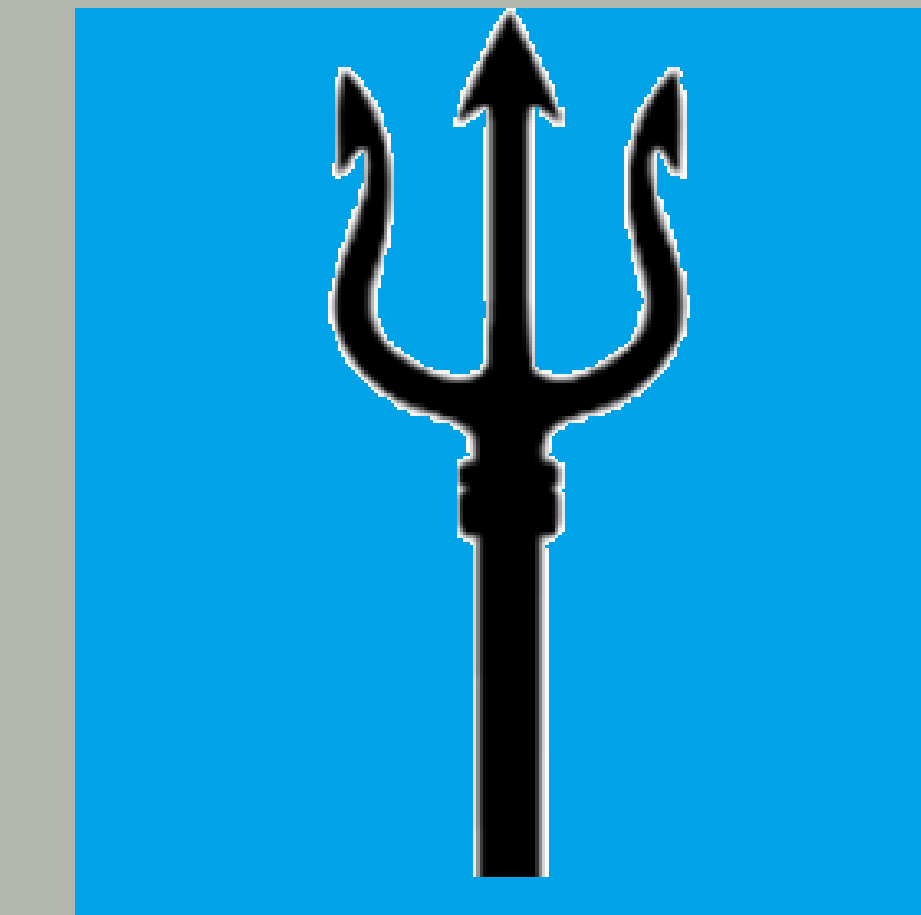# Trident GPS System

Solving Multipathing three GPSs at a time

Background

Surveyors work on the most precise level they are capable of. They use survey grade GPS receivers to receive data from active satellites in view. The common accuracy level is centimeters. A significant problem in quality of collected data occurs when obstructions, for example buildings or trees, nearby or overhead obstruct the line of site between the satellite and the GPS receiver.

