

Positioning: One Star's Altitude and Azimuth

INPUT: Altitude (**Alt**), North Azimuth (**Az**),
Right Ascension (**RA**), Declination (**Dec**) of The Star,
Greenwich Mean Time (**UT**), assumed Location

OUTPUT: Latitude and Longitude
Additional Output: GMST, LST, LHA, GHA, SHA

Two Equation of Altitudes and Azimuth are:

$$\sin(\text{Alt}) = \sin(\text{Lat}) \cdot \sin(\text{Dec}) + \cos(\text{Lat}) \cdot \cos(\text{Dec}) \cdot \cos(\text{Long} + \text{GMST} - \text{RA})$$

$$\cos(\text{Az}) = \frac{\sin(\text{Dec}) - \sin(\text{Lat}) \cdot \sin(\text{Alt})}{\cos(\text{Lat}) \cdot \cos(\text{Alt})}$$

Assumed Location are Initial values of Latitude and Longitude .
Then Newton iteration method, adjusted for two equation, gives more exact
Latitude and Longitude. An Error depends on the accuracy of measurements.