CHAPTER

5

LEO SATELLITE NETWORK HANDOFF MANAGEMENT

As LEO satellites move with high velocity, the user mobility and speed of rotation of the earth is ignored in the following discussion. Since the movement of a satellite is deterministic, all the information regarding the time of sweeping over a particular area is known i.e. the radius of the footprint region, the areas to be covered etc. The two algorithms are elaborated in the discussion to follow.

5.1 The Angle Estimation Algorithm:

5.1.1 Angle between Satellite and MS

The angle (α) between mobile station (MS) and the satellite is calculated by establishing a three dimensional coordinate system at the current footprint (where the MS is present) with the origin at the center of the footprint, as shown in Fig 5.1. Here 'r' is the radius of the footprint.

The exact position of MS at the footprint can be found with aid of Global Positioning System (GPS). We can consider the coordinate of the MS in three dimensions (considering level surface) as (x, y, 0). Owing to location of the satellites at very high altitude from earth surface neglecting the height of the MS would result in minimum error with simplistic calculations.

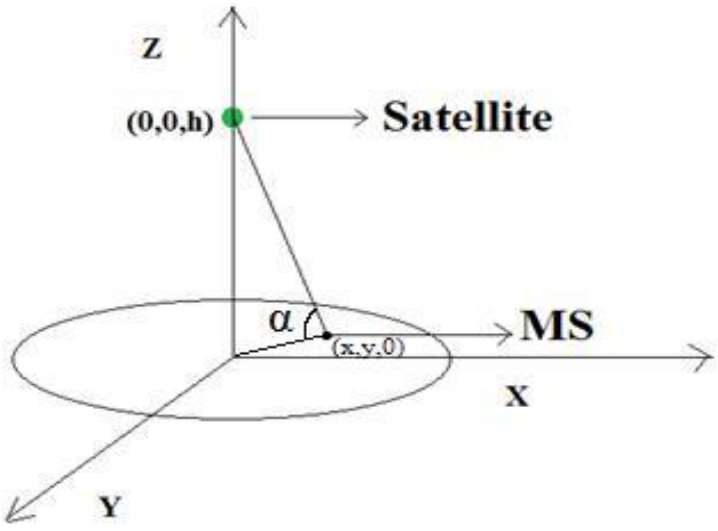

Fig. 5.1: A simplistic situation showing the angle between the satellite and MS

Now the angle 'α' between MS and the satellite can be calculated easily if the values of h, x and y is known which as stated is provided by GPS but at certain cost. In paper 'K'we have discussed the process of calculating 'α'.

5.1.2 Threshold Angle:

Threshold angle i.e. the angle after which the handoff will be initiated, is the angle between the satellite and the inner circle (which is determined by the footprint at which when handoff is initiated has the minimum most probability to suffer call blocking) of the footprint region. The height (h) of the satellite from the earth surface and the radius (r) of defined inner circle of the footprint is estimated by the GPS as stated earlier. From these two parameters, the threshold angle can be calculated. Fig 5.2 shows the diagram based on which the necessary calculations are performed for calculation of threshold angle.

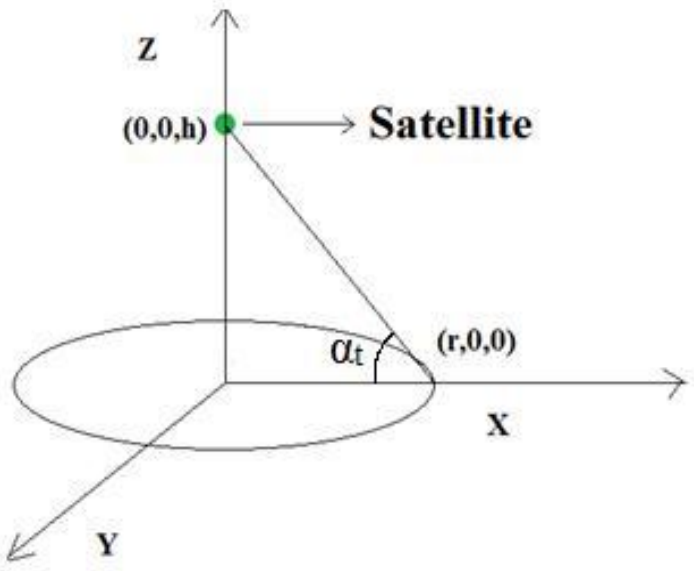

Fig. 5.2: Simplistic situation showing the threshold angle between the satellite and MS

α_t is the threshold angle which we can easily calculate if the values of h and r is known. Threshold value of a satellite is constant as the height of satellite and the radius of footprint, both are constant. In paper 'K'we have also discussed the process of calculating threshold angle. For handoff threshold angle is less than 'α'.