CONTROL ID: 2567716

TITLE: Shaping Asteroid with Genetic Evolution (SAGE) using lightcurve and radar data

ABSTRACT BODY:
Abstract (2,250 Maximum Characters): We are presenting new module added to SAGE (Shaping Asteroids with Genetic Evolution) algorithm (Bartczak et.al, 2014) which employs radar echo images.

Asteroids can be observed using many ground-based techniques, some of which allow for direct shape observations (eg. stellar occultations, adaptive optics imaging). One interesting, information-rich technique is radar imaging. It provides insights about surface properties, sizes, pole orientations and shapes of asteroids (Ostro, 2012). Radar echo images can be used both for modelling asteroids and testing results from lightcurve inversion methods. We aim to use radar images in SAGE algorithm the same way we use lightcurves.

Genetic algorithm starts with the sphere and random values for pole orientation. Then, by introducing small, random changes to the model parameters, a population of shapes and spin states is created. Subsequently, best model from the population is chosen and process is repeated until stable solution is reached. Assuming even distribution of mass we calculate center of mass and moment of inertia for each model.

For every intermediate step model we calculate synthetic lightcurves and compare it with observations with χ^2 test. Following the same principle, we create simulated radar echo images for a model and compare them with the observed ones. Both χ^2 values for lightcurve and radar are then used as a benchmark for choosing the best model in given population. The best one found serves as a starting model for the next generation of randomly modified models.

We are showing a model of 1996HW1 obtained using the described method.

CURRENT * CATEGORY: Asteroid Physical Characteristics: Spin States

CURRENT : None

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