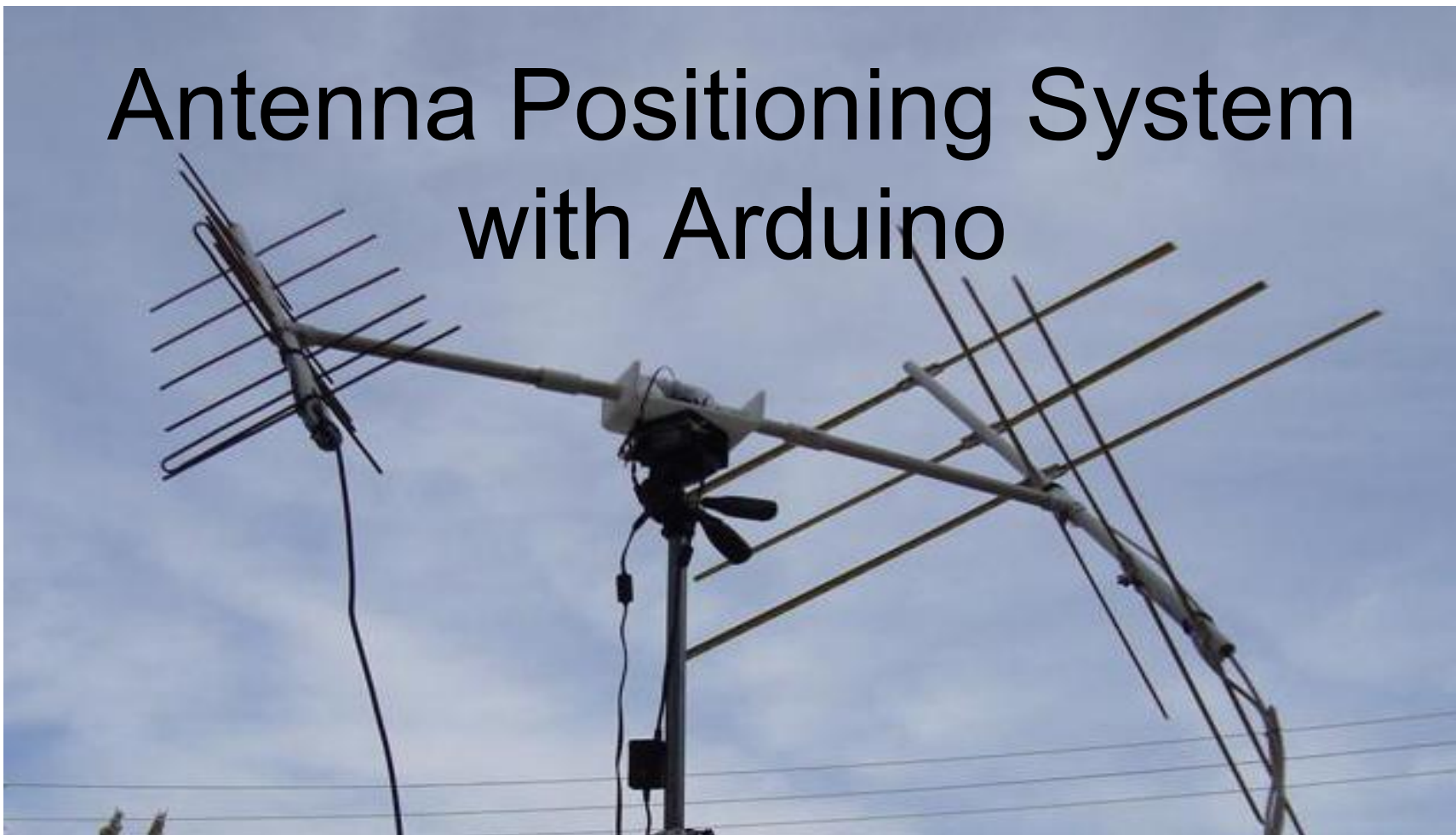# Antenna Positioning System with Arduino

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Foothill Amateur Radio Society

Antenna Positioning Systems

- Commercial Rotators: generally meant for heavy beams and tall masts used for HF

