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A NEW CONCEPT FOR CHEAP CONSTRUCTION OF GIANT TELESCOPES

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ABSTRACT

A new concept of a simple and cheap construction of giant telescope is described.

A new concept for a construction of large optical telescopes with a diameters of a few tens of meters is suggested. The suggested concept is based on the scheme of a construction of a giant annular radio telescope (Tovmassian 1964). The simplicity of the suggested constrution is achieved by:

a.observations at constant altitude above the ground, *i.e.* at the almucantarat, b.separate construction and movement of the secondary mirror, and c.composite main mirror

In the suggested design the main mirror is rotating only around vertical axis at an angle of about $\pm 45°$. The zenith angle of the main mirror might be about 35°.It is directed toward east or toward west, depending upon the landscape at the site. The range of observable declinations depends on the latitude of the telescope's site. If the telescope is located at the Earth's epuator, then the width of observable declinations would be about $\pm 45°$. In directions close to the poles the declinations is changing with azimuth at the almucantarat slower, and for this reason in the case of location of the telescope at higher latitudes the range of observable declinations would be somewhat smaller. The best coverage of declinations is being achieved when the telescope is installed closed to the Earth equator, at sites with latitudes less than about 30°-35°. The secondary mirror should be installed on circular rails at a relevant distance and relevant height from the main mirror. The pointing of the telescope is achieved by the corresponding rotation of the primary mirror around its vertical axis and the positioning of the secondary mirror on the optical axis of the former. The position of the secondary mirror could be controlled through use of an appropriate laser positional system.

In the proposed construction the main and secondary mirrors and their constructions are not subjected to variations of tensions, hence they may be made very light, simple and cheap.

The surface of the main mirror may be spherical or semi parabolic. It consists of mutitude of small (1m), very thin and cheap spherical mirrors.

The field of view of the telescope of about 5°, together with small rotation of the primary mirror and synchronous movement of the secondary mirror on rails, and a corresponding fine movement of the detector at focal plane will allow to track the observed and thereby to reach exposures up to about 1 h. The accessible field of view could be appreciably enlarged by the application of a field corrector (Borra 1993, 1995). It will allow to increase the traking of the sky, and thereby permit relatively long expousures.

The receiving equipment and field corrector are installed at a platform behind the main mirror, that rotates with the mirror. Hence there is no any restrictions on the weight of the recieving eqiupment: spectrographs, detectors, etc.

For decreasing the resistance to the wind the space between small composite mirrors of the main one be left open.

Both the primary and the secondary mirrors could be covered with a light, cheap shelters using fixed constructions. In the case of the secondary mirror its "dome" could be installed at a parking position at one of the ends of the railway.

In the case of, say, a 30 m telescope the gain in observing time in comparison with that of conventional telescope having a diameter of 6 m (*i.e.* comparable to the diameter of the secondary in the 30 m system) is at least 15. As a result, such giant telescope would allow us to investigate extremly weak and distant objects. At the same time the cost of a 30 m telescope wit this type of structure would not be appreciably large than that of 6 m conventional telescope including its rotating dome.

Using such techniques larger telescopes may be constructed, than are at present feasible using conventional methods. A limiting factor may be the size of the secondary mirror, and of course, the cost.

REFERENCES

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