

Evolution of Extra-Terrestrial Mining Robot Concepts

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ABSTRACT

Space resource mining is an emerging field and industry that has been postulated for over 100 years, especially in science fiction texts. It is widely accepted that space mining must occur to harness the resources in outer space but the specific equipment needed has not been defined or developed beyond terrestrial prototypes.

Outer space contains a vast amount of resources that offer virtually unlimited wealth to the humans that can access and use them for commercial purposes. One of the key technologies for harvesting these resources is robotic mining of regolith, minerals, ices and metals. The harsh environment and vast distances create challenges that are handled best by robotic machines working in collaboration with human explorers. Humans will benefit from the resources that will be mined by robots. They will visit outposts and mining camps as required for exploration, commerce and scientific research, but a continuous presence is most likely to be provided by robotic mining machines that are remotely controlled by humans.

An overview of the evolution of extra-terrestrial mining robot concepts and associated prototypes will be presented to inform and document the current state of this technology. Activities that have been occurring in government, academia and industry will be assessed, and future needs associated with commercial efforts at various space resource mining destinations will also be investigated.