Fast and Robust pointing and tracking using a second-generation star tracker.

Second generation star trackers work by taking wide-angle optical pictures of star fields, correlating the image against a star catalogue in ROM, centroiding many stars to derive an accurate position and orientation. This paper describes a miniature instrument (10cm cube), fast and lightweight (850g), including database and search engine. It can be attached to any telescope to deliver an accurate absolute attitude reference via a serial line. It is independent of encoders or control systems, and works whenever it can see the sky. Position update rates in the range of 1 to 5 Hz enable closed-loop operations. The paper describes the instrument operational principles, and its application as an attitude reference unit for a telescope. Actual data obtained at the University of Hawaii's 0.6-m telescope are presented, and their utility for correcting mechanical alignment discussed. The system has great potential as a positioner and guider for (i) remotely operated optical telescopes, (ii) infrared telescopes operating in dark clouds, and (iii) radio telescopes. Other application recommendations and the performance estimates are given.

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