Near Earth Object Detection by Continues Sky Imaging for Observing Occultation from Different Visual Points

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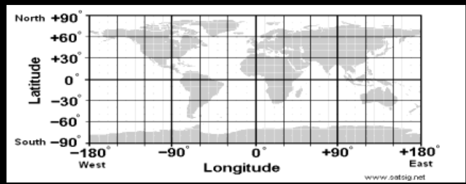
ABSTRACT

Asteroid occultation's are useful for measuring the size and position of asteroids. It is possible that an undiscovered asteroid could occult a celestial body at any time. By continuously monitoring these celestial bodies, we could discovery a new asteroid when it occults the body. Recently, several new tools and techniques have been developed to allow for robust detection and prediction of planetary encounters and potential impacts by near-Earth asteroids (NEAs). The difficulties involved in measuring occultation's from earth are, finding smaller asteroids requires more sensitive measurements, probably involving space-based instruments so that the blurring effect of the atmosphere does not obscure the effects of the small asteroid. We describe a system consisting of series of CCD Cameras placed at particular place in the earth's orbit. The system follows a sidereal drive, which means its rotational axis is parallel to the Earth's axis of rotation. It allows the instrument attached to it to stay fixed on any object in the sky and cover entire sky for rapidly measuring the brightness of the night sky

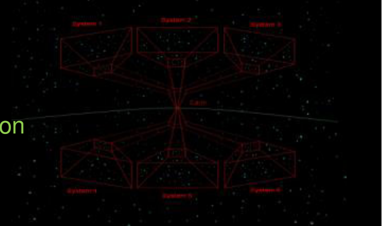
DESIGN OVERVIEW

By exposing the camera to a particular region of the sky, the total numbers of stars in that region are obtained, along with its background sky. From obtained sky image, the pixels where the stars are located and pixels where no stars are located are determined. The pixels in which the stars are located are only processed and pixels in an area where no stars are located are ignored. The pixel selection in use, selects pixels only which occupies the stars with a particular or required stars, other than these are not taken into account. Once the pixels containing the required objects are obtained, the complete data of each pixel content is extracted, which carries; position of the pixel in the frame, the object its holding (mainly the star), etc.

geographical position
- Latitude
- Longitude
- Altitude



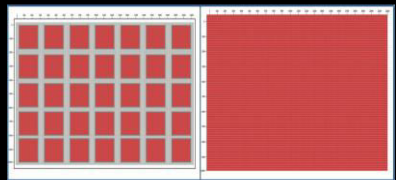
Instruments
- Telescope
- CCD Camera
- Server Connection



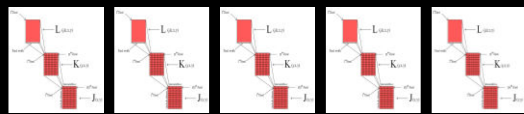
SYSTEM OVERVIEW

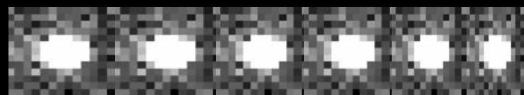
There must be number of systems working in coordination with one another in geographic regions in order to continuously monitor the same area of sky. To cover entire sky and to obtain accurate information, we require more than one system focused at different angles and connected to a single server to be controlled at once. The system consists of a Telescope, a CCD Camera, and a connection to the central server. There are many factors that are need to take into account, position of the system in latitude and longitude needs to be known and elevation (altitude) needs to be known. All of these factors are controlled by the central server. It is required that all the system components, at different places must have same configuration to get required measurements, in case if its not possible, The Field of View of the system should be given to the system, so that the system will make required changes to the input. Field of View can be formulated using.

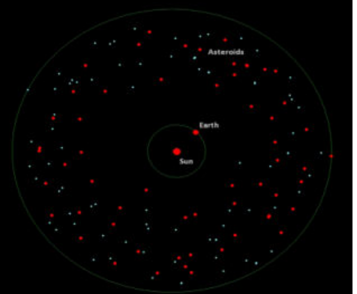
FOV (Degrees) = 57 x CCD Chip Dimension (mm) divided by focal length of telescope (mm).



CCD Camera
- Number of CCD;s
- Number of pixels
- Pixel size
- Pixel scale







DATA ACQUISTION

In the continuous clocking mode, data are continuously clocked through the CCD pixels. On identifying the pixels where the stars are located, the data is obtained continuously through these pixels. A timed exposure is made wherein a pixels collects data for a preselected amount of time. Once this time interval has passed, the charge from the selected pixels are quickly transferred to the Data Base. Data acquisition times are selectable within a range of values. Selecting a time interval shorter than the nominal value has the consequence that there will be no data acquired at that time, commonly called as "dead time".

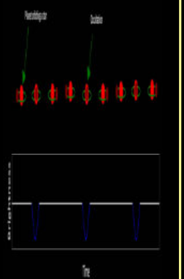
DATA PROCESSING

- Zero Difference Approach

This approach is to identify the stars which have shown zero difference in brightness over time. These stars are removed from the list of stars that had shown occultation. It is clear in rejecting stars that have zero difference, as each and every star can't be processed every time, as there will be a very large number of stars to be processed.

- Periodic Difference Approach

This approach is for identifying the occultation due to binary stars and planets orbiting the star, these stars show periodic change in brightness, which is different from the asteroid occultation that show changes after long duration. These stars are also removed from the list.



- Single Difference Approach

This approach is to identify th stars which have shown on time difference in brightnes over time. There are greate possibilities that this differenc in brightness could have bee due to occultation of a asteroid, hence all the stai showing one time occultatic are taken for processing.