5^{th} Semester project summery

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1 Random Walk

Random walks are the most general yet important phenomena in real life. In this project we demonstrated random walk in 2-D plane and visualise the results. To code our random walk we choose any random angle θ and move one step in that direction. We continued this process for different number of step and observed these results :

- As we increase the numbers of steps we drifts further from origin in every direction.
- Calculated average displacement in x and y is almost equal to zero($\Delta X = \Delta Y \approx 0$), this means probability to move in any direction is equal.
- Our R_{rms} values increases with the N(number of steps). Appended figure(R_{rms} vs $\sqrt{N}$) gives us the slope = 0.9671, close to 1 and hence proved that $R_{rms} \approx \sqrt{N}$.
- Result $R_{rms} \approx \sqrt{N}$ tends to agree with equation with the increase in number of steps.

2 Ellipsoid

We use Monte Carlo method to determine the volume of ellipsoid. Idea being that throw random points in a cuboid, dimensions equal to axis of ellipsoid and find the probability how many points are satisfying equation of ellipsoid hence inside the ellipsoid.

$$\text{Volume of ellipsoid} = \frac{\text{Number of points inside ellipsoid}}{\text{Total number of points}} \times \text{Volume of cuboid} \tag{1}$$

So to find out which points are inside the ellipsoid we apply and equation:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} \leq 1 \tag{2}$$

After performing the simulation results are:

- Converse rate of Monte Carlo is $1/\sqrt{N}$.
- As we increase the number of points our volume converges to analytical volume.
- We also get the convergence of fractional error to zero when we increase the number of points.