Forum: The Fourth Youth General Assembly (YA4)

Issue: Analyzing Various Methods for AI Tracking Systems to Effectively Help Mitigate the Growing Issue of Space Debris

Chairs: Talia Demashki & Claudia Darwish

Introduction

Space debris has long been a pressing issue and an extraterrestrial concern for the United Nations. In the past, the accumulation of space debris has negatively impacted rockets, satellites, and other means of spacecraft through excessive property damage. As of late, worrisome counts of space debris accumulation urge the United Nations Fourth General Assembly to take action in efforts to significantly reduce the amount of debris in space while utilizing AI models. It is paramount to address this problem for the ethical use of AI programs to reduce this problem. Retrospectively, efforts to combat this problem have been demonstrated throughout this document.

Definitions of Key Terms

Space Debris

Human-made waste matter—including old satellites and inactive spacecraft—that orbit the Earth.

Spacecraft

Machinery or technology designed to be sent to space including satellites, rockets, and space

shuttles.

AI

Intelligence is employed by refined technologies and computer systems.

Background Information

Millions of particles of space debris are in low Earth orbit. The majority of orbital debris is man-made items consisting of fragments of spacecraft, small paint particles from spacecraft, rocket parts, abandoned satellites, or explosions of objects in orbit traveling through space at high speeds. In addition, a noteworthy event in light of the space debris dilemma was the production of a man-made orbital trash-the rocket stage that carried the artificial satellite into space was the first piece and the satellite itself was the second—the 1957 launching of Sputnik I also made it plain that these objects would have to be tracked continuously in space.

Major Parties Involved

China

China has long been involved in space-related affairs, inducing that of mitigating space debris. The State Key Laboratory of Astronautic Dynamics, known as ADL and connected to the Xi'an Satellite Control Center in Shaanxi Province, Northwest China, has initiated an initiative entitled "Intelligent Modeling of the Complex Evolving Principle of Complex Environments for Space Debris and Autonomous Monitoring".

Japan

The Japanese government developed Astroscale, a novel cleanup technique that uses a magnet installed on its satellite to collect items, in response to the country's successful efforts to

decrease the amount of space debris. When the trash returns to the atmosphere, it will burn up after being sent into a lower orbit.

United States

With the National Aeronautics and Space Administration's (NASA) support, in development is a network of AI-controlled space lasers that would blast the debris orbiting the Earth. If functioning as it should, the system could independently change course for any space junk currently threatening a collision with a spacecraft, including crewed ones.

European Union

In June 2018, an experimental satellite called REMOVE DEBRIS was launched, designed, and built by a consortium of companies and scientific institutions. The spacecraft conducted in-orbit testing of three innovative, cost-effective technologies for active debris removal. A harpoon to grab a specified target, a net system to catch and trap debris, and a drag sail to de-orbit the satellite at the end of the mission were used. Another component of the mission was a Vision Based Navigation system that utilized cameras and LIDAR to verify methods of debris tracking in orbit.

Timeline of Key Events

Date	Description of Event
1978	When space debris began to alarm national astronomists, some NASA scientists predicted the so-called Kessler Syndrome: when most orbital
	debris will increase owing to collisions, not fresh launch operations.
1980	Events generating debris arrived and passed, and thus, the Air Force Space Debris Research Program. Following numerous fragmentation incidents concerning the Delta rocket system and following the U.S. entrance into ASAT testing, the research undertaking began.
2000	The CORDS reentry database has recorded spacecraft and other objects that have reentered the Earth's atmosphere.
2024	According to Agenda 2025, ESA has presented its Zero Debris strategy, which aims at drastically reducing the amount of debris produced on Earth and lunar orbits by 2030 for all forthcoming missions, programs, and operations of the Agency.

Previous Attempts to Resolve this Issue

1. International Cooperation

IADC was formed in 1993, which brought together 11 countries with their space agencies to study and arrive at a consensus on space debris. ITU gives out radio bands only under specific conditions for the removal of geostationary satellites;

2. Technology Development

Different technologies have been developed and tested for the removal of space debris:

- The EU-funded REMOVE DEBRIS project demonstrated key technologies for active debris removal, including a net system, harpoon, and drag sail;
- The European Space Agency developed the "space claw" (ClearSpace-1) to capture and dispose of space junk;
- The Japan-based Astroscale created Elsa-D, which uses two spacecraft to capture debris;
- The Australian company EOS has just revealed its laser technology that could "nudge" junk out of orbit;

3. Research and innovation

Initiatives such as Space Waste Lab attempt to upcycle space junk into art installations and contemplate further uses for debris.

These efforts display a commitment on the global platform to the problem of space debris through technological innovation, international cooperation, and the execution of policies.

Possible Solutions

1. Enhancing Database Management

Through rigorous revision of reports that chronicle the tracks of space debris, artificial intelligence (AI) might be used to improve database management. This would speed up the process of creating these reports without sacrificing important data that is necessary for the analysis of space debris tracks;

2. Upgrading Machinery with the Use of AI

Artificial Intelligence might intervene in the process to accelerate the manufacturing of space-removal machinery. Moreover, this could also enrich the overall quality of the manufacturing process of such machinery;

3. AI Ensuring the Future of Spacecraft

AI can analyze and design future spacecraft to avoid such wear and tear, turning them into debris. This might be done by methods of careful material examination and experimentation of the life span of said material typically used in spacecraft.

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