Design and Construction of a Wayfinding Method for the Completely Hackable Amateur Radio Telescope

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Background

- K-12 curriculum mainly covers basic astronomy, neglecting topics like radio astronomy[5]
- Designing amateur radio telescopes/opening telescopes to the public can solve this issue
- BHARAT, SALSA, and CHART (Completely Hackable Amateur Radio Telescope) are affordable examples[1-3]
    - Lack of wayfinding method limits their ability to record data in a specific area
- GAVRT Program allows public access to larger, more versatile telescopes capable of tracking[4]
    - Prohibitively expensive for amateurs
- Guidance system necessary to give amateur options like CHART the same capability

Aim

- Design a way for CHART to identify the direction it points in in Altitude - Azimuth, Galactic, Right Ascension-Declination coordinates

Methods

- CHART position information derived using 9-DoF Sparkfun IMU connected to laptop:
    - IMU relays acceleration and position data through computer
    - Laptop interfaces with IMU through Arduino IDE, calculates position through GPS coordinates, entered on the laptop
    - Coordinates are then displayed on the laptop screen
- IMU follows CHART's movements since it is attached to the waveguide via duct tape

Figure 1: CHART in use at Winona State University [2]

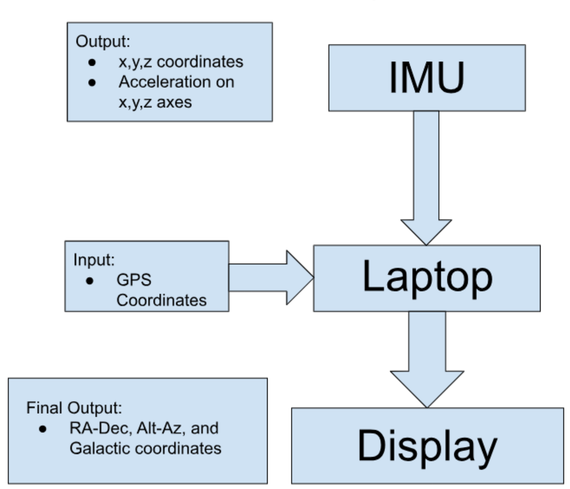

Figure 2: Block diagram illustrating how the system works

Future Goals

- Building and testing this approach in the field on CHART
- Adding a star-finding feature to allow the telescope
- Eliminate the need for processing data through the laptop to reduce system complexity by:
    - Replacing the laptop with a power supply
    - Adding an LCD screen to display the coordinates where CHART is pointing
    - Adding a hard shell to the guidance system for protection

Sources

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