

## SMART DEBRISBIN FOR SPACE DEBRIS MANAGEMENT

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### INTRODUCTION:

The term space debris refers to innate wastes found in the solar system: asteroids, comets and meteorites.[1][2]

Space debris includes the unconnected parts of the satellite broken by the rocket, as well as pieces of its breakdown and collision. Space debris is also known as orbital debris, space debris, space debris, space debris and space debris or space debris.

As of July 5, 2016, the United States Strategic Command has tracked a total of 17,852 artificial objects in orbit on Earth, including 1,419 operational satellites. However, these are only objects large enough to be traced.

As of January 2019, more than 128 million pieces of debris less than 1 cm (0.4 inches), about 900,000 pieces of debris from 1 to 10 cm and about 34,000 pieces of more than 10 cm were in orbit around the earth.

In 1957, Russia launched the satellite name SPUTNIK. It is the first satellite successfully launched in low Earth orbit. It is estimated that there are more than 128 million rubble of less than 1 cm. (0.39 in.) In January 2019.[4][5] The current number of large debris (defined as 10 cm in diameter or more) is 34,000.

### MOTIVATIONS:

- 1) **In November 2015, a large piece of an American space rocket was found in a sea in the sally islands. The section of the spacecraft that measures approximately 10m (32 feet) by 4m (13 feet) is located on the surface between Bryher and Tresco.[3]**
- 2) Because of the junk present in the space, the Chinese space station felt down in the ocean, the junk is also dangerous for Astronauts and also damages active satellites every year and the INTERNATIONALSPACE STATION was moved from one place to another place for three times.

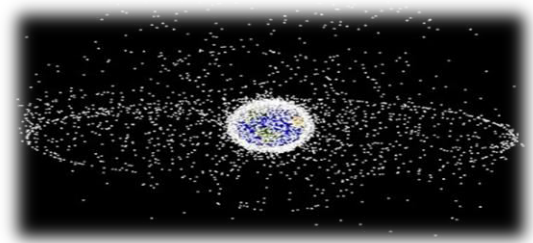


Fig.1 Current Status of Debris Present in a Space

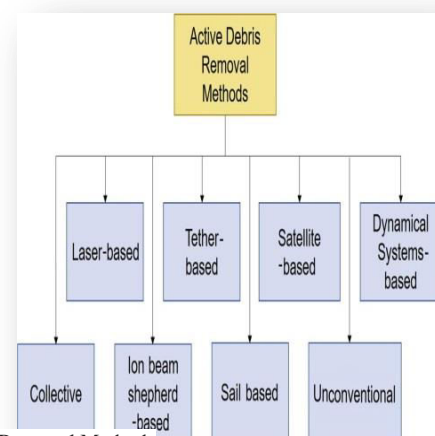


Fig.2 Debris Removal Methods

- 3) Many countries try to remove this debris but no one succeed to remove this debris.
- 4) India doesn't have any option to remove debris, so this concept can be used for the debris management.
- 5) Waste from these tests can damage the operations of civil and military satellites and collide with other objects in space. But India said it had intentionally carried out its "Shakti Mission" test in the lower atmosphere, at an altitude of 300 km (186 miles),[6] to make sure there was no debris and that what was left "would break down and return to fall to earth in a matter of weeks. "



Fig.3 Mission Shakti Run by INDIA.

**Current status and Challenges**

**Current status:**

RemoveDebris



Fig.4 DebrisSat 2

- 1) - Network experience: one of the CubeSats, called DebrisSat1[7], will deploy a globe designed to simulate a piece of space debris. At close range, the Remove DEBRIS satellite will attempt to capture debris in a network, then manipulate this packet to fall into the Earth's atmosphere and burn.
- 2) Navigation by vision: the other CubeSat, called DebrisSat 2[8], will be launched, and the Delete DEBRIS satellite will be the subject of a series of maneuvers to obtain data and images using LIDAR[9] and optical cameras.

**3) JAXA Japan**



- 1) JAXA prides itself on the success rate in the launch of the H-IIA launcher, which is among the highest levels in the world. However, as 14 years have passed since its inaugural launch, some problems have arisen, such as the outdated launch installation and the need for greater payload launch capacity. JAXA leads the H-IIA update project to

address these problems. We will achieve more efficient launch operations by improving the launch capacity of the H-IIA and its global competitiveness, and simplifying installation on the ground.

