**DIGITAL ASTRONOMY**

*Exploration of the Solar System*

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**Abstract**: In the following lines is illustrated the project for a temporary exhibition about the Solar System. Through images and simple texts, it is aimed at providing visitors a basic knowledge on the topic and increasing their curiosity about it.

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**Target**: The project is addressed at people aged between 60 and 65 without a deep knowledge of the structure and functioning of the Solar System. Due to the selected target, the concepts will be exposed mostly through the use of images, to allow everyone to understand and memorize better the information proposed. The choice to address a target of this type is due to the fact that many times people of this age don't have a deep knowledge on scientific topics.

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**Modality**: The exhibition on the Solar System that I'd like to create is developed in different thematic rooms, which focus on the description and analysis of a specific aspect of the System. At the entrance there are inceptive panels (not interactive) which aim to provide visitors a general picture of the functioning of the Solar System, also with some macroscopic data.

First of all is explained the process that led to the formation of the System, starting from the gravitational collapse to arrive at the planets as we know them today. Then, to give visitors some more information, there will be tables showing the rotation periods of the planets (after an explanation), or the distance between each planet and the Sun. Here is a model which could be used:

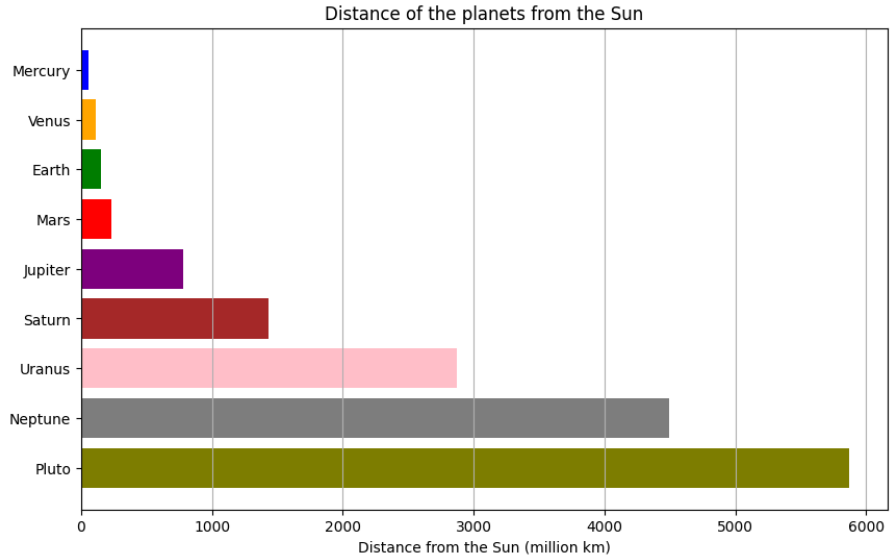
```
import matplotlib.pyplot as plt

# Data of the planets: distance from the Sun (in million kilometers)
distance_from_sun = {
    "Mercury": 57.9,
    "Venus": 108.2,
    "Earth": 149.6,
    "Mars": 227.9,
    "Jupiter": 778.6,
    "Saturn": 1433.5,
    "Uranus": 2872.5,
    "Neptune": 4495.1,
    "Pluto": 5870.0  # Pluto is considered a dwarf planet
}

planets = list(distance_from_sun.keys())
distances = list(distance_from_sun.values())

# Colors for the bars
colors = ['blue', 'orange', 'green', 'red', 'purple', 'brown', 'pink', 'gray', 'olive']

# Plot
plt.figure(figsize=(10, 6))
plt.barh(planets, distances, color=colors)
plt.xlabel('Distance from the Sun (million km)')
plt.title('Distance of the planets from the Sun')
plt.gca().invert_yaxis()
plt.grid(axis='x')
plt.show()
```




After visitors will have obtained a general understanding of the theme of the exhibition, they will be ready to enter the main room, where they will watch a video in which the planets of the Solar System are in motion. From this moment everyone will have to wear their own headphones and listen to the contents prepared via a QR code located in front of each panel. Since we are talking about an exhibition, it is easier and cheaper to don't organize the path in different physical rooms, but only using panels as 'scenic wings'.

The actual journey begins, which starts from Neptune and reaches the Sun. By observing animations and listening to the recordings, visitors will learn more about the characteristics of each planet. In addition, everyone will be told about the way and times of discovery: in the case of Jupiter, for example, we will also talk about its four moons and about Galileo's observations. For Pluto, instead, some time will be spent to say something of Tombaugh. Due to the selected target, however, we will not delve into extremely complex physical-matematical details, but everything will be dealt as simply as possible.

After people will have learnt the main things about the Solar System, we'll move to a different room, in which visitors will have a chance to analyse in the detail the part of the System which really matters to us.

In this room panels will provide some information about the seasons. We'll refer to the rotation of Earth, and for the most curious there will also be a panel reguarding perihelion and aphelion referring to Keplero's laws.

