Python in Astronomy 2015 – Session on "Observation planning and scheduling"

General info / discussion

- Eric Jeschke – Introduces the idea: develop a new Astropy-affiliated package for observation planning and scheduling. Should be useful for individual astronomers and observatories with a wide variety of needs / backgrounds
- Anne Archibald – May need to limit complexity, not try to fit all needs. E.g. scheduling methods / needs are different. LOFAR is limited by data rate to disk. Need to make tradeoffs on # sources and how long to observe
- Eric Jeschke – Try to make it pluggable, try to get "use cases" for scheduling algorithms want.
- Terminology: OB = observation block = minimum schedulable block = MSB
- Geert Barentsen – ESO has one format to specify observations "OBs"
  Eric Jeschke – Has to be extensible though, because one format doesn't fit all. File formats come and go, package classes should be the primary focus. Then have read / write to certain file formats (usually only a subset of the info).
- How to continue?
  Another session later this week to gather concrete use cases and then do a first API design for the package to be. The question "What are concretely the toolbox pieces that should be implemented?" wasn't really discussed.

Desired features / use cases

- **Single observer planning an observing night.**
- **Observatory doing queue scheduling.**
- Concrete example: "can I observe target X tonight?"
- Several people mentioned it needs to be fast, specifically the ephemerides calculations. We should benchmark against PyEphem or e.g. SLALIB.
- Weather data query from the web?
- TOO = Target of opportunity observations.
  Something that must get done.
- Continuous monitoring on sources – interplay between blocks.
- Moving object support
- Robotic telescope, scheduler without human interaction.
- Need metrics: "how good is this schedule"?

What software is already available?

- http://catserver.ing.iac.es/staralt/index.php (Staralt, Startrack, Starmult, Starobs)
- Hubble takes a month of compute time to build the schedule. Not dynamic.

- Anne – LOFAR doesn't have a scheduler yet because it's very complicated, because the instrument has such a large field of view (~ 20 deg)
- Edward Gomez / Curtis McCully – LCOGT TelOps – Real-time scheduler already running. "Gurobi solver" – 12 telescopes, parallel scheduling problem.
    - Built on "visibility windows"
    - Scheduler runs almost continually, re-schedule every 3 to 15 minutes. Kernel is a commercial package, still computation effort is an issue.
- Eric Jeschke – Subaru uses a weights-based system "fuzzy scheduling"

Would observatories use this new package?

- Eric Jeschke – Yes for Subaru
- Curtis McCully – Probably no for LCOGT, have a working fancy system. Maybe for the toolbox (e.g. rise / set times), not the scheduling.

What kinds of constraints are there?

- Target
- Daytime, angle wrt. sun
- angle wrt. moon and moon-phase
- airmass
- orbital phases of astrophysical objects
- cadence of repeat observations (of the same target)
- Seeing
- transparency
- current position of pointing
- need to go back and forth between science target and calibration source
- activities / observations at fixed time constraints relative to other observations