These obstructions create potential for signal reflection, causing the GPS receiver to obtain an erroneous location. This phenomenon is termed multipathing by surveyors. This is a huge setback to surveyors because they set up their equipment, survey for hours on end, then process the data and recheck the position the next day. If multipathing occurs, they will need to recollect data.
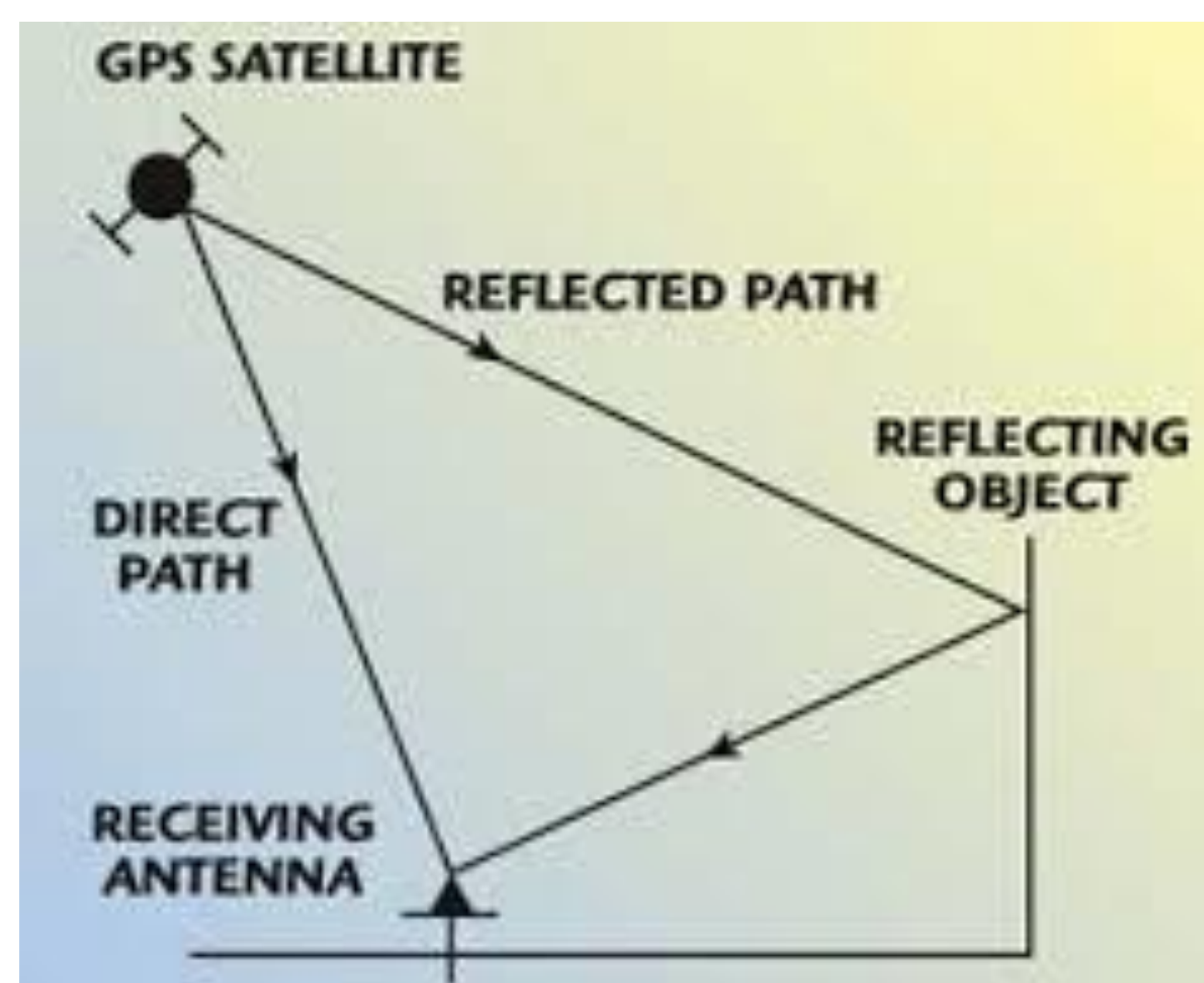

Figure 1. GPS signal reflects off of obstructions causing Multipathing

Description

Instead of one GPS receiver, we use three. One main receiver and two to cross check the main. Oriented linearly with the main receiver in the middle.

