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Detection and Analysis of Near-Earth Object Encounters

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Abstract: Recent advances in encounter theory have allowed the very early identification and analysis of asteroid-Earth collision possibilities, even those with very low impact probabilities. The problem hinges on two issues. First, it is necessary to actually detect any impacting trajectories that are compatible with the available astrometric observation set. Linear methods are reliable only for detecting impacting trajectories at uncomfortably high probabilities of impact (~0.1%). Thus nonlinear search methods are necessary to ensure the earliest detection of a threatening encounter, which is the key element of any hazard mitigation strategy. After a potential collision is detected it becomes necessary to compute the probability of impact in order to assess the risk posed by the collision in question.

The theoretical tools needed to automatically and robustly monitor the ever-changing asteroid catalog for threats to the Earth are now available and such a system is presently under development at JPL.