DESIGNING A LOW COST TILT AND AZYMUTH ADJUSTMENT SYSTEM FOR AN ANTENNA USING A MOBILE PHONE

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ABSTRACT

The aim was this project was to design and construct a Low Cost Mobile Controlled Tilt and Azimuth Adjustment system for an antenna. This is a device which can be installed in a sector antenna at the top of a tower. Basically this device has two servo motors , a GSM shield and an arduino circuit. The two servo motors are installed to control both tilt and azimuth separately, a sim card installed in GSM shield provides the connectivity between operator and the unit.The arduino circuit was used to control the whole system. Installing a sim card in GSM shield provides unique identity for each sector antenna. C++ language was used in coding to provide a very efficient algorithm for carrying out required task.

Keywords: *Tilt, Azimuth, Arduino*

1. INTRODUCTION

Although the existing systems available to control antennas have some failures. Some of them are designed to control antenna from the ground level of the tower using a switch. Some of the antennas are controlled manually. In both these situations there should be an operator/technical officer to adjust tilt and direction levels in to desired levels. In rainy days these operations are not possible.

When coverage optimization is carried out at desired areas, these problems are arises for each network provider in Sri Lanka. Most of the times these problems are not available in foreign countries because they are having sufficient amount of investments to automate their networks. As a developing country, the providers in Sri Lanka cannot achieve that level because of the investment needed.

By considering these drawbacks, this mobile controllable low cost tilt and azimuth adjustment system was introduced.

2. EXPERIMENTAL

The block diagram of the designed system for low cost mobile controlled tilt and azimuth adjustment system for mobile antenna is shown in figure1.
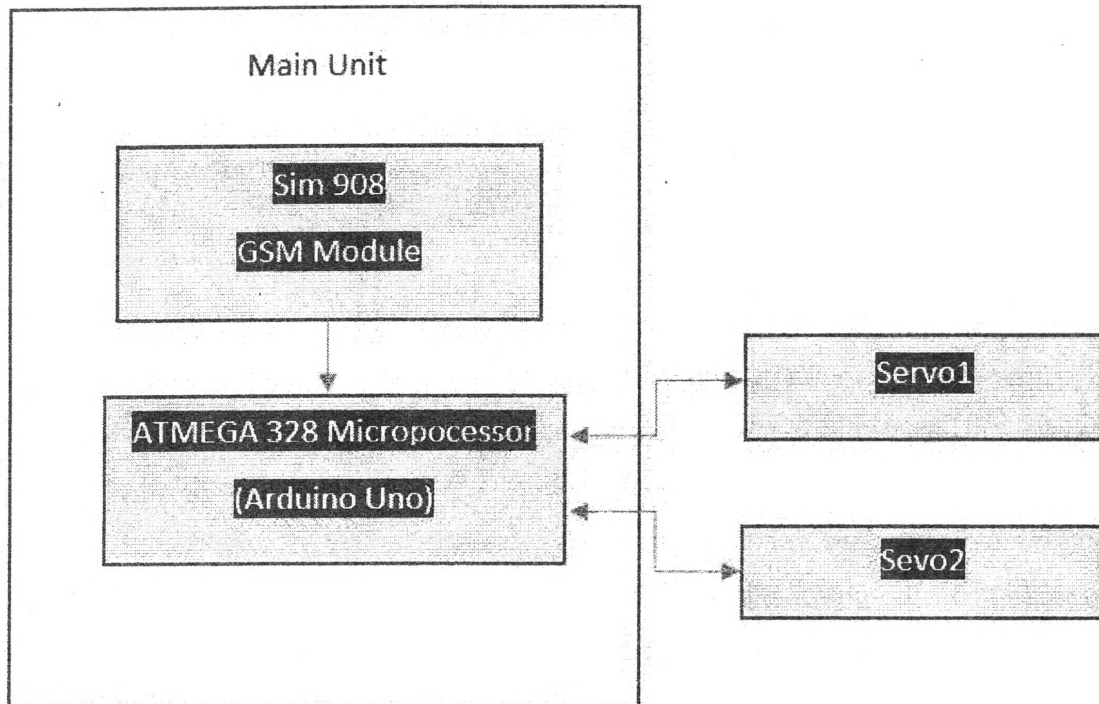

Figure 1: Block diagram of Proposed Low Cost Mobile Controlled Tilt and Azimuth adjustment system

To establish a connection between operator and the antenna sector, a sim card was installed in a GSM shield. This method was used because it enables operator to identify any antenna sector by a unique number.

