Prediction and archival tools for asteroid radar observations

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The Earth-based radar facilities at Arecibo and Goldstone have provided very powerful tools for characterizing the trajectories and physical properties of asteroids. This is especially important for near-Earth asteroids (NEAs) which are key in the contexts of hazard mitigation, spacecraft exploration, and resource utilization. Over 10,000 NEAs have been identified and over 430 have been detected with radar (http://radarastronomy.org). Both of these numbers are growing rapidly, necessitating efficient tools for data archival and observation planning. The asteroid radar database hosted at radarastronomy.org keeps track of all radar detections, documents NEA physical properties, and provides NEA observability conditions. With the help of UCLA students, we are integrating a number of tools with the database to facilitate recordkeeping and observation planning. For instance, a geometry-finder tool allows us to identify the optimal times to observe specific NEAs and to compute rise-transit-set windows. Signal-to-noise (SNR) tools allow us to compute SNR values for both Arecibo and Goldstone observations. Python-based graphical tools help visualize the history of asteroid detections and plan future observations. A collaborative research environment (wiki) facilitates interactions among radar observers. These tools and others in preparation enable a more coordinated and efficient process for asteroid radar observations.