

Discovery and light curve measurement of unknown minor planet

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http://www.iat.jaxa.jp/res/adtrg/a01_01.html

Sample return by Hayabusa is carried out to clarify structure and mechanism of near earth object. The choice of a target toward a next asteroid exploration is going to be performed. In the asteroid becoming a candidate of a next exploration, a list is put up. If a large-scale telescope is not used because many of candidates are very dark, the observation is difficult; therefore, the data has almost not taken.

Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology, Advanced Space Technology Research Group, established the Nyukasayama optical observatory in the Nagano Prefecture Ina-shi Takato-cho for studies of observational technique of space debris. Unknown debris is discovered, and orbit is determined, and a technique to tracking is studied. And a moving objects detection technique developed in our group is used in this observatory, and it is assumed by a search of unknown minor planet as well as debris detection. An observatory begins a part of use at year before last, and two domes are completed in last fall, and observation is being got ready for really from this winter. An observation system uses 0.35m Newton-type reflecting telescope and a 2K2K-CCD camera mainly.

A moving object detection technique searches by stacking image of many of a short time exposure to movement of moving object, as a result this software can find the invisible moving objects from one image. If this technique is use, even a small telescope can have efficiency to detect equal to apertures more than 2 times. The flow of detection is of a dark and flat correction, the match with the guide star catalog, a correction of a position and the image and the sky level correction. And it perform mask processing with a median image of all images. Only the fixed star which does not move is removed, and only the moving objects are left to an image. Moving object is searched for from this image. The search assumes the motion of the moving object, stacking while shifting the image according to the motion, and has detected the moving object. Detected moving object confirms a motion by a blink. And equator coordinate of moving object is determined, and known minor planet or unknown moving object is identified by the Minor Planet Checker. Orbit of moving Object is determined last, and moving object provided from observation of two nights more than is identified, processing to report is possible. In fact, a lot of minor planet was discovered in more than 1 year after transferring observatory, and a temporary code to exceed 180 by present could be got, and it was possible for proof of a detection technique. If some field is observed, unknown minor planet can be detected by all means. Minor planets 21-22 which can be detected by this technique are exceed to magnitude. With new discovery in this class the top 691: Steward Observatory and Kitt Peak (0.9m) which go and G96: Mt. Lemmon Survey (1.5m) and the like being on a par even in the world, it has reached also the extent which competes the discovery report ahead. The light curve data by the rotation of the minor planet can be obtained because it observes it spending three hours from two hours in one observation area in our observation of minor planet. If it is a small minor planet, most seems in the rotating period for several hours. The light curves to obtain a rough rotating period by observe at two nights or three nights tying can be measured. The light curve measurement becomes an important means also for presuming the shape of the minor planet.

This paper discusses the observation system of the Nyukasayama optical observatory, search technique of the moving object detection software, the newly discovered minor planets and light curve measurement of the several minor planets.