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GNSS Student Toolkit

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Abstract

The GNSS Student Toolkit helps geomatics students learn about the complicated Global Navigation Satellite Systems (GNSS) and coordinate transformations. This toolkit was made with MIT App Inventor for software and Arduino/Venus GPS for hardware integration. It lets you convert between these things in real time:

• Geographic (λ, φ, h), Geocentric (X, Y, Z), and projected grid coordinates (Easting, Northing).

• Palestine-specific map projections: Palestine 1923 Grid, Palestine 1923 Belt, Israel TM Grid, and UTM (Zone 36).

Key features include:

1. Interactive transformations using 12 ellipsoids (e.g., GRS80, Clarke 1880).

2. Hardware integration for live GPS data streaming (HDOP ≤1.0, 9-satellite fix).

3. Visual map interfaces (road, aerial, terrain views).

The toolkit enhanced conceptual understanding of geodesy and cut down on practical learning time by 60% when tested with surveying students at Palestine Polytechnic University. Venus's GPS accuracy (±2.5 m) and lack of RTK support are among its drawbacks. Subsequent iterations will incorporate stakeout capabilities and release to app stores.

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