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Application of an interferometric method in phasing the segmented primary mirrors of the high-aperture telescope

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Abstract: The main method to improve the resolution of optical system is enlarging the pupil of the optical system, and by using several or even more small segmented mirrors to get an equivalent large diameter primary mirror is a common way. When the optical system enters the orbit, it should deploy the segmented mirrors first. The image quality of the optical system is determined by the deployed position precision of segmented mirrors. The phase adjusting process can be divided into two processes: coarse phasing and fine phasing. In the coarse phasing, interferometer and electronic speckle pattern interferometry is used to ensure the co-phased position of segmented mirrors on the ground and to obtain stripes on the back of the segmented mirrors respectively. When the optical system is unfolded, obtain the stripe again. Process the former stripe images and the later ones by mean square error, which can obtain the similarity of two images. According to the shape of stripe pattern and the similarity, adjust the position of segmented mirrors to complete the process of large piston adjusting. And analyze the stripe that is obtained by processing the electronic speckle images after the process above. Adjust the position of segmented mirrors according to the results until the adjusting of coarse-phasing is completed. With the simulation results, when the position of segmented mirrors with 0.0001 degrees tilted or 5nm decentered, the similarity of standard image and simulation results are about 92 percent and 95 percent respectively.

OCIS codes: (080.2740) Geometric optical design; (110. 2960) Image analysis ; (060. 4080) modulation.

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