We wrote a program to connect to all three receivers, and collect data from all three. Checks for multipathing and notifies surveyors of system status via a graphical user interface.
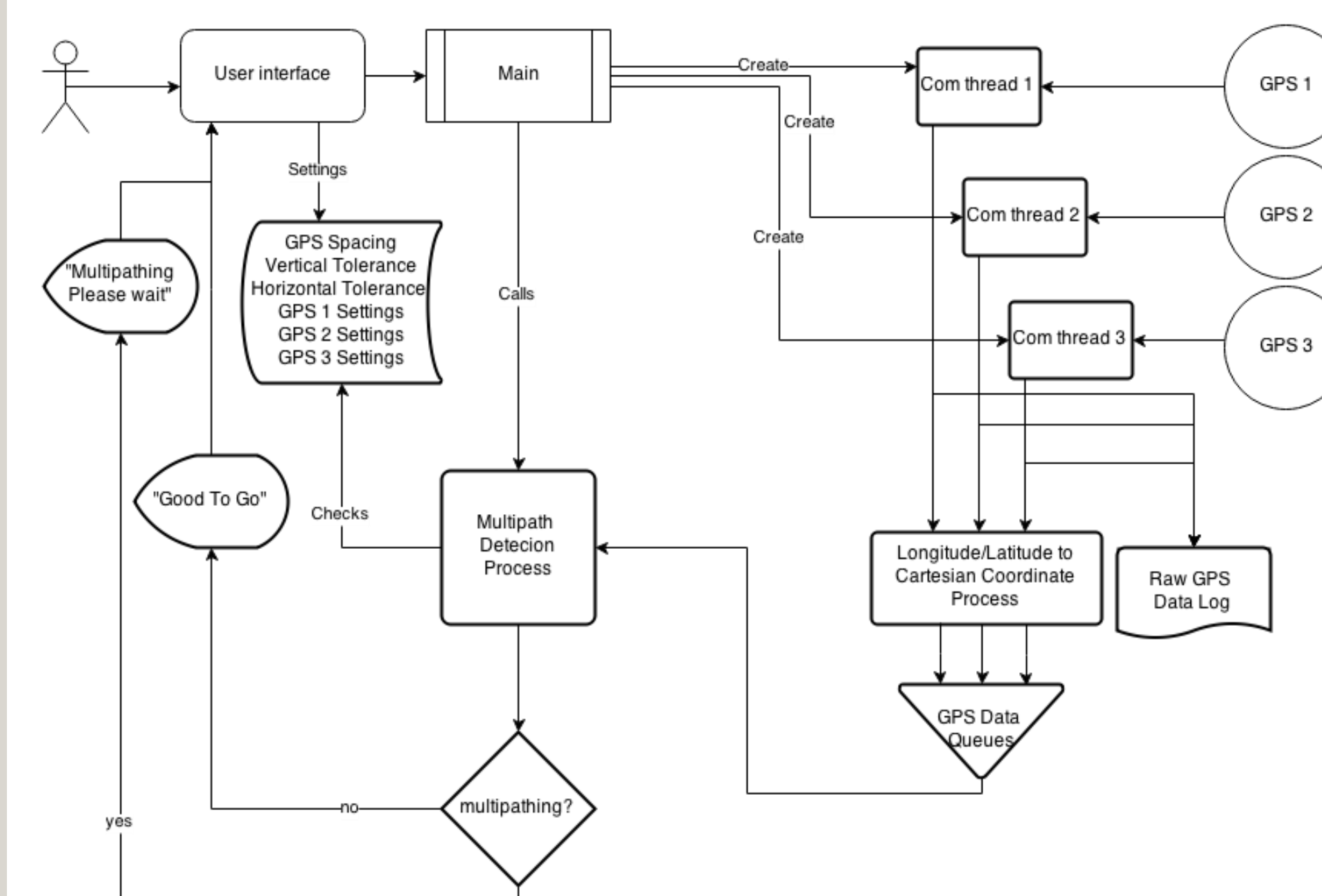

Figure 2. Trident Software Flow Diagram

The programming language we used was Python for speed and simplicity. Incorporating the Kivy framework for the GUI.

The multipathing algorithm tests for multipathing by:
- single dot product calculation
- average dot product calculation
- linear tolerance check
- outlier check
- linear altitude tolerance check

Results

- Bullet
- Bullet
- Bullet

Snapshot of User interface

Figure 3. Initial testing of GPS connection and parsing via USB

Figure 4. Trident GPS system, transmitting via Bluetooth to laptop

Contact Info

Client:
Dr. Dan Gillins Ph.D., P.L.S.
Assistant Professor of Geomatics
School of Civil & Construction
    Engineering
Oregon State University
Dan.Gillins@oregonstate.edu

Team Members:
Albert Le
    leal@onid.oregonstate.edu
Nathan Christopher
    Christon@onid.oregonstate.edu
Daniel Lin
    Lintzu@onid.oregonstate.edu