- Most are Azimuth only, bulky, expensive

- Satellites move both in Azimuth and Elevation

- Satellite Antennas are relatively light weight
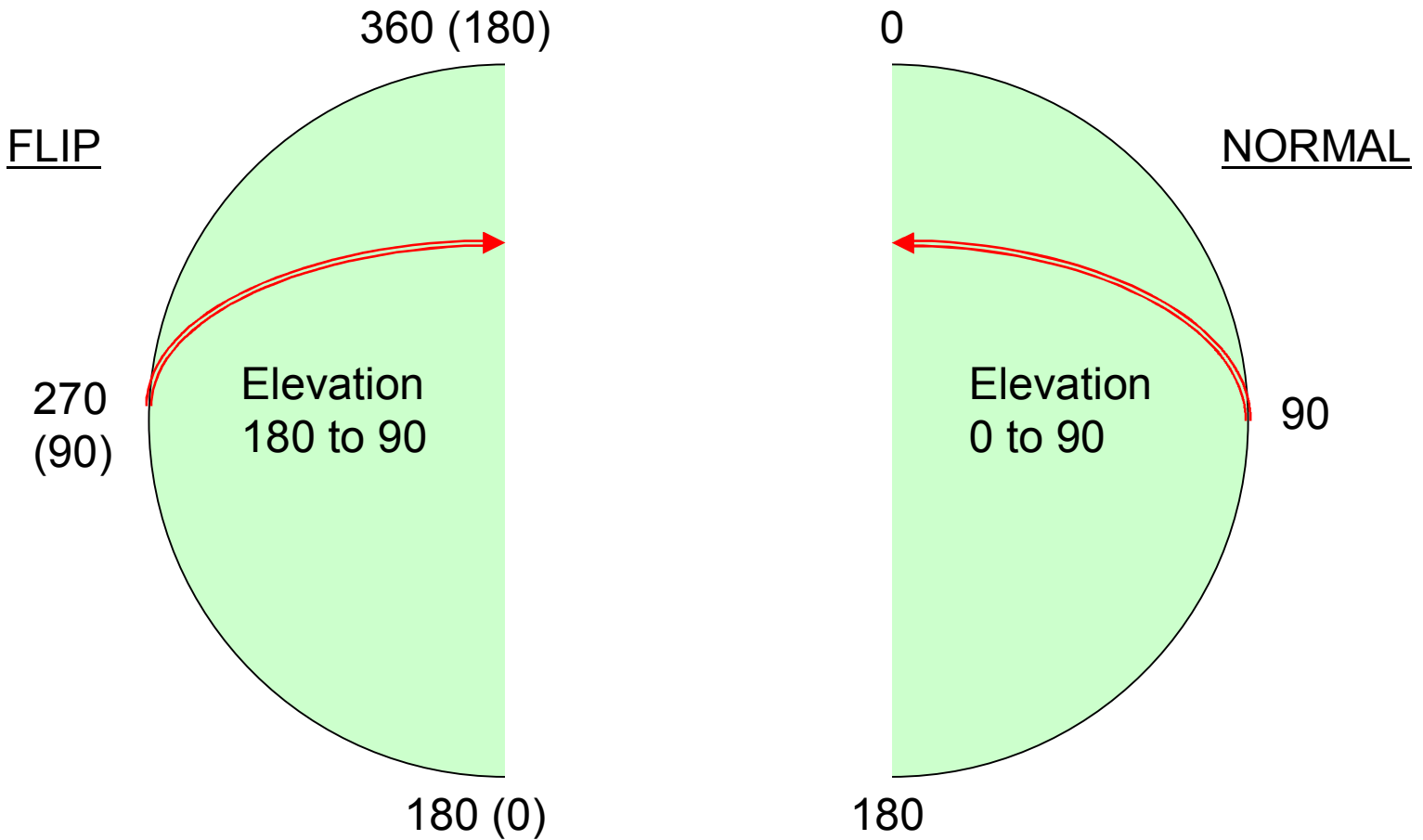
New Design: Keep It Simple

1. Simple Open Frame Design
2. Rigid Plastic sheet and PVC fittings
3. RC Servos - cheap, compact and powerful
4. Arduino - small, powerful and easy to embed, easy to program