The job assigned to GSM shield was to receive SMS (Short Message Service) from the operator and hand over them to ATMEGA328 Microprocessor[1]. The Microprocessor checks whether the messages arrived are in given format or not. If a message is in a correct format, it starts to read the message. At the reading stage of the message it identifies what the message saying. i.e. the message is to control tilt or azimuth. To achieve efficient control from the mobile phone, two servo motors are attached to the system to control both tilt and azimuth separately.

At the development stage, C++ language was used to write the code and Arduino software was used as IDE.

Tilt - Elevation refers to the angle between the beam pointing direction, and the local horizontal plane. It is the up-down angle

Azimuth - Azimuth refers to the rotation of the whole antenna around a vertical axis. It is the side to side angle. Typically the main mount bracket is loosen and the whole antenna is swing all the way around in a 360 degree circle[2]

3. RESULTS AND DISCUSSION

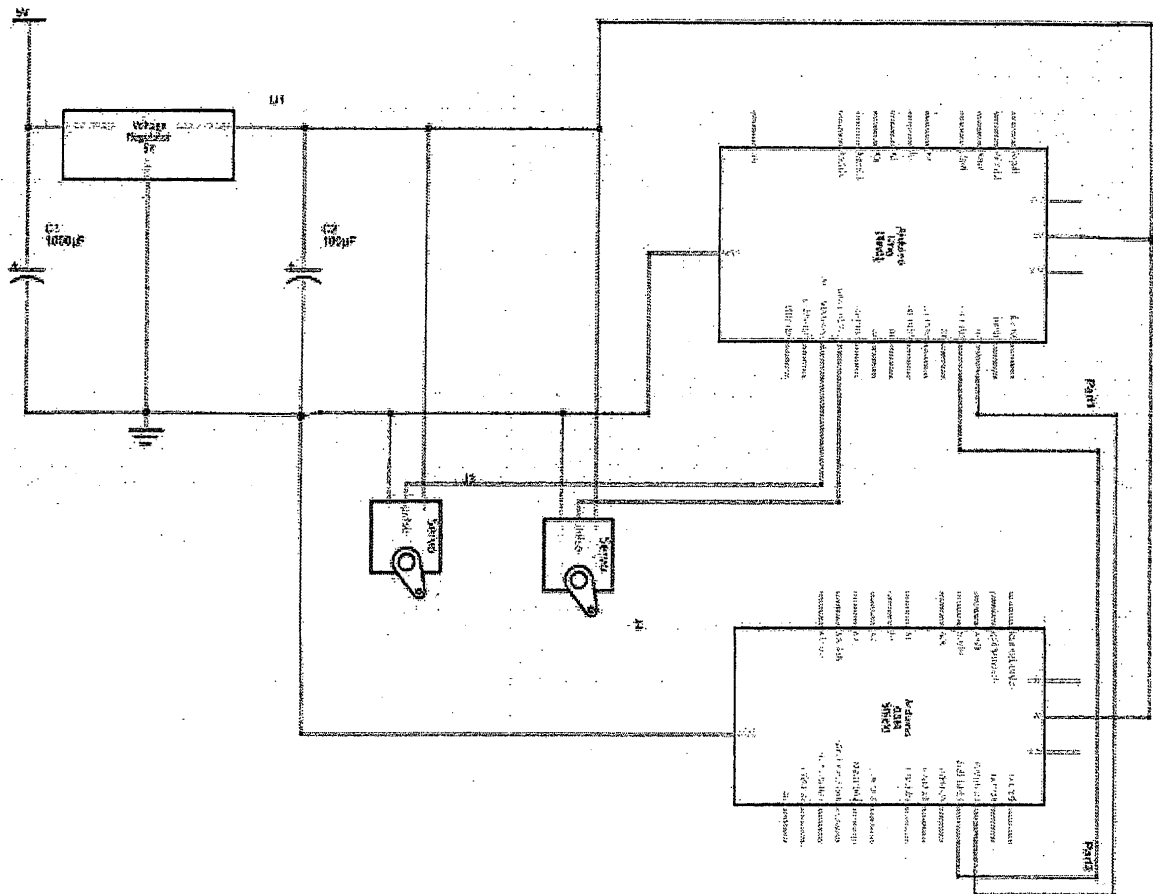The circuit diagram of the designed system is given in figure no 02.

