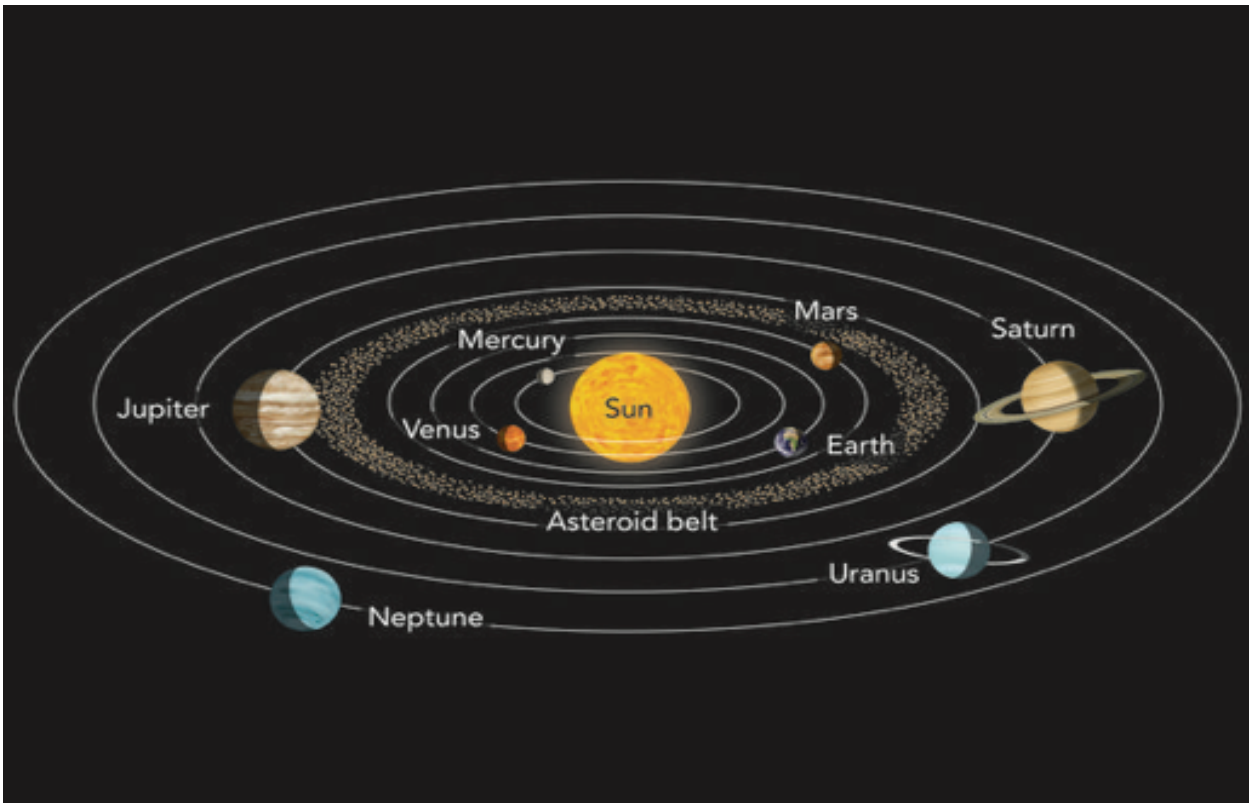
JITEN_MISHRA

DSC430_Assignment1002_PlanetDistance

I have not given or received any unauthorized assistance on this assignment.



