Simulation assignment 2

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1. Trajectory

- A random position of the MS is chosen within the reference hexagon. Velocity of 3, 30, 120 km/hr is assigned to the MS along with a direction chosen uniformly at random from 0 to 360°
- The simulation plots are as shown below. The blue dots indicates the handover instances and the red line indicate the overall trajectory. The green square indicates the starting point of the MS. 200 handoff instances have been simulated in all cases.
- For low speeds, the handover instances are very closely clustered at the boundary of the cells. Also the clustering is more at the boundary of the reference cell. This is because only 2 tiers are considered and there are more BSs surrounding the reference cells and hence more option for handoff near the reference cell.

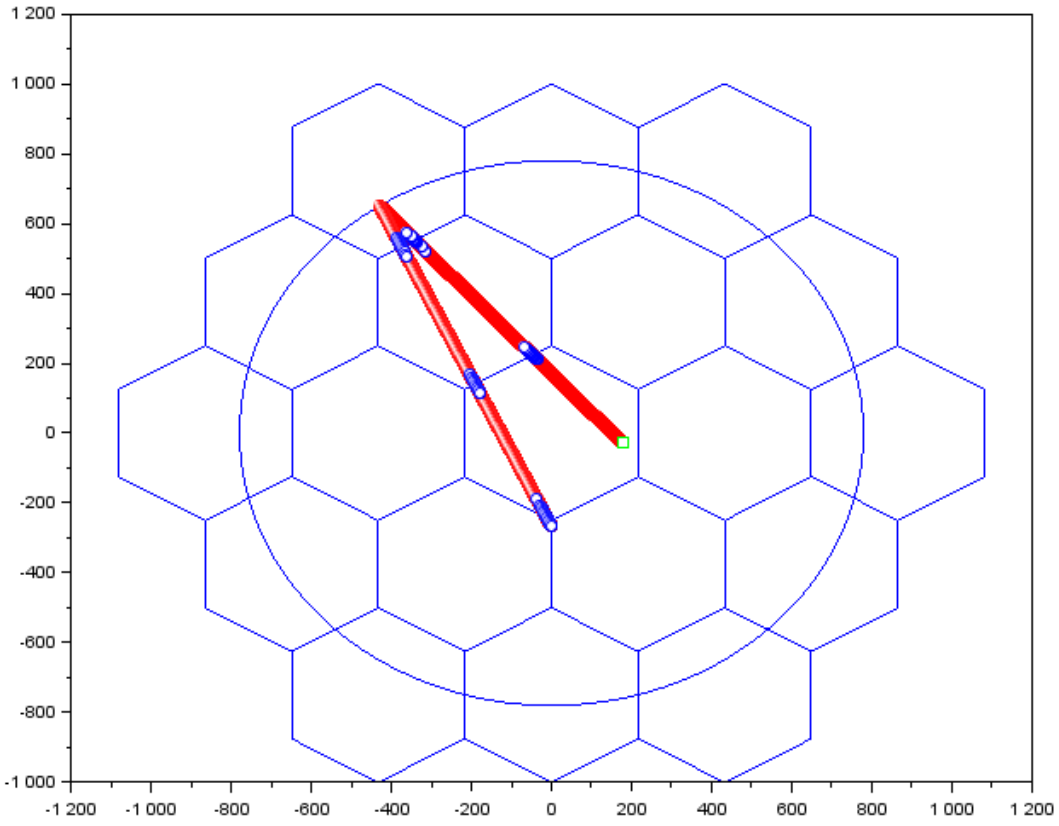


Fig: Trajectory and handover Instances for v = 3km/hr

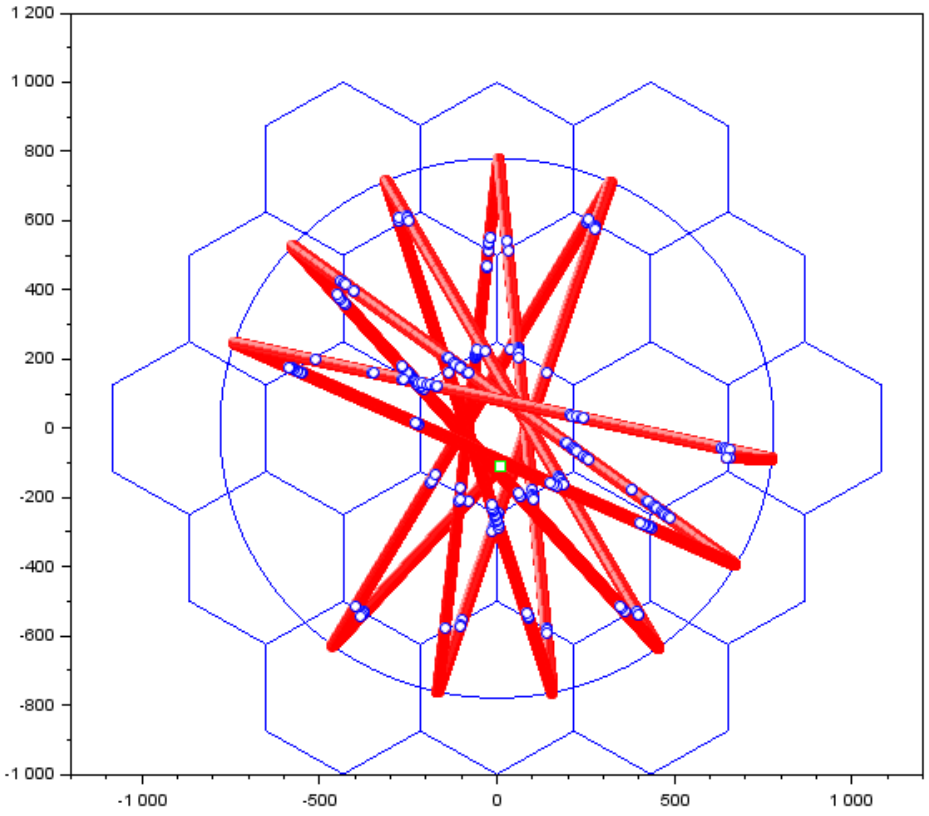


Fig: Trajectory and handover Instances for v = 30km/hr

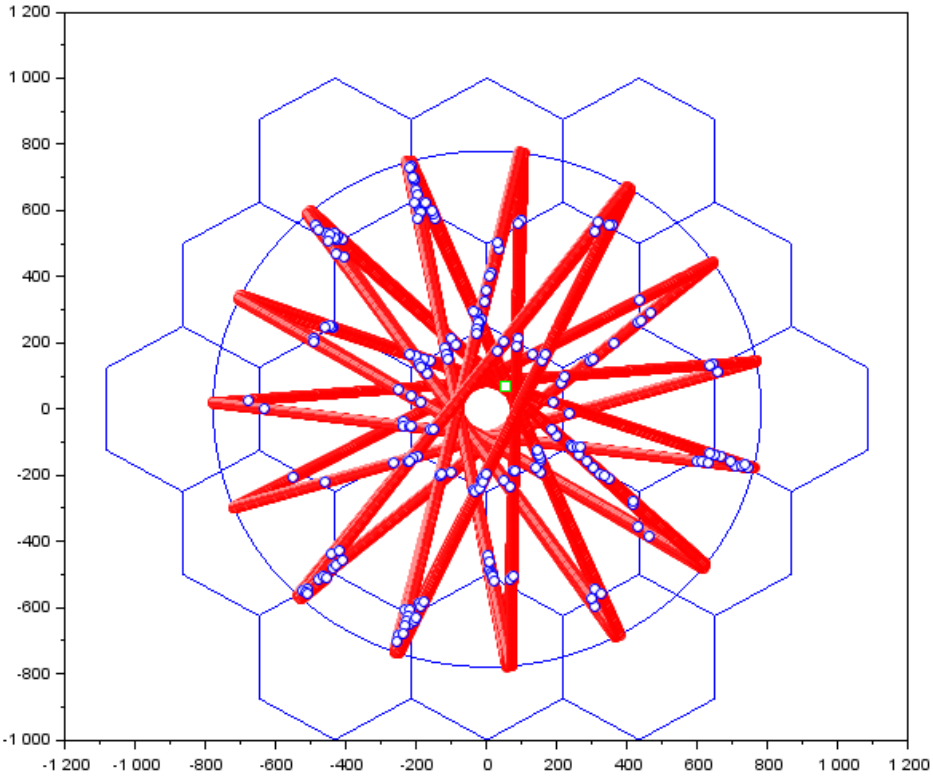
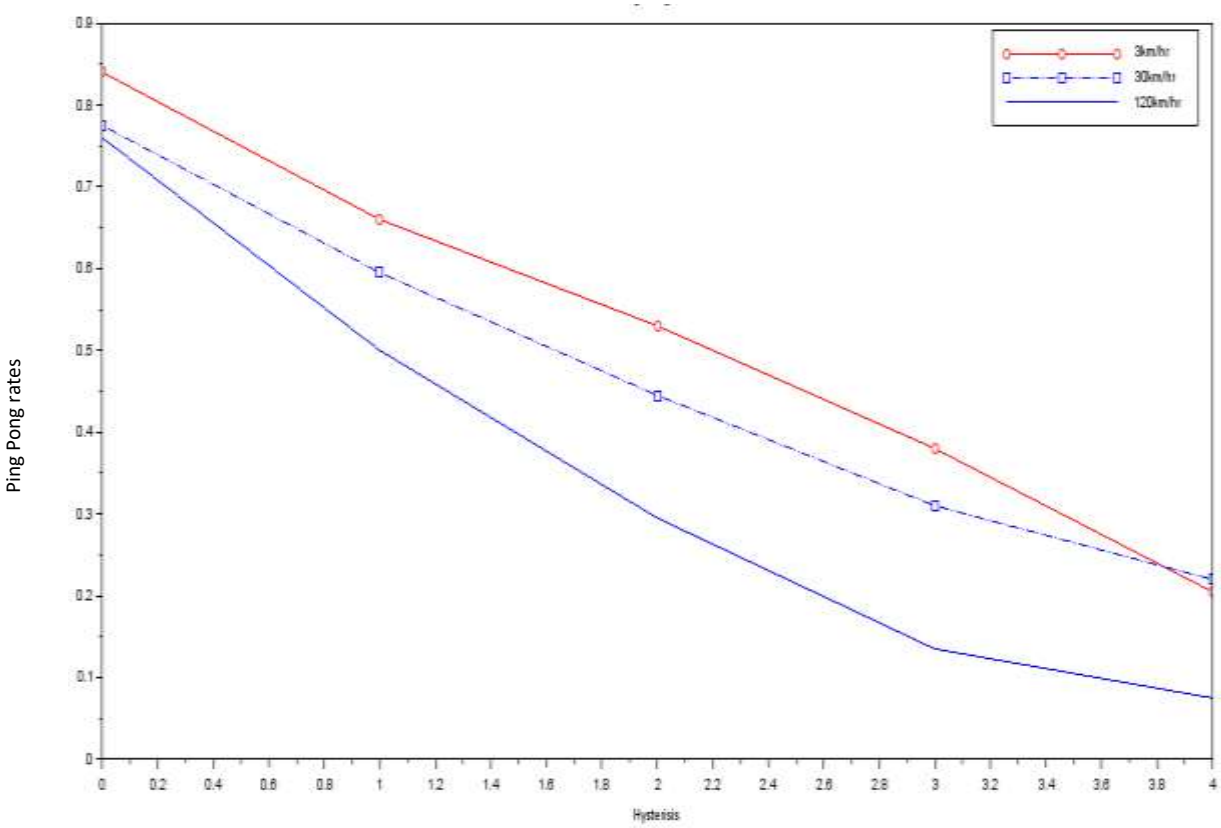


