Abstract Submitted
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Angles-Only EKF Navigation for Hyperbolic Flybys IAN MATHESON, University of Arizona — Recent concepts for interstellar travel, notably the Breakthrough Starshot initiative, attempt to define a minimum feasible probe to return in situ data about a nearby star within the career lifetime of a single researcher with minimal investment in ground-based or space-based infrastructure. These concepts generally propose launching gram-scale probes, consisting of little more than an optical camera and a microprocessor, to speeds on the order of $0.1c$ on an enormous laser. For lack of onboard computational resources, an extremely simple navigation technique is required to autonomously estimate position and velocity; most authors suggest some form of Kalman filter. This study shows that a simple extended Kalman filter processing angles-only measurements is capable of consistently estimating position and velocity for a Starshot-style probe when provided with highly accurate initial estimates and small initial uncertainty at speeds characteristic of current space probes ($0.00002c$), as well as the gravity of the target star, but does not investigate filter performance at proposed Starshot speeds.

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