source: pintrest.com

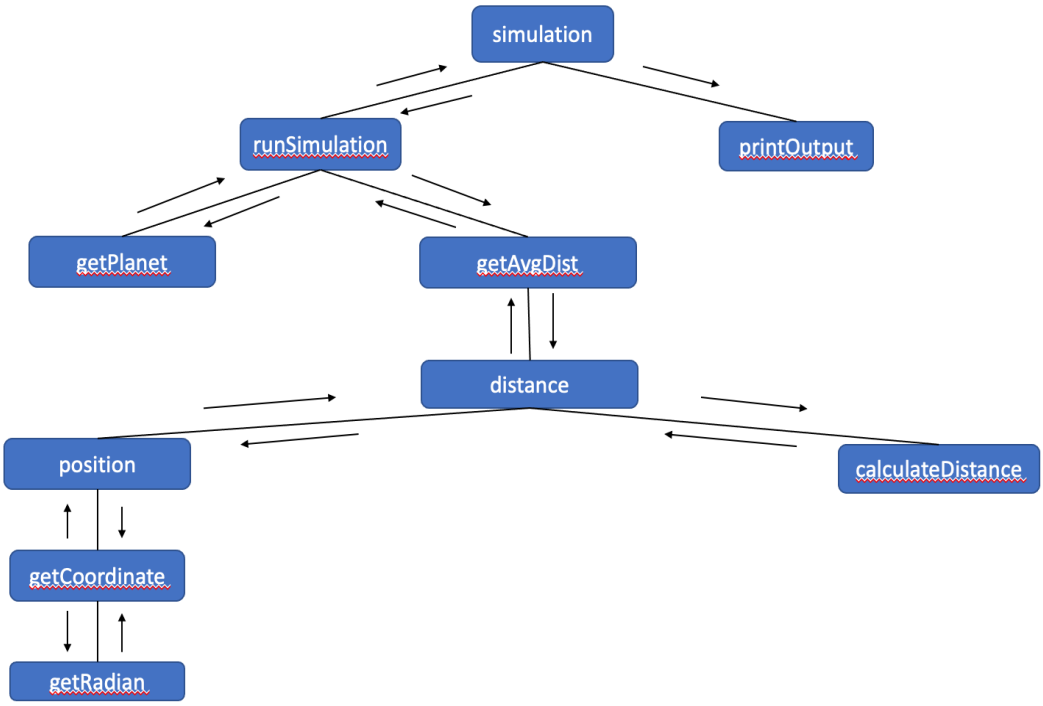
DSC430

Winter 2022

Prof: Noriko Tomuro

Part A:

Top-down structure chart of Simulation with planet object



Note: We assumed the orbit of the planetary movement is circle.

8 x 8 chart of Average distance between each planet

Matrix representation of Average distance between each planets for 1000 earth year

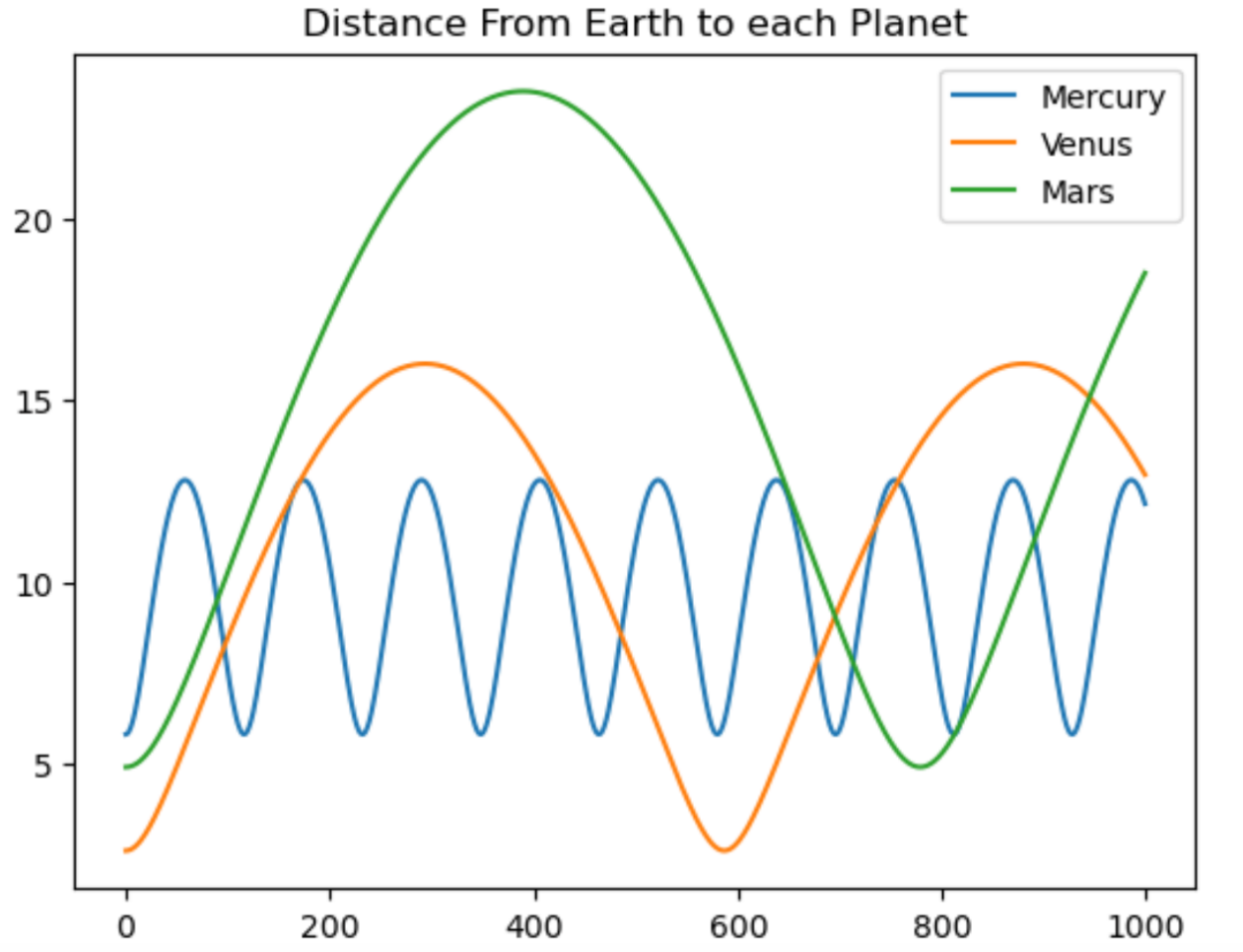
	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
Mercury	0.000000	7.165479	9.632488	14.416431	48.463277	88.934577	179.017224	288.010741
Venus	7.165479	0.000000	10.550754	15.002459	48.632216	89.025632	179.062106	288.038410
Earth	9.632488	10.550754	0.000000	15.771544	48.849381	89.142677	179.119881	288.075670
Mars	14.416431	15.002459	15.771544	0.000000	49.445326	89.464711	179.279206	288.170766
Jupiter	48.463277	48.632216	48.849381	49.445326	0.000000	95.490784	182.202017	289.948424
Saturn	88.934577	89.025632	89.142677	89.464711	95.490784	0.000000	190.081366	295.306532
Uranus	179.017224	179.062106	179.119881	179.279206	182.202017	190.081366	0.000000	320.885379
Neptune	288.010741	288.038410	288.075670	288.170766	289.948424	295.306532	320.885379	0.000000

