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CONCEPTUAL DESIGN OF A COMPACT 6 DOFS REPOSITIONING AND LOCKING MECHANISMS FOR HIGH PRECISION ALIGNMENT OF EARTH OBSERVATION SPACE TELESCOPE

Abstract

Off-axis telescopes used in Earth Observation require high assembly precision of component's positions which results in compromised image quality. One way to solve this problem is to use a multi-axis stage instrument which is ground support equipment to adjust the positions of the components. The problem is the commercial parts are not suitable to use in this situation due to the physical constraints of limited space, causing difficulty in the assembling process.

To solve this problem, a conceptual design of a repositioning and locking mechanism was developed and is capable of precisely adjusting the position and orientation of components in 6 DOFs and locking the parts in place by a smaller package that fits within the available space, and the repositioning part is removable. The concept behind the repositioning mechanism is the displacement of compliant mechanism and the tip-tilt of a stage, both are actuated by micrometer heads. For the locking mechanism, mechanical fasteners were utilized to lock the position of the components. In this experimental design, the prototype was manufactured using 3D ABS plastic printing technique.

The design is smaller than the commercial part. The mechanism is adjustable in all 6 DOFs and has accomplished the resolution which satisfies our expectation. However, when dealing with one axis, other axes were affected by the movement of the compliant mechanism.