STEM@CGI
SCIENCE - TECHNOLOGY - ENGINEERING - MATHEMATICS

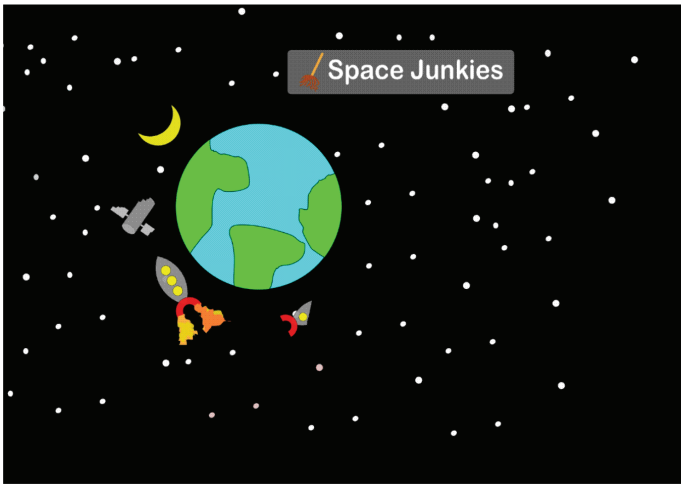
LEARNING LINKS FOUNDATION

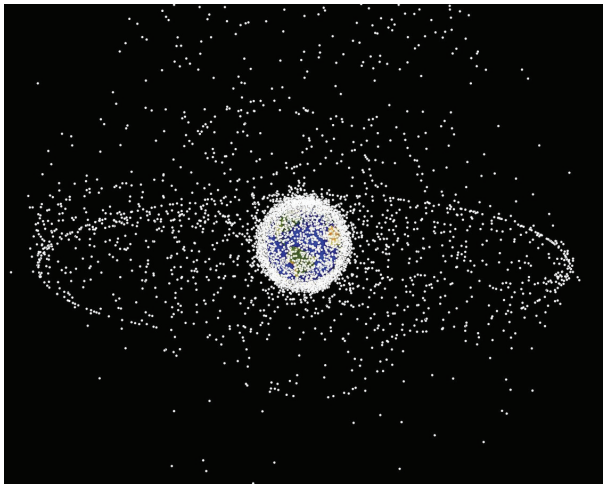
NITI Aayog | ATAL INNOVATION MISSION

STEM from Home

Space Junkies

Would you believe me if I tell you that we have got junk worth millions of dollars? By cleaning up this junk we will not only contribute towards strengthening our economy but will potentially be saving lives from possible accidents!





Credit: By NASA image - NASA Orbital Debris Program Office, photo gallery, Public Domain, https://commons.wikimedia.org/w/index.php?curid=52126

Pre-Reading Materials:

1. Article on Space Debris and Human Spacecraft
2. The cost of space debris

Can you guess how many satellites have been launched by the entire world since the first launch by Soviet Union on 4th October 1957? About **8,900 satellites** from more than 40 countries have been launched till date. According to a 2018 estimate, about **5,000** remained **in orbit**. Of those, about **1,900 were operational**, while the rest had exceeded their useful lives and have become **space debris**. This debris from the 3100 satellites further divided into smaller pieces. As per NASA, more than 27,000 pieces of orbital debris, or “space junk,” are tracked by the Department of Defense’s global Space Surveillance Network (SSN) sensors.

This debris is a major cause of concern for future space missions. The spacecrafts travel at an approximate speed of 25000 km/h. At this speed, an impact of even a tiny piece of orbital debris with a spacecraft could create big problems.

Main Activity: **Mega Cleanup**

Introduction

In 2015, all the members of the United Nations (UN) adopted **The 2030 Agenda for Sustainable Development** which provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At the core of the 2030 agenda are the 17 Sustainable Development Goals (SDGs).

Reference Video: https://www.youtube.com/watch?v=RX2elsVjY-c (Given below)

https://youtu.be/RX2elsVjY-c?t=19

For further reading refer to the website:

https://sdgs.un.org/goals

SDG 12: (Responsible consumption and production) The targets of Goal 12 include using eco-friendly production methods and reducing the amount of waste. By 2030, national recycling rates should increase, as measured in tons of material recycled.

Space Debris poses a major challenge to our future space missions. If we can safely retrieve the millions of dollars' worth of debris economically and efficiently if would immensely boost our space exploration attempts. In this activity, you will be designing the retrieval spacecraft using 3D modelling tool called Blender.

What you will learn:

- You will be able to understand the challenges faced in designing a space craft.
- You will be able to apply your creative skills in designing a 3D model.
- You will learn the software Blender and representing your 3D model in Blender.

What you will need:

- Desktop / Laptop,
- Sketchpad and pencil
- Blender (https://www.blender.org)

Getting Started

Access the activity from here.

Bonus Activities

Activity 1: Let's Anticipate

Introduction

Space Missions involve huge investment of time, labour, and resources. Therefore, it is imperative to take utmost care in preparation for all possible obstacles which we may face.

In this activity we will try to understand how gravity affects the trajectory of different celestial objects.

What You Will Learn

- You will be able to make predictions about the motion of different objects given gravitational forces in action.
- You will be able to appreciate the role of simulations in improving the understanding of real-world scenarios.

What You Will Need

- A computer /laptop
- PhET – Gravity and Orbits Simulator (https://phet.colorado.edu/en/simulations/gravity-and-orbits)

Getting Started

Let's Get Started

Challenge Activity: My Sci-Fi Movie

Animation makes it easier for us to communicate our ideas in an easy-to-perceive manner. At times, it also enables designers to visualize practical problems which cannot be understood using the text description.

Your challenge is to animate the 3D model you have just designed as part of the Bonus Activity. You need to create an animation to show how will your model collect the space debris. Feel free to add all elements required to make it more attractive, engaging, and impactful.

What You Will Need

- A computer/laptop
- Blender Software

Once you complete the challenge, upload a link to your video.

Resources:

- https://en.wikipedia.org/wiki/Satellite
- https://en.wikipedia.org/wiki/Space_debris
- https://www.nasa.gov/mission_pages/station/news/orbital_debris.html
- https://www.esa.int/Safety_Security/Space_Debris/The_cost_of_space_debris
- https://www.nationalgeographic.com/science/article/space-junk
- https://phet.colorado.edu
- https://www.blender.org