RC Servos

- Used Standard Servo
- Futaba S3305 ($35)
- Good Torque (8.9kg-cm)
- Fast & Accurate Positioning (0.2s/60°)
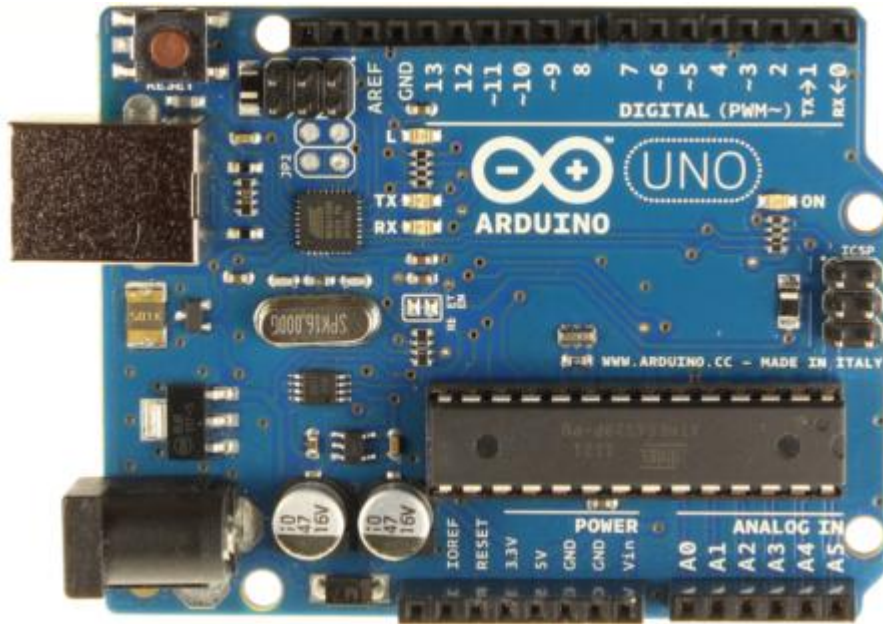- 3-wire Interface: Power & PWM Control
- Rotation Angle: 0 to 180 degree ☹

Solution: Use Flip Mode

FLIP

360 (180)

270
(90)

Elevation
180 to 90

180 (0)

