Figure 1: Sub-system block diagram
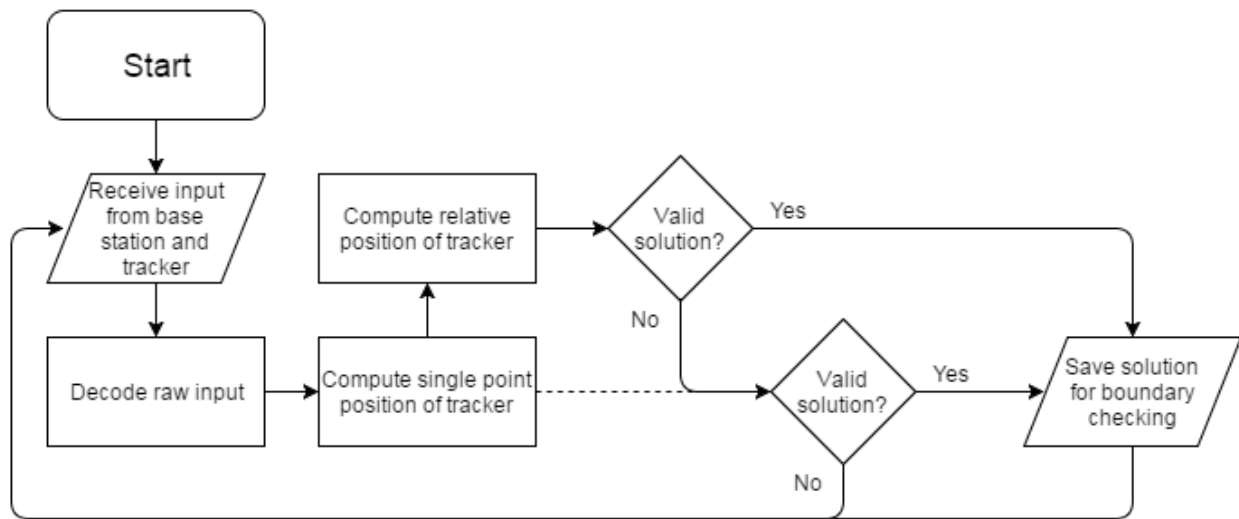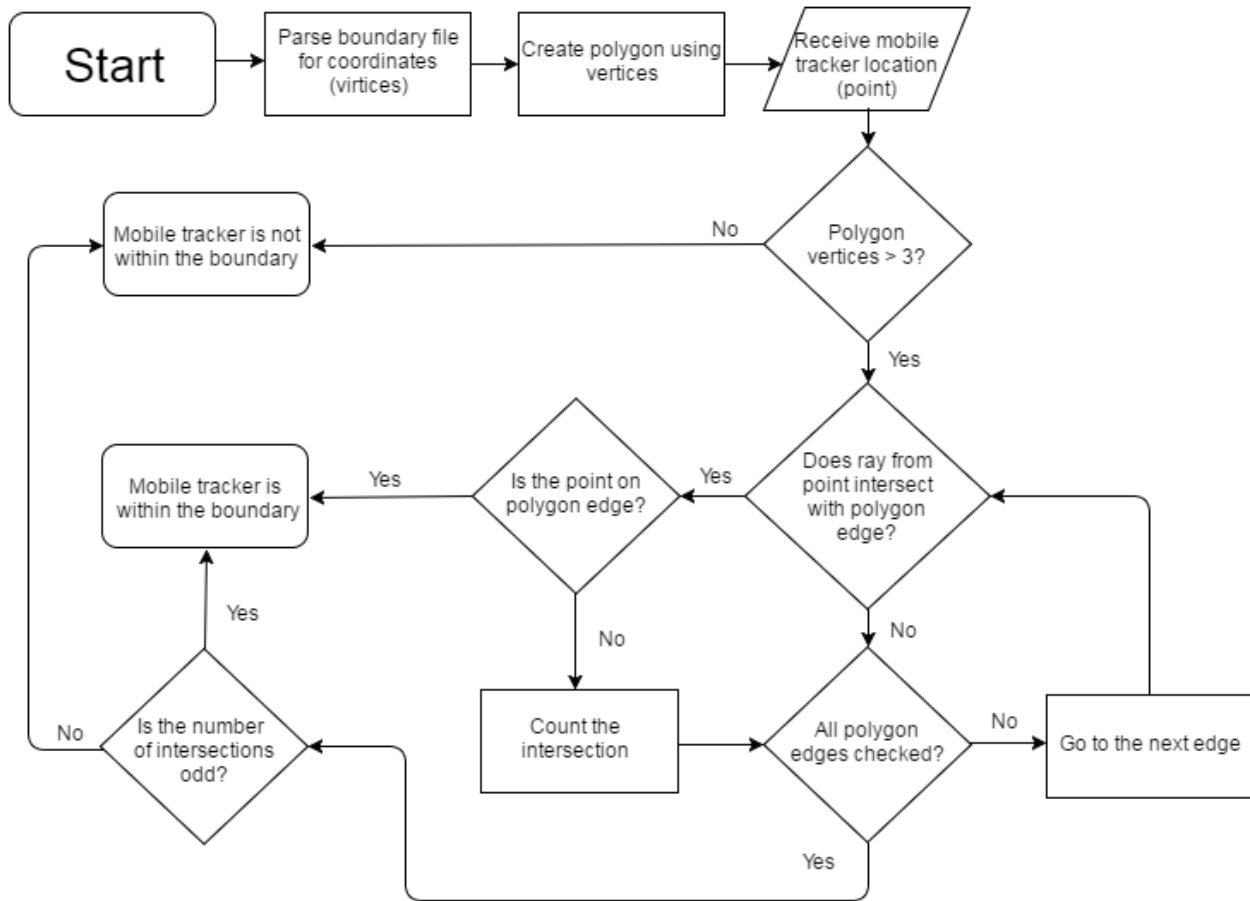

Figure 2: Positioning flowchart.

Figure 3: Boundary checking flowchart.

The fence controller subsystem is responsible for processing data received by the user interface and the mobile tracking unit. The subsystem is entirely software based and will run on the BeagleBone Black. The fence controller will receive requests for the location of the mobile tracker and new boundaries for the virtual fence. Outputs will consist of the location of the mobile tracker and information on whether or not the tracker is within the boundary. The processing of location data received by the mobile tracker and the base station will be accomplished using Real Time Kinematic (RTK), a method for precise positioning with GNSS.

I. Functional Requirements

a. The fence controller subsystem shall determine the location of a mobile tracker relative to the base station with an accuracy of no less than 1 meter while the mobile tracker is stationary. The same accuracy should be expected for a moving target, but will not be promised due to potential difficulties in testing.

b. The fence controller subsystem shall determine if a mobile tracker is within a boundary, received from a user interface, consisting of no less than 3 and no more than 100 points. In the event that the mobile tracker is not within the boundary, the user interface and the mobile tracker shall be notified.

c. The fence controller will report the computed position of the mobile tracker to the user interface at 1Hz.

II. Constraints and Assumptions

a. Positioning will depend on stable input from the GPS receivers. Thus, a minimum of five satellites visible to both the base station and the mobile tracker are required.

b. Positioning will depend on current data from the mobile tracker. Thus, a stable communication channel is assumed.

Parameter	Min	Nominal	Max
Raw input		19200 baud	
Raw input		UBX encoded	
Number of visible satellites	5		
Boundary points format		Lat/lon, .txt file	
Number of boundary points	3		100
Width of boundary	3 meters		900 meters
Accuracy of computed position (relative to base station)			1 meter
Communication with user interface		TCP/IP socket	