Moving the Antenna

- The Arduino Mega takes information from the computer and makes the controller move the antenna motor.
- Once the antenna moves, the Arduino receives the x, y, and z coordinates from the accelerometer and magnetometer.
- With these coordinates, it calculates the position of the antenna using Equation 1.
- It then displays these values on the LCD.

Reading Sensors

- The microcontroller being used is the PIC24F16KL402.
- The microcontroller controls the communication between the accelerometer and the magnetometer and relays the information down to the Arduino using UART communication for display.
- The magnetometer is on the same board as the Microcontroller shown in Figure 3.
- The accelerometer is connected on a separate board, shown in Figure 4 is the full connection of the assembly up top.

Measurements

- Figure 5 shows the test of moving the magnetometer with Figure 6 showing the waveforms of the board with the green line counting the movement.
- Figure 7 shows the test of moving the magnetometer with Figure 8 showing the waveforms of the board with the green line counting the movement.
- After the antenna rotates and the data from the sensors is sent back down to the Arduino, the Arduino calculates where the antenna is positioned and displays it.
- The LCD shows where the operator wants the antenna to be positioned and where the antenna presently is in Azimuth and Elevation.
- The current Azimuth position is calculated using the Magnetometer sensor reading.
- The current Elevation position is calculated using the Accelerometer sensor reading.

Conclusions

- To be safe for the environment, our product was made in small form, with no moving parts, causing little degradation of parts.
- Our low power usage is run off of 10 mA at 3 V for safety of operators.
- Our product has the advantage of being more accurate than most products on the market by using an accelerometer and a magnetometer on the antenna rotor.
- Other products do not verify that the position of the antenna is correct.

Applicability

- The Magnetometer and Accelerometer sensors talk to the Microcontroller using SPI communication.
- The Microcontroller communicates to the Arduino through a RS-485 cable.

HAM Radio Club Antenna Positioner System
University of Arkansas Electrical Engineering Senior Design Project

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