

Antarctic Project for astrometric observations

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Abstract. Astronomical Institute of Romanian Academy initiated this project in 2005. The results of researches related to the construction of mechanic systems and the proposed astrometric tasks will be finished in 2008. The module PROTEL is a result of several research groups and it will perform astrometric control observations remotely.

Keywords. astrometry, reference systems, surveys

1. Objectives

The aim of this project is to achieve a robotic telescope adapted to polar environment activity. The autonomous module for Antarctic astronomical surveys PROTEL (Polar Robotic Telescope)- represents an automatic telescope designed to work without human intervention in conditions of low temperature, imposed by polar environment. Astroclimate studies have indicated an annual average temperature falling down to -25°C , in area where the instrument is intended to be sited. That implies the use of special kinds of materials, optical components, electronic devices, and operating systems adapted to work in extreme cold. The lack of human participation imposes a completely automated, easy to use instrument. The astroclimate conditions there allow a highly precise detection of images. Thus it is possible to: observe near-Earth celestial bodies, improve the stellar reference frame in the neighborhood of extragalactic radio stars, study the mutual phenomena of the bodies in the Solar System, study stellar systems visible only from the Southern hemisphere, study the vertical deviation by astro-geodetic methods. Carrying out astronomical-geodetic determinations in the Southern hemisphere will allow to enlarge of the database which contains: local reference points of the extra-galactic radio-sources, positions, proper motions and rotation periods of the NEOs, mutual phenomena of the bodies in the solar system.

2. Scientific and technical aspects of the project

The first step performed is the technological study which contains the main parameters and attaining goals. Second step is the elaboration of the astroclimate study using the already obtained data-base and in site determination at Romanian-Australian scientific polar station Law-Racovita. The module will be built based on the following studies, projects and testing of materials and components in Romania and in polar region. After performing the final test in Romania, the module shall be installed in site by our scientific associates, after a preliminary training. Observational results are intended to be stored in data-bases, for analyzing and processing. The astro-geodetic observational programs will be performed through satellite communications. The meteorological conditions factor we mean the astroclimatic conditions during the testing and then during the achievement

of the results is the major risk which the working team will incur. The materials and the technologies used can be greatly influenced by the environment conditions, there may be differences between the tests made at home and the real conditions in the work area. We do not exclude the possibility of contrary conclusions in some researches, which, however, cannot affect the general background of the problem, conclusions which will necessitate supplementary efforts and project modifications. The optical tube is a OGS - Ritchey Chretien 14"25 f/8 telescope, adapted to hard work at low temperatures (-40°C). The optical field of such a telescope in conjunction with a corresponding CCD camera is estimated to be at least 15×15 arcminutes, having an angular pixel resolution of 0.3 arcseconds/pixel. The positioning system adopted for the optical tube is a completely automated Fork mount. By means of a software downloadable in the memory of main command and control system, the mount enables the pointing of telescope toward the target - stellar areas. A GPS used as a temporal reference system synchronizes the inner time of instrument with the universal time.

3. Conclusion

We identify some new elements in the design of a Romanian astronomical instrument: a completely autonomous running module conceived as a specific data capturing robot, successful operating in the extreme conditions of environment, maintenance by data flow via satellite communications.

References

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