Possible Algorithm for Landmark Geolocation

1. Gather relevant data from sensors
   1. Get current elevation from barometer
      1. Get atmospheric pressure, , from barometer
         1. Accuracy depends on sensor, ~0.5m error
         2. If in atmosphere(atm) convert to Pascal(Pa), 1atm = 101325Pa
         3. If in millibar(mb) convert to (Pa), 1mb = 100Pa
      2. Plug pressure into Pressure Equation:
         1. static pressure (Pa) = 101325Pa
         2. standard temperature (K) = 288.15K
         3. standard temperature lapse rate (K/m) = -0.0065K/m
         4. height above sea level (m)
         5. height at bottom of atmospheric layer (m)
         6. universal gas constant: 8.3144598 (J/mol/K)
         7. gravitational acceleration: 9.80665 (m/s2)
         8. molar mass of Earth’s air: 0.0289644 (kg/mol)
      3. Solve for (elevation)
         1. Assume
         2. Highest point on earth (Mount Everest) < 11000m
   2. Get current Latitude and Longitude from GPS
   3. Get phone orientation
2. Find landmarks in direction of phone
   1. Assume spherical coordinates in GPS form (Latitude, Longitude, Elevation)
   2. Find Line of Sight (LoS) in direction
      1. Calculate possible max LoS
         1. If phone orientation is greater than 45 degrees below horizontal, max LoS is 2000m
         2. If phone orientation is between 45 degrees below horizontal to horizontal, max LoS is 5000m
         3. If phone orientation is between 45 degrees above horizontal to horizontal, max LoS is 16000m
         4. If phone orientation is greater than 45 degrees above horizontal, ignore
      2. Pull Map data from current location to max LoS location
         1. Convert angles to 3D vector with length max LoS
      3. Apply version of Bisection Method to calculate line of sight
         1. Calculate c
         2. Check if a’s elevation > c’s elevation
         3. If true, b = c, repeat
         4. Else, a = c, repeat
   3. Pull all landmarks from current location to LoS location
3. If landmark found, calculate distance between current location and landmark
   1. Use Law of Haversines, ~0.5% error
      1. Radius of Earth at equator: R = 6378137m
      2. Include change in elevation
4. Done
5. Possible edge cases to look for and possible fixes:
   1. Looking straight up/down – Ignore search if pitch/roll are both 0
   2. Inside caves –
   3. On top of cliff looking down -
   4. On summit of mountain –
   5. Underwater –
   6. Looking into water –
   7. In the sky(plane, skydiving, paragliding) –
   8. Under an overhang looking up -