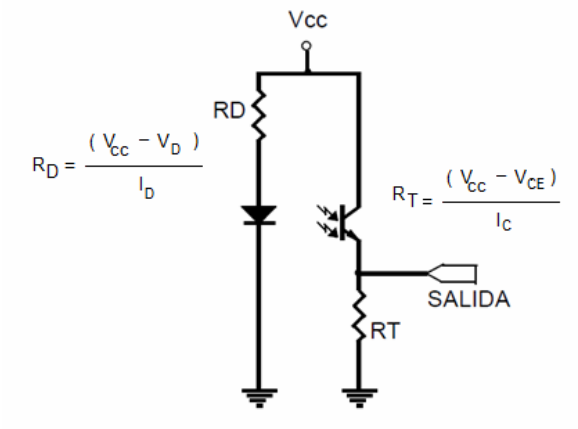

Figure 8 Configuration used in the design of a sensor Encoder of a single contact

Power Circuit

At this stage the aim is to control by a gear motor using PIC and H. Bridges

H Bridge

The H bridge is in charge of giving the servomotor the desired direction depending on the position where the antenna is located.
Given the demand for minimum and maximum current of the IC a Gear motor L293B is used which complies purposes without inconvenience because it has the following features:

• Output current of 1 A per channel.
• Signal for enabling outputs
• High noise immunity
• Power for separate loads of control power.
• Protection against over - temperature.

When the PIC sends a signal it will depend on the pressed key to rotate the motor and a position sensor to be performed subsequently to the position required by the user channel.

Gear motor

At this stage, the aim was to choose the best type of engine, the main requirements for the election were:

• Soft turn
• High enough torque to move the antenna without difficulty
• Low Supply Voltage (preferably 5v to power with the same font throughout the project)
• DC Motor

Figure 9 Geared motor

Motor reduces to 5 V which is particularly suitable for use in robots, providing 291 revolutions per minute in vacuous with a consumption of 110 mA.

This engine may be used up to 24 V is not provided continuously, as is the case of competition robots, usually feed voltages 2 and 3 times and the nominal motor voltage only for during brief instants.
The motor axis is 6 mm and mates perfectly with the antenna base.

TESTS AND RESULTS

Testing the remote control

Began testing this new alternative using commercial remote and an infrared sensor to detect special signal produced by this control, where we obtained the following signs of some control keys.

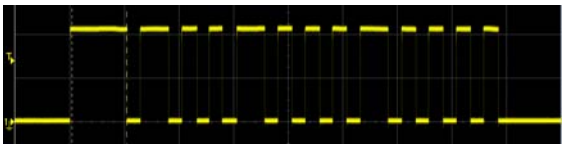

Figure 10 Signal corresponding to the 0 key

Receptor test

In conducting the necessary tests, it was obtained satisfactory results, since you can control the menus and the options presented by the PIC through the LCD. The PIC used in this stage is a 16f877A and was selected because it meets sufficient requirements, and has an internal memory of 256 bytes that is more than enough, for storing logs for each channel, it also has five ports that are more than enough for all components of input and output.

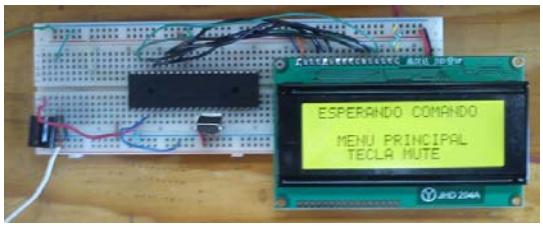

Figure 11 Receiver circuit complete with LCD showing message

Figure 12 Screens showing the different menus. Showing different messages presented on the LCD for the receiver circuit which correspond to different circuit functions.

Sensor Tests

Considering that our antenna requires a sensor to know where is the reference point we proceeded to design a suitable sensor, such as a sensor Encoder.
By using the configuration of Figure 13 it ensures that when the engine reaches a limit antenna, the PIC receives a high level signal which causes the motor to stop. In this design a reel was used to simulate the sensor disk but only two holes represent contacts with the disk.

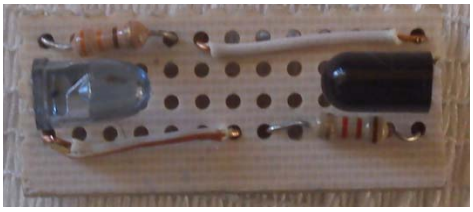

Figure 13 already mounted physical sensor using a Emitting diode and a phototransistor

Testing Geared motor

In the first tests with the engine included in the antenna, we verified that the power of this motor is AC type. As motor opted to use was the DC type power.

Figure 14 Motor to use

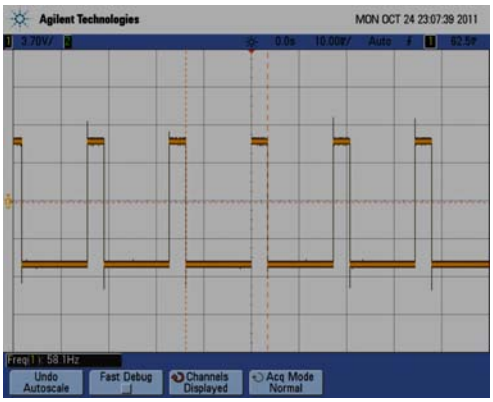

Figure 15 Motor power signal proposed

It is noteworthy that for the correct implementation of the new antenna motor some physical changes were made.

Conclusions

During the project there were difficulties such as the design of the remote control, the first proposal consisted of a transmitter circuit which consisted of a PIC and infrared diode matrix keypad and a receiver circuit consisting of a PIC, an LCD and LED receiver. The main problem encountered was the long-distance transmission, because the circuit used was very directional which means that the lead had diagonal receiver decoding errors and this hampered the proper functioning of the device. To address the issues raised we decided to scrap this idea and go for a different design which would save the transmitter circuit design, and would be reused as a commercial remote control for remote control of the system. The main advantage over conventional rotating antenna, is that the positioning of the antenna for each TV channel is performed only once and these positions are stored in the device memory, and then may be used by a commercial remote control for selecting different channels.

The main advantage over conventional rotating antenna, I could highlight that in the system built the positioning of the antenna for each TV channel is performed only once and these positions are stored in the device memory, and then be used by a commercial remote control for selecting different channels received giving a wearer comfort.

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AUTHOR PROFILES:

Ing. Carlos Aquino Ruiz was born in Mexico on April 2, 1972 is in Communications and Electronics Engineering from the National Polytechnic Institute, a research professor and areas of development are applied computing, data networking and security.

Ing. Celedonio Enrique Aguilar Meza was born in Mexico on march 3, 1959 and holds a degree in communications and electronics from the National Polytechnic Institute IPN, is currently research professor and development areas are the processing and handling, coding and compression, safety and efficient transmission.

Dolores Zamorano Saavedra. She is a methodological research and has master's degree in Educational Sciences. Nowadays it is a research professor at the School of Mechanical and Electrical Engineering (ESIME) in Mexico. Her areas of development are assessment and project development, scientific writing and methodology of science