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## Portable Satellite Tracking with Automated Initial Calibration

This project involves the design of a portable satellite tracking system that requires little or no initial setup by a user. The computations required to track the position of a satellite are done onboard and the system provides a simple user interface which allows the unit to be operated without needing additional equipment. An azimuth-elevation rotor is controlled by the onboard processor and sensor package which allows an antenna can be pointed at a satellite. To minimize the setup required, the system does not need to be leveled or pointed in any specific direction for proper operation due to the automated setup and calibration that occurs when the system is started. This setup and calibration is achieved through the use of a three-axis accelerometer and a two-axis magnetometer. The accelerometer is used to determine the horizontal plane, thus compensating for a non-level placement of the system. Once the horizontal plane is determined, a magnetometer is then used to determine the directional orientation of the system. Based on the horizontal plane and the directional orientation, the azimuth and elevation coordinates can be re-mapped in software to the true position of the azimuth-elevation rotor. After the user or a GPS has provided the current location and time, the system is then setup and calibrated. Once the initialization is complete, the position of a user selected communications satellite is continuously calculated using the SGP4/SDP4 model and the antenna orientation is constantly updated to follow the position of the satellite.



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