Figure 2: The Circuit Diagram of the Circuit

At the development stage of the system, the controllable amount of tilt and azimuth angles were extended than in existing systems to provide an optimizing ability.

The device was tested by sending each of tilt and azimuth angles within scope of the unit. As a result of testing, the device was corrected to avoid some of the errors.

But when a sms received to the unit, both servos attached to the system vibrate due to pulses generates by the GSM shield.

The arduino Uno (ATMEGA328) and GSM Shield (Sim908) were used as in given figure 03.
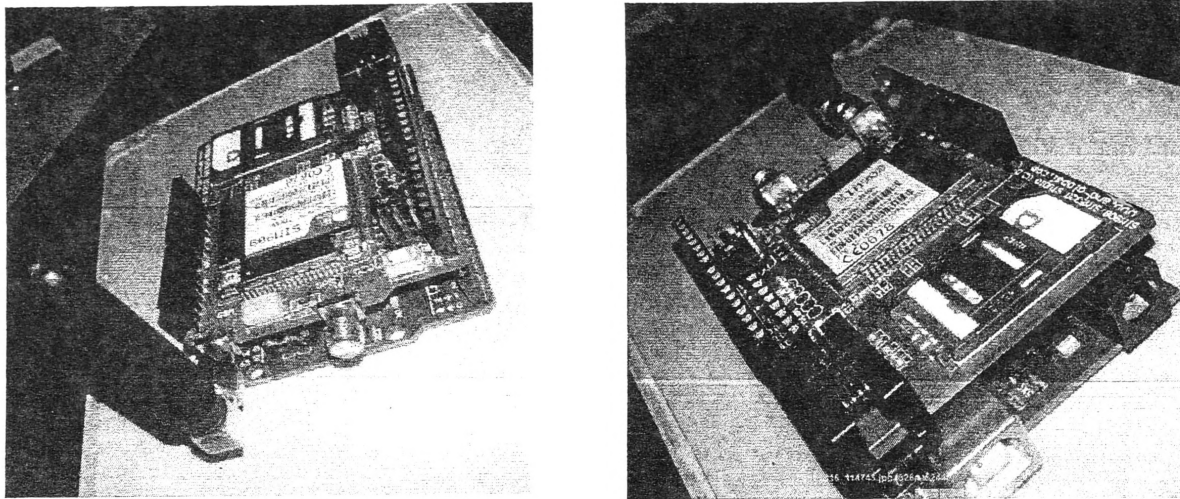
Figure 3: The method used to connect GSM shield and Arduino Uno

4. CONCLUSION

The Main aim of this project was to develop a system to control tilt and azimuth of an antenna using a mobile phone. At the initial stage, it was developed as a prototype. But when apply to practical scenarios it can be developed using industrial servo motors. For that only change to be done is to be replace the Servo motors and the power supply. Mainly this low cost project was targeted developing country like Sri Lanka. This solution will help to any network provider who uses antennas. Also this would be helpful for operators who is having responsibility to optimize coverage level at any weather condition or in any rural area.

ACKNOWLEDGEMENTS

REFERENCES

[1]. http://www.cooking-hacks.com /documentation /tutorials /geolocation- tracker- gprs-gps-geoposition-sim908-arduino-raspberry-pi

[2]. http://www.telecomhall.com/what-is-antenna-electrical-and-mechanical-tilt-and-how-to-use-it.aspx.