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Project of Multi-purpose Optical Tracking System: Design and Deformations of Optical System's Transmitting Path

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The ESF-funded project of multifunctional optical tracking device is under construction in the Institute of Geodesy and Geoinformatics and Institute of Physics of the University of Latvia.

The planned result of the project is a functional prototype of newly designed multi-purpose optical tracking system for both positional and satellite laser ranging (SLR) observations with the additional capability to observe near-Earth objects (NEO).

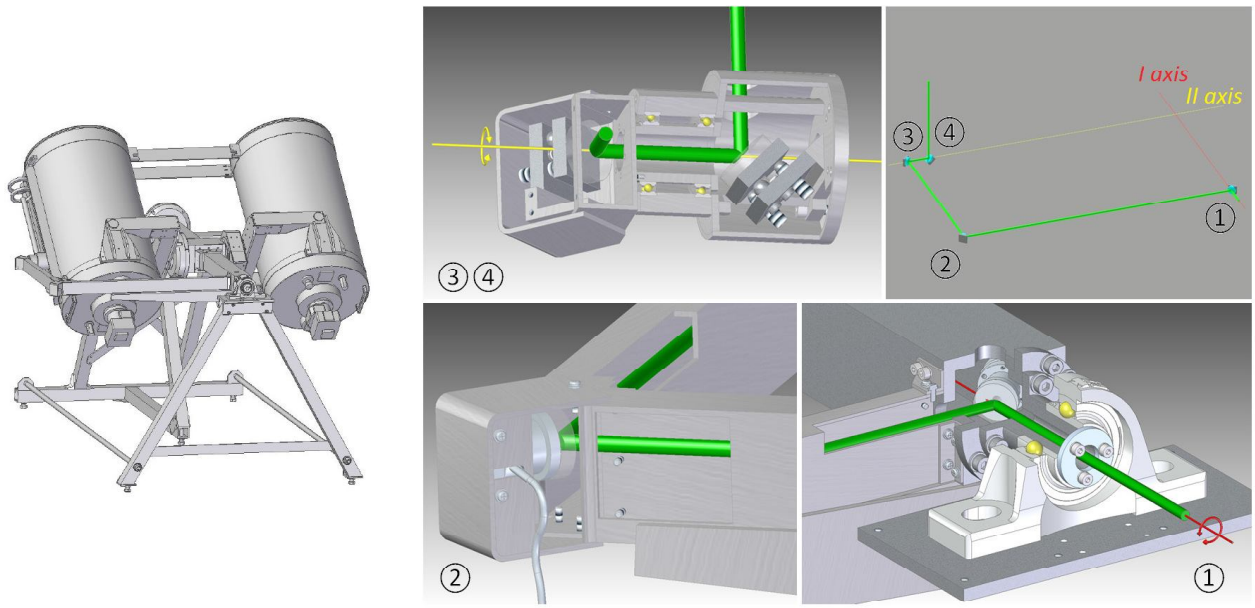

Fig.1. Design of device and separate optical units with laser path in beam turning mirrors' assembly.

This tracking system will be operating in both active (light-transmitting) and passive modes. In case of the active mode a pulsed laser (Nd:YVO4, 50 Hz, 18 mJ, 28 ps) for SLR purposes or other light-emitting source for target illumination purposes can be used.

A novel optical scheme with three optical channels – one transmitter and two receivers, is being designed to provide precise pointing to support active more observations including daytime tracking.

The optical transmitter directs the laser beam through the system:

- the first two mirrors of laser path are equipped with actuators,
- each mirror reflects 99,5 % of laser beam light,
- laser beam turns at the mirrors with optimised performances at 532 nm wavelength,
- laser beam diameter is 6 mm,
- laser beam expander ($10^{\times}$ expansion presently).

Computer controlled high-performance tripod design actuators will be used for compensation of deformation effects in the beam path. Each actuator ensures beam deflection up to 2.4 mrad.

Deformation of system's first axis causes additional turning of the first mirror. To compensate for this additional turning a 3D actuator will be used that is associated with the mirror. As the actuator is fixed at the first axis, it must compensate displacements in two planes.

Tests will be performed after installation of montage with the aim to determine additional error sources which impact laser beam pointing. This will be achieved by star observations.

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