

# Positioning: Two Star's Altitude Method

**INPUT:** Altitudes (**Alt**), Right Ascensions (**RA**),  
Declinations (**Dec**), Greenwich Mean Time (**UT**),  
assumed Location

**OUTPUT:** Latitude and Longitude

Two Equation of Altitudes are:

$$\sin(\text{Alt1}) = \sin(\text{Lat1})\sin(\text{Dec1}) + \cos(\text{Lat1})\cos(\text{Dec1})\cos(\text{Long} + \text{GMST1} - \text{RA1})$$
$$\sin(\text{Alt2}) = \sin(\text{Lat2})\sin(\text{Dec2}) + \cos(\text{Lat2})\cos(\text{Dec2})\cos(\text{Long} + \text{GMST2} - \text{RA2})$$

Assumed Location gives 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.