DESIGN AND CONTROL OF A GYRO STABILIZED PAN-TILT SENSOR SYSTEM FOR MOBILE APPLICATIONS

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INTRODUCTION.

Pan-tilt platforms are the motion control systems, mostly used for controlled positioning of various devices such as video cameras, sensors, antennas, etc. (Picture on the right). Utilizing pan-tilt platforms in mobile applications for precise pointing and target tracking has significant disadvantage due to inherent rotation range limitations due to only two degrees of freedom available (pan and tilt rotations) for adjusting positions of the mounted sensor systems. To overcome this problem, several configurations of parallel manipulators have been proposed for designing three degrees of freedom system of pure rotation for optimal camera orientations.

METHODOLOGY.

In this project the investigators propose to design and implement a gyro stabilized multisensory system, which will accommodate a spherical manipulator platform equipped with commercially available laser range finder sensor, an orientation and sensors and vision cameras. Combining these technologies will allow creating a 3D map of the surrounding environment.

RESULTS.

A 3D printed prototype of a spherical parallel manipulator platform was designed and assembled to provide three degrees of freedom of pure rotation. Forward and inverse kinematics of the mechanism were fully analyzed.

Algorithms for processing sensor information from LIDAR for the 3D mapping of the surrounding environment and object detection were developed and tested on a 6-axis Staubli robot-manipulator with the Hokuyo 2D laser rangefinder sensor mounted on the semi-anthropomorphic robot end effector (Figure below).

CONCLUSIONS.

The proposed sensor system will be tested on a developed hexapod mobile robot platform.