[S1-3] Automated Streak Detection for High Velocity Objects : Test with YSTAR-NEOPAT Images

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We developed an algorithm to efficiently detect streaks in survey images and made a performance test with YSTAR-NEOPAT images obtained by the 0.5-m telescope stationed in South Africa. Fast moving objects whose apparent speeds exceed 10 arcsec/min are the main target of our algorithm; these include artificial satellites, space debris, and very fast NEOs. Our algorithm, based on the outline shape of elongated sources employs a step of image subtraction in order to reduce the confusion caused by dense distribution of faint stars. Comparison with visual inspection proves the efficiency and completeness of our automated detection algorithm. When applied to about 7,000 time-series images from YSTAR telescope, nearly 700 incidents of streaks are detected. Fast moving objects are identified by the presence of matching streaks in adjoining frames. Nearly all of confirmed fast moving objects turn out to be artificial satellites or space debris. Majority of streaks are however meteors and cosmic ray hits, whose identity is often difficult to classify. Details of our algorithm and interesting examples of streaks will be presented.

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[S1-4] Fast Optical Transients from YSTAR

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We report the detection of large number of extremely short lifetime transients from a subset of the YSTAR-NEOPAT database, which contains all image data obtained by the 0.5m survey telescope stationed in South Africa. For the detection, we use a privately developed pipeline based on image subtraction photometry. The pipeline is able to detect transients down to about 17th magnitude in R band. From 196 sample time series images taken in a single observing night, we detect a total of 163 optical transients. Each of these flash events appear to have short lifetime on the order of 10 seconds or less. Approximately 80% of these events have stellar point spread function and therefore considered real. What gives them astrophysical significance is the fact that about 25% of them have counterparts in faint source catalogues. It appears that the observed transients indicate these faint sources have occasional brief brightening of some 2 to 3 magnitude amplitudes. Considering the relatively bright limiting magnitudes of available all-sky photometric catalogues, the fraction of counterparts may increase significantly if they are searched in deep images. Another interesting point is that some of these transients show recurrences.

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