NASA LUNABOTICS MINING COMPETITION FOR UNIVERSITIES: RESULTS AND LESSONS LEARNED

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Introduction: Space Mining for resources such as water ice, and regolith, which contain many elements in the form of metals, minerals, volatiles and other compounds, is a necessary step in Space Resource Utilization. One of the primary goals is to extract propellants from the regolith such as oxygen and hydrogen which could then be used for in-space transportation. In addition, the space mining system can be used for various construction tasks that can benefit human and robotic exploration as well as scientific investigations based on the exposed topography.

The National Aeronautics & Space Administration (NASA) Lunabotics Mining Competition is a university-level competition designed to engage and retain students in science, technology, engineering and mathematics (STEM). NASA will directly benefit from the competition by encouraging the development of innovative lunar excavation concepts from universities which may result in clever ideas and solutions which could be applied to an actual lunar excavation device or payload. The challenge is for students to design and build a remote controlled or autonomous excavator, called a lunabot, that can collect and deposit a minimum of 10 kilograms of lunar simulant within 15 minutes. The complexities of the challenge include the abrasive characteristics of the lunar simulant, the weight and size limitations of the lunabot, and the ability to control the lunabot from a remote control center.

This paper will present the results of the first and second annual Lunabotics Mining Competitions held in May 2010 and May 2011. It will also preview the 2012 competition with a review of the revised rules and latest 2012 entries. In 2010, 22 United States (US) universities competed, and in May 2011 the competition was opened to international participation.. There were 12 international teams and 34 US teams registered. This combined total directly inspired an estimated 544 university students. More students and the public were engaged via internet broadcasting and social networking media. The various designs will be cataloged and categorized to provide information to future Lunabotics mining robot designers and competitors. It is also expected to be of value for actual future space missions, as knowledge is gained from testing many innovative prototypes in simulated lunar regolith.

References:

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