

NASA SBIR/STTR Technologies

H6.01-9902 - Robotic Autonomous Navigation and Orientation Tracking System



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Identification and Significance of Innovation

To improve robotic platform navigation and real-time position and orientation tracking on lunar and planetary surfaces, Physical Optics Corporation (POC) proposes to develop a new Robotic Autonomous Navigation and Orientation Tracking System (RANOTS) based on a set of compact self-mixing interferometers utilizing low power semiconductor laser diodes. This system will supplement currently used vision-based navigation and wheel odometers to improve navigation precision, location awareness, platform orientation tracking and speed for lunar and Mars Exploration Rovers. The RANOTS will offer position accuracy better than 1 m with 95% probability per hour of fast (meters per second) motion without interacting with other positioning systems. In Phase I, POC will demonstrate the feasibility of the RANOTS by creating and testing a preliminary prototype. In Phase II, POC plans to develop a fully functional prototype and demonstrate its operation in an autonomous vehicle on rough Earth terrain.

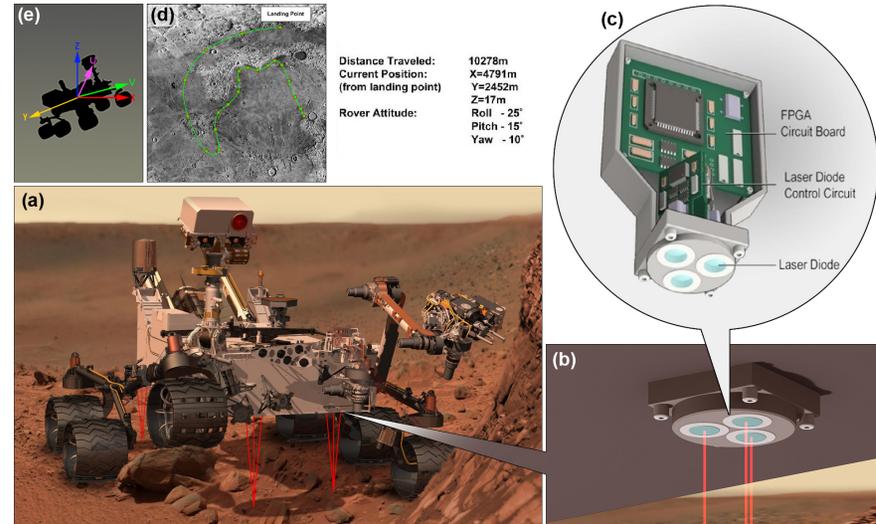
Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

1. Development of a 3D dynamic model for the RANOTS system and preliminary system design and performance simulation.
2. Identification of autofocusing technologies for implementation into the RANOTS system.
3. Integration, testing, and evaluation of the RANOTS system prototype. Preliminary definition of the commercial potential of the RANOTS technology.

Work Plan

- Develop a 3-D Dynamic Model for a Planetary Robotic Platform.
- Develop Self-Mixing Interferometric Sensors.
- Design Signals Processing Electronics for the RANOTS Prototype.
- Assemble the RANOTS Prototype.
- Demonstrate Feasibility of RANOTS.
- Explore Commercial Potential and Product Viability.
- Prepare and Submit Reports.



NASA Applications

The RANOTS system will directly contribute to the success of already planned NASA Moon and Mars missions. The RANOTS will provide real-time position and attitude tracking with accuracy better than 1 m and better than 1deg roll, pitch and yaw tracking with 95% probability per 1 hr of autonomic motion. It will allow for accurate navigation of platforms moving with significantly higher velocities (meters per second) than the maximum velocity of current Martian Exploration Vehicles (5 cm/s).

Non-NASA Applications

RANOTS military applications will include: navigation/position determination for ground platforms and dismounted soldiers in urban area battlefields or GPS-denied environments, within buildings, tunnels, caves, etc.

Firm Contacts

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NON-PROPRIETARY DATA