Mega-precovery and data mining of near-Earth asteroids and other Solar System objects

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The vast collection of CCD images and photographic plate archives available from the world-wide archives and telescopes is still insufficiently exploited. Within the EURONEAR project we designed two data mining software with the purpose to search very large collections of archives for images which serendipitously include known asteroids or comets in their field, with the main aims to extend the arc and improve the orbits. In this sense, "Precovery" (published in 2008, aiming to search all known NEAs in few archives via IMCCE's SkyBoT server) and "Mega-Precovery" (published in 2010, querying the IMCCE's Miriade server) were made available to the community via the EURONEAR website (euronear.imcce.fr).

Briefly, Mega-Precovery aims to search one or a few known asteroids or comets in a mega-collection including millions of images from some of the largest observatory archives: ESO (15 instruments served by ESO Archive including VLT), NVO (8 instruments served by U.S. NVO Archive), CADC (11 instruments, including HST and Gemini), plus other important instrument archives: SDSS, CFHTLS, INT-WFC, Subaru-SuprimeCam and AAT-WFI, adding together 39 instruments and 4.3 million images (Mar 2014), and our Mega-Archive is growing.

Here we present some of the most important results obtained with our data-mining software and some new planned search options of Mega-Precovery. Particularly, the following capabilities will be added soon: the ING archive (all imaging cameras) will be included and new search options will be made available (such as query by orbital elements and by observations) to be able to target new Solar System objects such as Virtual Impactors, bolides, planetary satellites, TNOs (besides the comets added recently). In order to better characterize the archives, we introduce the "AOmegaA" factor (archival etendue) proportional to the AOmega (etendue) and the number of images in an archive.

With the aim to enlarge the Mega-Archive database, we invite the observatories (particularly those storing their images online and also those that own plate archives which could be scanned on request) to contact us in order to add their instrument archives (consisting of an ASCII file with telescope pointings in a simple format) to our Mega-Precovery open project. We intend for the future to synchronise our service with the Virtual Observatory.