NORMAL

0

Elevation
0 to 90

90

180

Arduino

- Versatile Microcontroller Board
- Fast Processor (16MHz)
- Pulse Width Modulation Feature Built-in
  - 6 PWM output pins
  - PWM software library
- Onboard EEPROM
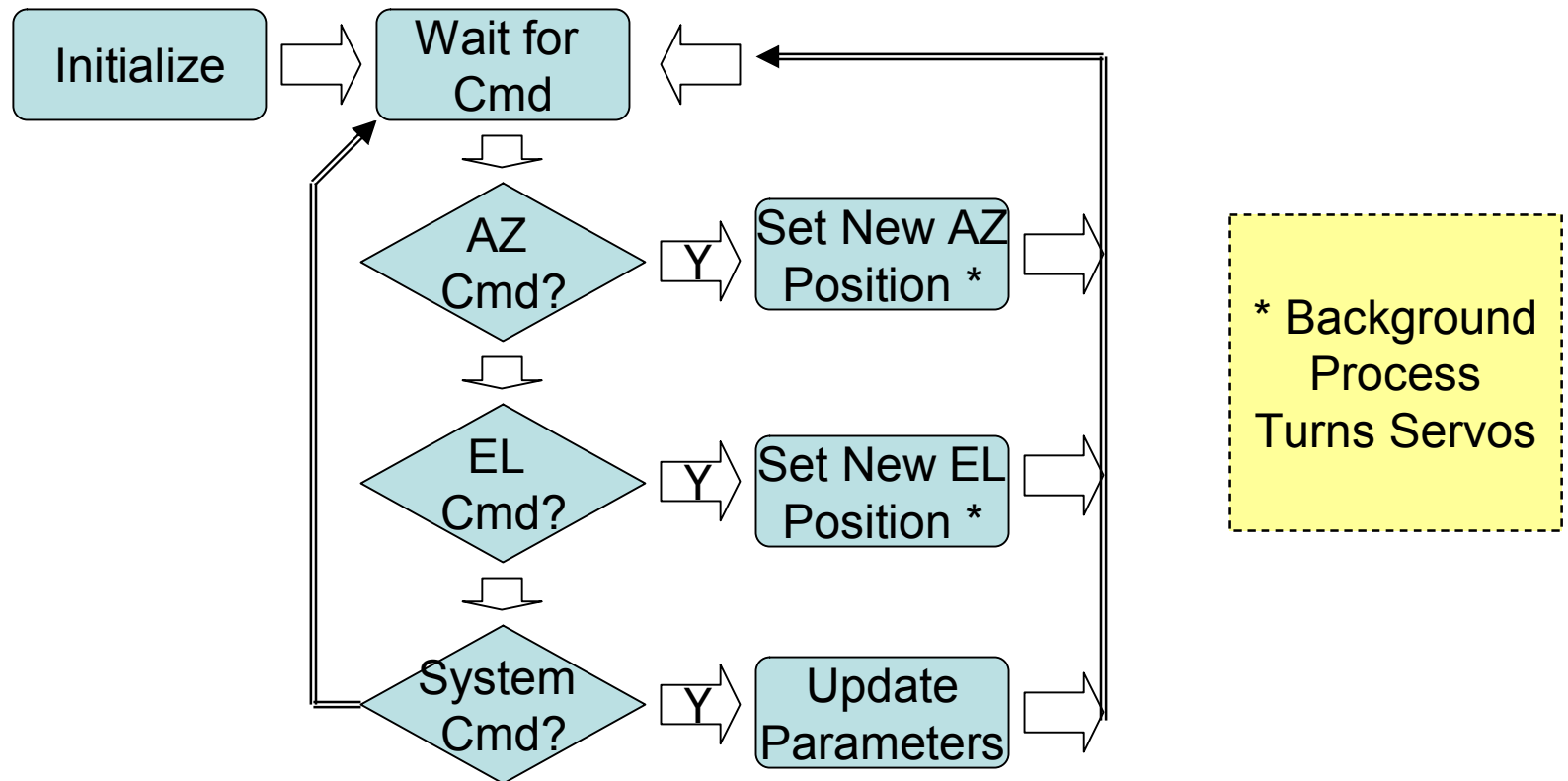- Native RS-232(TTL) Serial Interface

Arduino Uno & Pro Mini

2.1 x 3 inch

0.7 x 1.3 inch

Flow Diagram of Control Program

Arduino Program Structure

```
void setup () {
    Servo AzServo;  // initialize servo
    AzServo.attach (pin9, minPW, maxPW);
}


void loop () {
    // read & parse command from serial port
    AzServo.write (AzDegrees); // move servo
}
```

Rotator Commands
(EasyComm II)

AZ[nnn.n]   (position azimuth rotator)
EL[nn.n]   (position elevation rotator)
SA   (stop azimuth rotator)
SE   (stop elevation rotator)
VE   (show version)

HELP   (show this page)
SV   (show current values)
SV AZPW|ELPW [nnn nnnn]   (min/max pulse widths)
SV SPEED [nn]   (1 to 50 rpm)
SV TIMEOUT [nn]   (seconds)
SV DEFAULTS   (reset defaults)

Live Demonstration

Azimuth Positioning,

Elevation Positioning,

Flip Mode,

High & Low Speeds,

Etc.

Tracking AO-27 Satellite

Summary

- High Utility & Fun DIY Project
- Can Support Any Protocol
- Simple Construction & Mounting
- Easily Portable & Setup
- Perfect for Satellite Antennas
- Cost ~ $110   (+ Elbow Grease !)

References

- Arduino www.arduino.cc
- RC Servos www.pcbheaven.com, etc.
- RC Store sheldonshobbbies.com, etc.
- Tap Plastics www.tapplastics.com
- AMSAT www.amsat.org

Thank You !

Wishing you a fun time

Building Arduino & Amateur Radio projects !

Email Questions or Comments to

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