According to the chart Mercury is the closest planet to earth. This did not meet my expectation as mercury is closest to sun and Venus comes

after mercury at the second place and Earth being at 3rd place, I thought Venus should be the closest one to earth whereas the fact is the planet which is in between sun and earth at a given instance is the closest.

2nd Simulation of 1000 days

Simulation ran for distance between Earth to Mercury, Venus and Mars



As per the time series plot, we see the distance of Earth to Mercury range from 5 CM to 12 CM approximately in a span of 1000 days and we see it stays in the same range.

Distance of Earth to Venus range from 2.5 CM to 15 CM approx. in a span of 1000 days and stays in the same range.

Distance of Whereas Earth to Mars range from 5 CM to 22 CM approx. in a span of 1000 days and stays in same range.
From the time series when we look at the range of the distance between Earth and Mercury. Venus and Mars we clearly see Mercury is the one which is closest to earth.

3 Ways we could extend the simulation.

1. We can extend the simulation to be calculated on a elliptical orbit rather than on a circular orbit.
2. We can extend the simulation to represent a animation of planetary movement based on position and distance that we calculate.
3. We can extend the simulation further to compare planetary size and distance.

Part B:
Q & A:
How Efficient is your code? Can you do better?
My Code is quite efficient where I have used dictionaries and arrays to compute the data and data frame to store information and plot a time series.
Yes, I could have done at little better where for the 8x8 matrix I could have maintained another data structure to track which planet distance was calculated so that I do not have to compute the distance of the combination of planets which was already calculated.

When computing the average distance between planets, would it be better to sample random days rather than iterating over every day for 1000 years?

No sampling it over random days would have made it difficult to analyze the results logically and it would give different result every time making it difficult to reach any conclusion.

What was your original assumption regarding the closest planet to Earth? Did the results match your expectation? Does the definition of "closest" matter?

My Original assumption regarding the closest planet to Earth was Venus since it holds the second position from Sun. The result surprised me and made me surf the internet for some explanation.

So, the closest is time relative as the relative distance of a planet is measured from sun, so at a given instance of time the planet that is in between earth and sun is measured as the closest planet to earth.

So technically the definition of closest doesn't matter here.

And in this case the distance which is minimum on average w.r.t to Earth is Mercury.