- 2) In January 2017, JAXA[10] tried and failed to put a miniature satellite into orbit on one of its SS520 series rockets.

### **Challenges:**

- 1) International and Domestic Policy: No regulation forcing companies to remove debris
- 2) Public awareness of the problem is lacking
  - a. Limited government investment in ADR[11][12].
  - b. Cannot track old satellite debris.
  - c. Need to develop and integrate technologies for difficult mission
    - Guidance, Navigation and Control
    - Proximity operation
    - Propulsion
    - Capture
    - Software
    - Ground control

### **Problem formulation:**

- 1) We use Dustbin for collect garbage like that the Debrisbin works on itself to collect piece of junks.
- 2) Debrisbin attached to exact lower side of satellite because when satellites enter in orbit than satellite automatically move on than Debrisbin separated and it start to collect piece of junk.
- 3) When the Debrisbin storage is full than engine has automatically start and Debrisbin come down in earth atmosphere than engine will stop and parachute will open and land on earth safely.
- 4) If an object is big than Debrisbin than lasers are activated automatically and laser will attack on an object and break in small pieces.

- 5) Than Debrisbin throw the net and collect these junk pieces. Debrisbin have Small Engine, Net, Laser, Sensors, Parachute, Fuel Tank.

### **Impact on society:**

- There may be an effective ecological impact on fossils and on human life.
- It may also save sea life and earth surface. It may helpful in preserving geological objects.
- This technology may be helpful for solving the problem of debris. When space debris will remove than climate will change and also weather is changed.
- We can get proper forecasting of space debris and debris collection.
- It's very useful for Astronauts, because it is dangerous for Astronauts and if we remove all debris than we save Astronauts life and we save the future accidental damage to satellite.
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### **Design Approach & Novelty.**

- 1) Debrisbin is made up of the Polymer coating and Balloon type bag with chain. It is easy to fit in any rocket according to the shape of the satellite.
- 2) Debrisbin will have self-engine to move or detach itself from the satellite.
- 3) When debris is near to the Debrisbin, the Silver Polymer Coated collection net can catch debris and move into the bag.
- 4) When sensor captures debris then collection net will get active to start automatically and cap of Debrisbin opens and closes when the particles of debris been stored in bag.
- 5) When Debrisbin filled up full of debris at its extreme level then sensors will be activated and door or cap of Debrisbin will be locked permanently.

- 6) Then engine will get active to detach Debrisbin and throw it to the earth atmosphere successfully.
- 7) After that a parachute will open and Debrisbin will come down slowly on the earth surface.
- 8) Then we can recycle debris and
- 9) Debrisbin for next mission.
  - Over all working of Debrisbin is represent by using following flow chart:

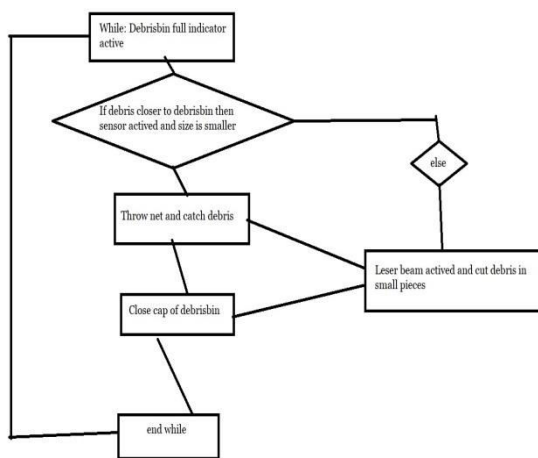


Fig.5 flow chart for smart debrisbin



Fig.6 Working of Smart Debrisbin

**Expected Result:**

Smart Debrisbin is concept to utilize. We are proposing this idea of Debrisbin. This proposed method of Debrisbin is not implemented. The

expected result for this purposed idea will be in huge reduction in the amount of debris in the space.

**Conclusions:**

Space Debris is a big problem in future so it is mandatory to manage the overall junk present in the space by using various methods Debrisbin. It is one of them it may reduce some part of debris which is present in a space. It will improve the environmental weather and climate.

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