PROJECT REPORT

Solar System Simulation
using Python2.7 and VPython

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IDEA:

The idea of this project is to simulate a solar system through which relative rotations and revolutions of the 8 major planets can be observed.

This solar system currently has Sun and the 8 major planets revolving around it in elliptical orbits.

TECHNOLOGY AND IMPLEMENTATION DETAILS:

Visual Python and numpy packages were used to implement this project along with python 2.7.

The concept of dictionaries is used to represent the keplerian elements like tilt,spin,mean anamoly etc
The code is dominated by three functions:

1.)orbit:
In this function kepler's equation is solved by the newton-raphson method iteratively and linspace(which returns evenly spaced numberes) from numpy package is used to generate a numpy array of thousands of x,y,z coordinates.

2.) initialise:
In this function a sphere for every planet is generated as per the elements in the respective dictionary.

Also a list of parameters required for simulation like the object,rotation_rate,timeperiod w.r.t earth,array of coordinates is returned

3.)update:
In this function,a set of coordinates is picked from the huge numpy array based on the relative time elapsed and the respective planet's position is updated.
Also the planet is designed to leave a trail of the path it takes.

SCREENSHOTS OF THE SIMULATION:

1.)I have represented the universe as a sphere which contains our solar system. The solar system can be viewed by zooming in(mouse right_click+left_click+scroll)
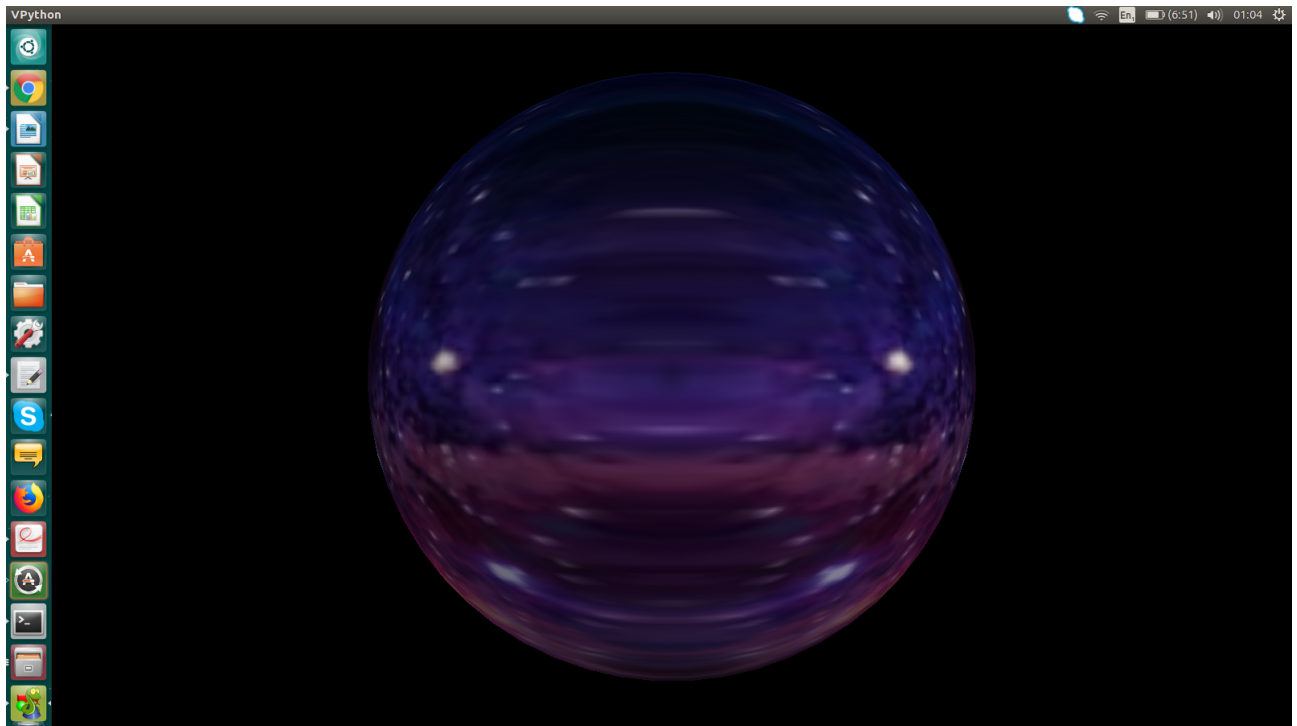
2.)After zooming enough, this side view of the solar system is obtained. It can be viewed at different angles by right_click on mouse+movement of cursor depending on direction.
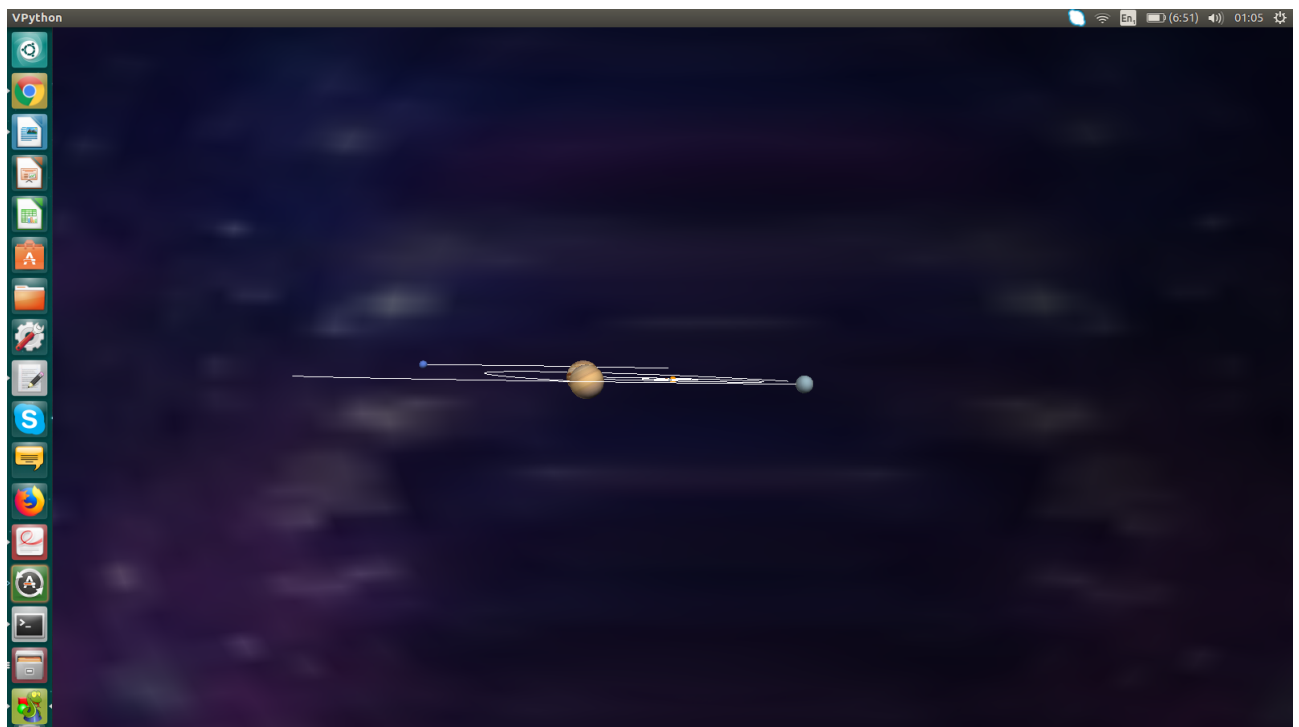
3.)Pictures at other angles:
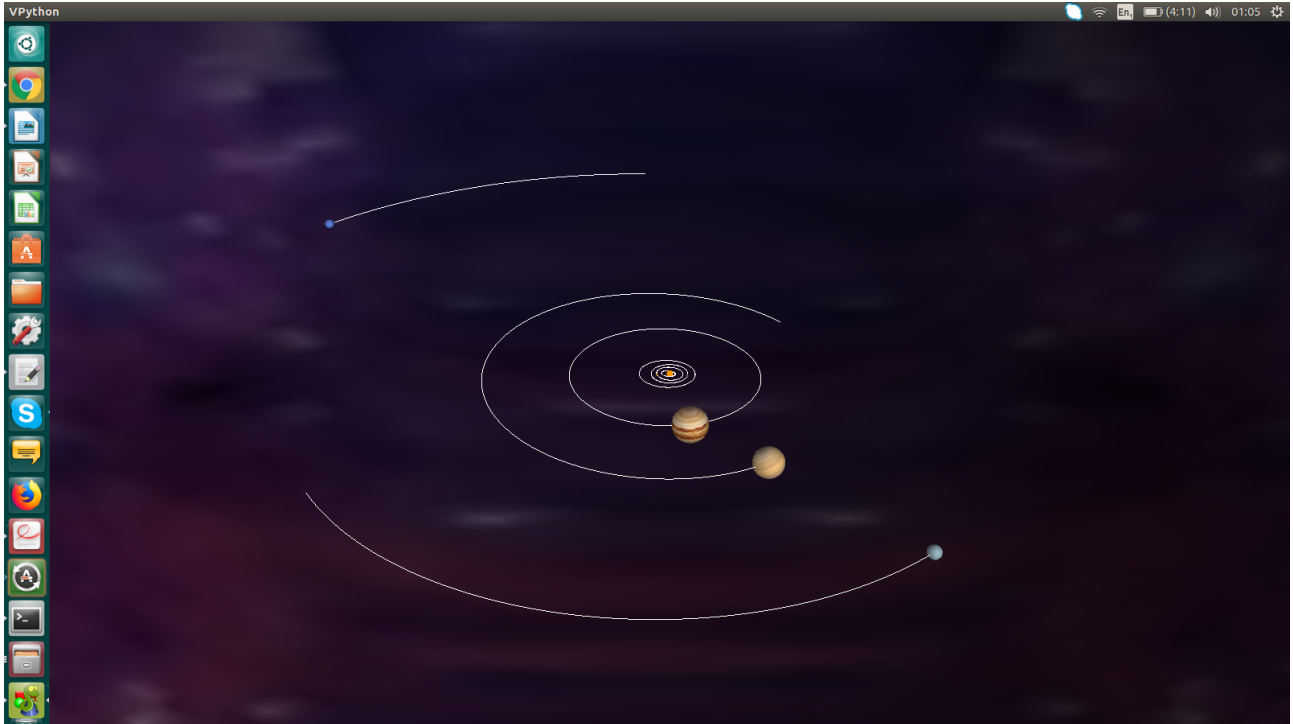
FUTURE SCOPE OF THE PROJECT:

This project has so much scope for development.

Moons of the planets can be added.

Spaceships can be added.

Rings can be added to saturn and uranus.

EXPERIENCE:

It was altogether a great experience.

I realised that solar system had so much physics involved.

Learnt how to use visual python and numpy packages.

This project enhanced my python knowledge.

As a person who is deeply interested in space science, it was a great feeling that I could code some astrophysics.

REFERENCES:

https://guigui.developpez.com/cours/python/vpython

www.physics.stackexchange.com

http://murison.alpheratz.net/dynamics/twobody/KeplerIterations_summary.pdf