Intel ISEF 2009 OFFICIAL ABSTRACT and CERTIFICATION

A Novel Approach to Asteroid Identification Using Image Processing of Existing Data

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Asteroids are dangerous objects for Earth, as evidenced by previous asteroid impacts that have had planet-wide effects. Asteroid orbits are easily perturbed, or changed, by the gravitational pull of other solar bodies. For this reason, it is vitally important to carefully track the motion of all potentially dangerous asteroids in our solar system.

In this project, we analyze existing astronomical data for asteroid sightings. A large-scale analysis of existing image data could lead to identifying new asteroids, to better understanding the patterns in asteroid orbit perturbations, and to more effective ongoing observations.

Our study begins with obtaining astronomical images for analysis and corresponding stars from a reference catalog. Using this data, we then compare the stars in the image to the stars in the sky by finding similar triangles between corresponding stars. This enables us to determine the exact location and orientation of the image in the sky. Any unknown objects that are in the image are then translated to a location in the sky, constituting one object observation. We can further analyze these observations to find previously unknown asteroids or to document perturbed asteroids.

We have developed software to identify potential asteroid observations in astronomical images. We have made our methods versatile by investigating ways of making the image analysis techniques applicable to a wide variety of images. Our program has successfully been applied to a variety of astronomical images and has identified possible asteroid observations in these images.

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