Before leaving the exhibition, visitors will watch a last video, which lasts about ten minutes, that resumes the main notions exposed throughout the '*exploration of the Solar System*'.

```
import matplotlib.pyplot as plt
import numpy as np

fig, ax = plt.subplots()

# Draw the Sun as a yellow circle
sun = plt.Circle((0, 0), 0.1, color='yellow', label='Sun')
ax.add_artist(sun)

# Draw the Earth's orbit as an ellipse
earth_orbit = plt.Circle((0, 0), 1, color='none', linestyle='dashed', edgecolor='blue', label='Earth Orbit')
ax.add_artist(earth_orbit)

# Calculate Earth's position on the ellipse
angles = np.linspace(0, 360, 360)  # angles in degrees
earth_x = 1 * np.cos(np.radians(angles))  # x-coordinates of Earth
earth_y = 0.6 * np.sin(np.radians(angles))  # y-coordinates of Earth

# Plot the Earth's positions on the ellipse
ax.plot(earth_x, earth_y, color='blue')

# Plot the Earth at a specific angle (e.g., angle 0)
earth_angle = 0
```

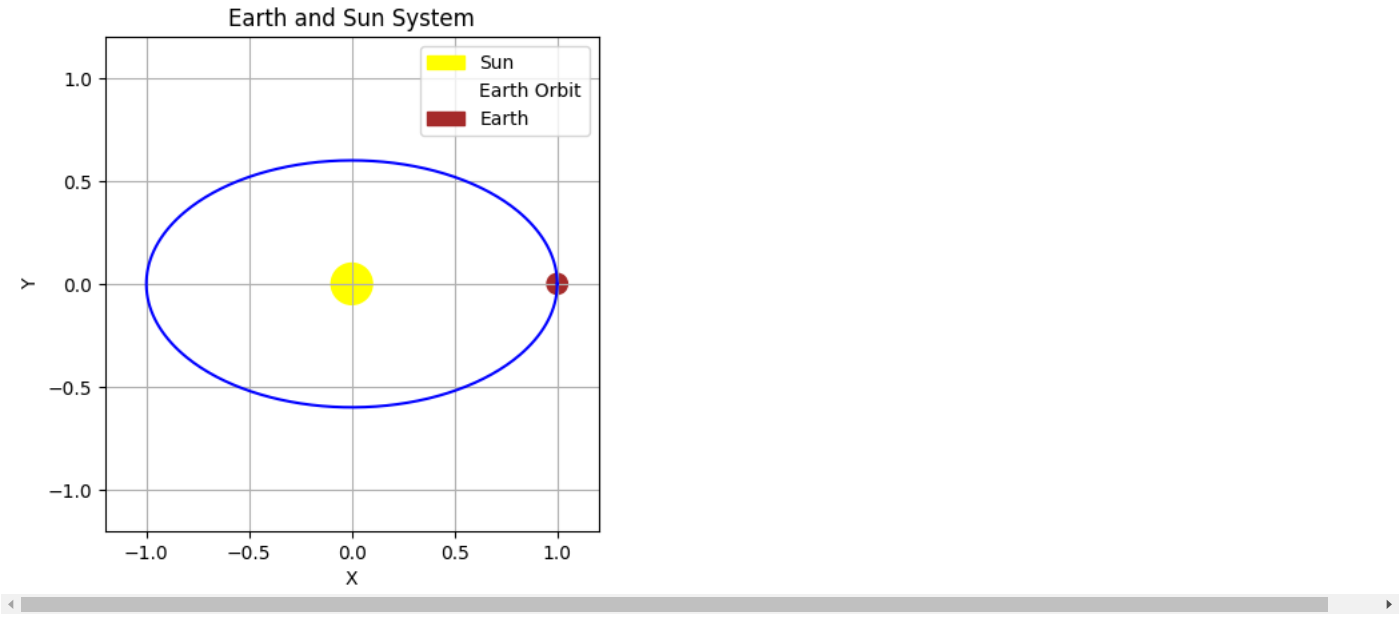
```
earth_x_at_angle = 1 * np.cos(np.radians(earth_angle))  # x-coordinate of Earth at angle
earth_y_at_angle = 0.6 * np.sin(np.radians(earth_angle))  # y-coordinate of Earth at angle
earth_at_angle = plt.Circle((earth_x_at_angle, earth_y_at_angle), 0.05, color='brown', label='Earth')
ax.add_artist(earth_at_angle)

ax.set_aspect('equal')

# Set the limits of the plot
ax.set_xlim(-1.2, 1.2)
ax.set_ylim(-1.2, 1.2)


ax.set_xlabel('X')
ax.set_ylabel('Y')
ax.set_title('Earth and Sun System')
ax.legend()
plt.grid(True)
plt.show()
```

```
<ipython-input-4-504039bce430>:11: UserWarning: Setting the 'color' property will override the edgecolor or facecolor proper
  earth_orbit = plt.Circle((0, 0), 1, color='none', linestyle='dashed', edgecolor='blue', label='Earth Orbit')
```

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**Analysis**: The main focus of the exhibition is to stimulate visitors' curiosity: it is hoped that after learning some fundamental data on the planets of the Solar System they will like to delve deeper into the topic. A more mature audience might even think about focusing on scientific notions. Since the exhibition is addressed to people aged between 60 and 65, maybe some of them have nephews yet, so they could introduce them too to what they learnt during their experience. The project, therefore, could involve so many people.

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**Self-criticism**: I believe that processing the images or preparing the information panels, after a deep research, would not be extremely complex. However, the fact of having selected a target whose knowledge is not very depth on one side allows us to don't be too specific from a scientific point of view, on the other it complicates things: talking about a topic like the Solar System only using simple terms is not a small matter. Another difficulty that arises from the target is the developing of an exhibition in which people must be able to use their phone to scan a QR code and access to the contents: even if they are not too old, it is not obvious they are capable to use it.