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Impact Monitoring System of the Institute of Applied Astronomy of the Russian Academy of Sciences

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ABSTRACT

When a new near Earth asteroid is discovered it is important to know if the discovered object can collide with the Earth and cause danger. The monitoring for such possible incidents is an important role in planetary defense. Nowadays there are systems that have been working on that problem: CLOMON2 and Sentry. Here we present an operational system for monitoring collisions of potentially hazard objects developed in the Institute of Applied Astronomy of the Russian Academy of Sciences. Our system regularly obtains observations of near Earth objects and computes their orbits with covariance matrices. A covariance matrix shows the errors of orbital parameters and characterizes the possible positions of the object (confidence ellipsoid). The system estimates the impact probability of an object by the Line of Variation sampling approach [1]. The longest axis of the confidence ellipsoid is chosen to be sampled obtaining virtual asteroids. Each virtual asteroid's orbit is propagated from the time of discovery 100 years ahead. If a virtual asteroid comes closer to the Earth than a certain distance the impact probability is computed. In the case the nominal orbit of the asteroid collides with the Earth the system

determines the parameters of entry point and calculates the possible area of collision on the Earth surface. If the nominal orbit passing by the Earth, but the probability of a collision is not negligibly small the strip of risk on the Earth surface is determined.

[1] Milani A., Chesley S.R., Sansaturio M.E., Tommei G., Valsecchi G.B. *Nonlinear impact monitoring: line of variation searches for impactors* // ICARUS, V. 173, p. 362-384 (2005).