Fig: Trajectory and handover Instances for v = 120km/hr

2. Performance metrics

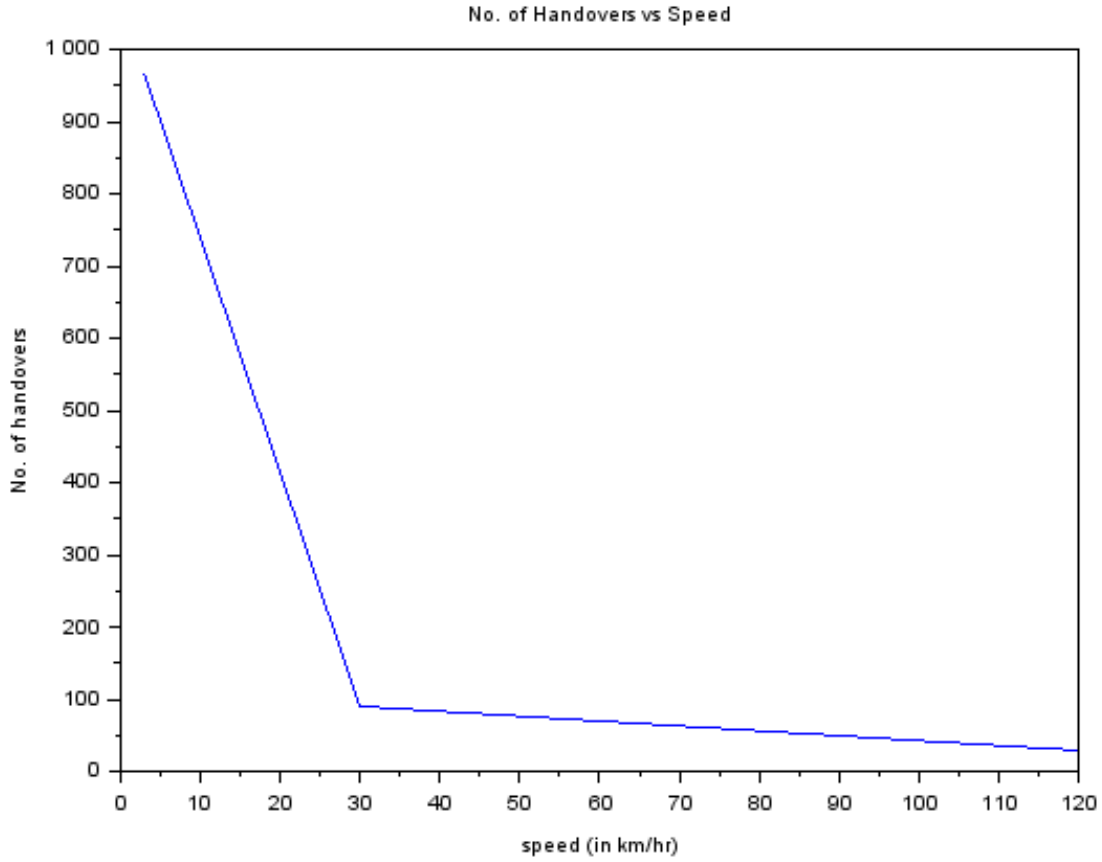
(a) Ping Pong effect:

It is clear that, as H increases, the ping pong rate decreases. As the speed goes from high to low, the ping pong rate (in 200 handoffs) increases as with low speeds, the MS will be near the boundary of the cells for a longer time and the random noise logX will have a greater effect compared to the other terms in RSS resulting in more ping pongs.



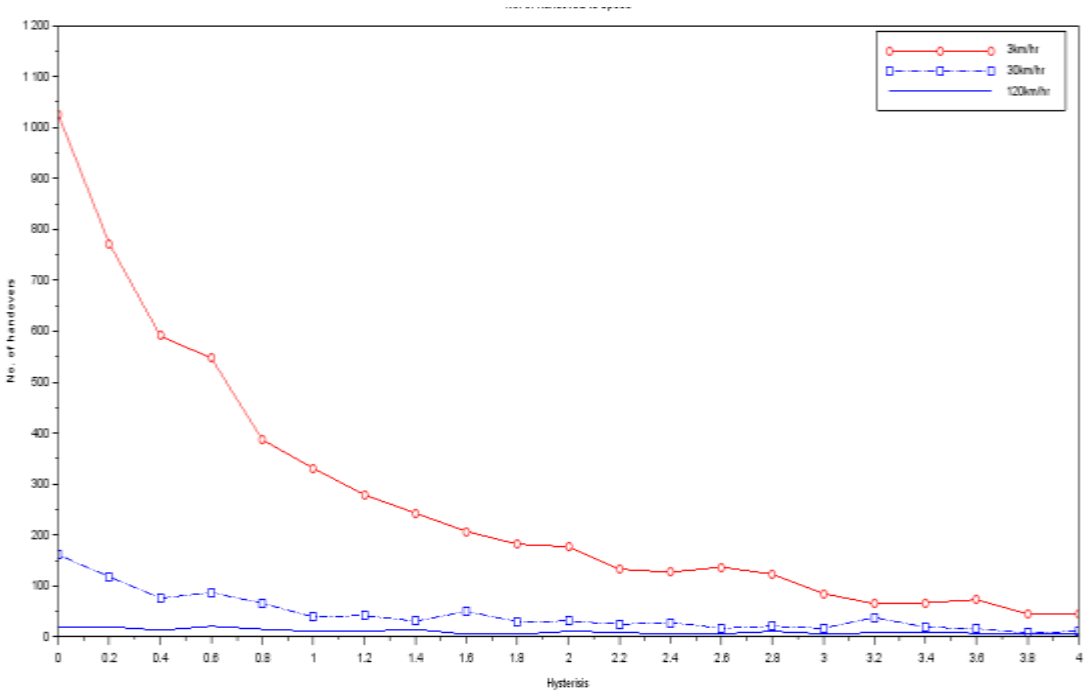
(b) Number of handovers vs speed

In this part, the total distance traversed by the MS is keep constant to compare the no. of handoffs at various speeds. Like in the previous part, as the speed increases, the number of handoffs decreases.



3. Optimal hysteresis margin for a constant speed user:

The distance traverse at various speeds and H value is kept constant for comparison. At a particular speed, the no. of handovers varies with different H values. The BS assigns that value of H to a constant mobility user which results in the minimum no. of handovers.



Velocity (in km/hr)	Hoptimal (in dB)
3	3
30	2.8
120	2.6

The optimal value of H margin is taken to be the minima in the respective PPR vs Hysterisis plots (H in the interval [0, 3] as given in the question is considered).