the real-time motion control with high precision for the ground-based telescopes

[1]Wangping Zhou, [2]Yong Wang *([1]Nanjing University of Information Science & Technology, [2] Shenzhen Institute of Information Technology)*

wpzhou@yahoo.cn

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In the mount drive system of many large ground-based telescopes, either optical or radio, the mount moves in general at a constant low velocity. Guiding devices are used several times per second to correct the telescope pointing precision. However, the guiding feed-back with a very low frequency to some extent decreases the tracking precision seriously. In this paper, a real-time control method with high frequency feedback is proposed for the telescope mount driving. A fast image processing algorithm is put forward, which greatly compresses the image data of reference stars. With a proper filter, the central pixel of the star image can be figured out in no more than one millisecond. Then, a robust vari-able-structure controller using high frequency feedback is designed, which has exponential convergences to the coordinate errors between the calculated central pixel and the reticle. Theoretical analysis and experiments show that the proposed approach can obtain high-precision motion control for the mount of large ground-based telescopes.