

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Kyunghwan KIM
France, kimkyung83@hotmail.com

Mr. Nicholas McGhee
United States, Nick@marsincubator.com

DESIGN OF AUTONOMOUS SWARM ROBOT FOR LUNAR INFRASTRUCTURE CONSTRUCTION

Abstract

Human space exploration is more expensive than robotic system deployment, and carries human risk. In order to reduce the human risk, robotic development is recommended to prior to human exploration. Estimates on the cost of robotic construction in the lunar environment should consider the required ground support and transportation costs. "3D printing" construction equipment using on Earth is too massive to send to the Moon. Our study proposes autonomous construction using swarm robotics to additively sinter layers of regolith in-situ, and a pave the road for future lunar development and robotic. This paper demonstrates an autonomous system that harvests energy, collects lunar construction materials, produces infrastructure, and communicates data required to solve relative tasks. The guiding design challenge addressed in this proposal is the construction of a Spacecraft Landing pad on the Lunar surface by several small collaborative robots that distribute redundancy and collaborate together.

The major advantages of the autonomous robot are:

- Fully autonomous operation without the need for additional conversion and transport
- Automated error measuring, analysis and autocorrection
- Unlimited building area
- No resupply requirements
- Low cost of transportation by lightweight and small sized robots
- Possible for continued operating construct additional building
- Self-powered systems

In this paper, we focus on an overall concept design of the system in order to fabricate a test model next year.