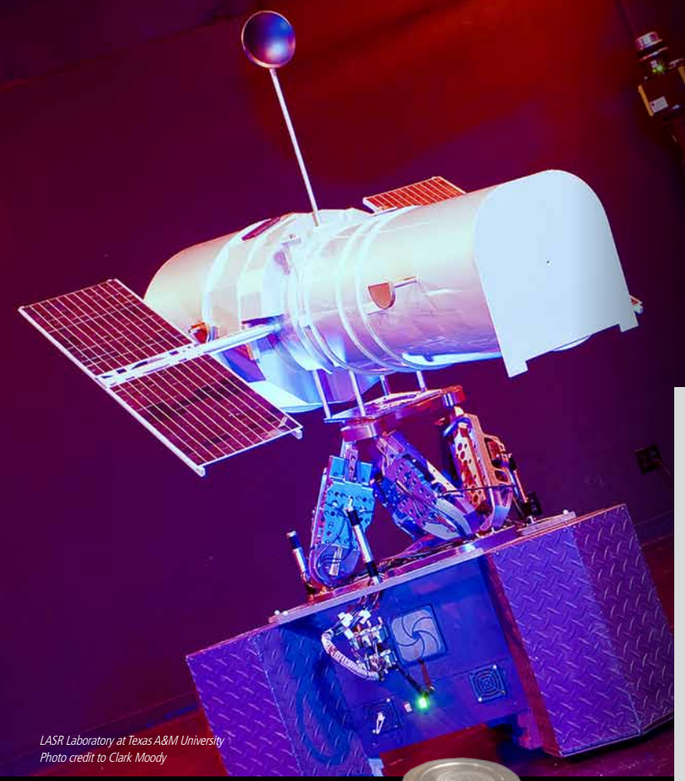
Nikon Metrology iGPS helps LASR Lab research advanced trajectory following for space applications.



LASR Laboratory at Texas A&M University
Photo credit to Clark Moody

Robotic sensing and control is researched at Texas A&M University to enhance critical proximity operations performed in space. Engineers at the University's Land, Air and Space Robotics (LASR) Laboratory use iGPS to provide the HOMER robot with sub-millimeter trajectory following. These experiments directly relate to aircraft formation flying and automated aerial refueling. Space applications cover spacecraft rendez-vous and experiments involving a 1:10 scale model of the Hubble Space Telescope.

HOMER proximity operation experiments at LASR

The Land, Air and Space Robotics (LASR) Laboratory at Texas A&M University conducts research in robotic sensing and control with an aim to enhance the fields of proximity operations, human-robot interaction, machine vision, swarm robotics, and autonomous aerial vehicles.

Proximity operations is a class of experiments requiring high-precision motion throughout the experimental space which directly relates to spacecraft rendez-vous, formation flying, and automated aerial refueling. These particular experiments are supported by the Holonomic Omnidirectional Motion Emulation Robot, better known as HOMER.

How iGPS inertial sensing fits into HOMER operation

HOMER consists of a mobile, planar base accompanied by a micron-class Stewart platform and is capable of manipulating a 10-kilogram payload through 6 degrees of freedom. The base provides large, omnidirectional, untethered motion while the Stewart platform superimposes out-of-plane motion and accounts for any inaccuracies in the base. It is critical to employ a high-fidelity inertial sensing system to provide HOMER with the ability to accurately track the desired motions.

The LASR Laboratory uses Nikon Metrology's iGPS System to feed coordinate measurements to HOMER's controller and correct for any inaccuracies the otherwise blind system experiences. iGPS sensor readings track the position of HOMER and other vehicles moving around it. This concept of closing the control loop is often referred to as "feedback control" and is essential to any autonomous robotic application.

Closed-loop robot control increases confidence and accuracy

Because of the high-precision measurements iGPS offers, this large-scale measuring system is also used to establish the laboratory truth and characterize the accuracy of other inertial sensing systems used at LASR.

iGPS mimics GPS functionality to a large extent. Instead of satellites orbiting in space, the system consists of six fixed iGPS transmitters that cover the 2000 square foot experimentation area. iGPS vector bar sensors mounted on the rigid HOMER body frame simultaneously take their own positional coordinates in real time. Quite unique is that all absolute point coordinate measurements are referenced to a single coordinate system.

The iGPS Wireless PCE option helps close the feedback control loop while allowing HOMER to remain untethered. When pairing HOMER with iGPS, the entire system can provide trajectory following with sub-millimeter accuracy throughout the workspace.

More information about LASR can be found at
http://lasr.tamu.edu/

More information about iGPS can be found at
http://www.nikonmetrology.com/iGPS

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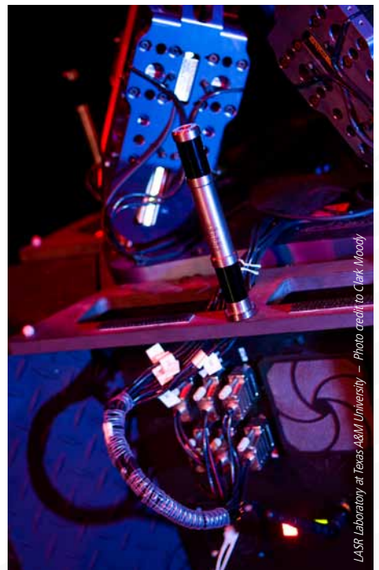

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iGPS sensors feeds coordinate measurements to HOMER and correct for any inaccuracies.