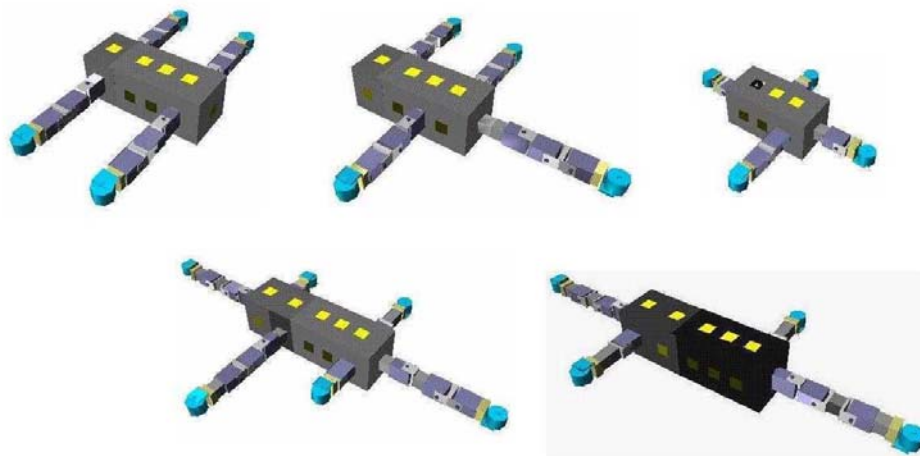


Shane Farritor

The University of Nebraska-Lincoln

*“A Modular Robotic System for Surface Operations of Human Mars Exploration”*

This proposal presents a study of a Mars Surface Modular Robotic System (MSMRS). Human exploration of Mars is planned for the 2010-2020 timeframe. Extensive use of robots would reduce costs and increase safety. A wide variety of tasks, requiring large variation in robot capabilities will be performed. Current robot technology may not be sufficient to accomplish all tasks required within the mission constraints. For example, large quantities of regolith may need to be manipulated for resource extraction, a task requiring bulldozer-like capabilities. Also, delicate scientific instruments may need to be deployed. Creating an individual robot for each class of tasks is not an efficient approach, especially since not all tasks can be foreseen.



The challenges of a human Mars mission may require revolutionary robotic solutions. The Mars Surface Modular Robotic System, a new approach to space robot design, is proposed as a possible solution. Here a robotic system, rather than an individual robot(s), is proposed. The system is based on a fundamentally modular design to efficiently address the unique challenges of the human Mars missions. The system consists of individual modules that can be assembled into many different robot configurations. With this system, robots can be dramatically reconfigured to perform dramatically different tasks. This approach, based on solid engineering principles, will allow the robot system to accomplish a wide variety of tasks, and will promote extreme reliability through adaptability.

Such an adaptable and reliable system would have clear benefits to a human Mars mission. The Phase I study will explore the requirements and design of such a system. Important root tasks will be identified, and a modular system will be designed to accomplish these tasks. The adaptability and reliability of the proposed system will be demonstrated using detailed physical simulation and animation.