

PEP 151 Observational Project 2

Apparent Motion of the Moon & Stars

In this project you will record the apparent motion of the moon (and possibly stars) in your local sky. You will also examine and explain the phase of the moon you observe.

Part 1. The Moon

(20 points) Make a time-lapse video or gif of the motion of the moon in your local sky. The video or gif needs to satisfy the following:

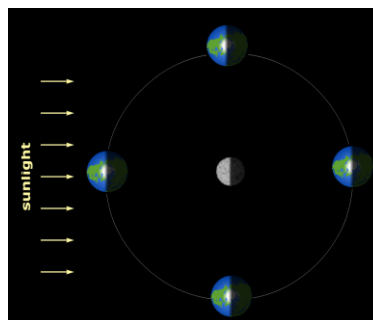
- The total time range of your observation should be at least an hour, and should contain at least 6 frames with roughly equal time intervals.
- You can either use the time-lapse function of your phone camera if available, or take a sequence of individual photos with the same framing and stitch them into a time-lapse video (in mp4 format) or gif afterwards. Regardless, the final product
- You should have some landscape in your frame so that the motion can be compared relative to the stationary landmarks.

Name the file **Moon_Motion_YourLastName.FileExtension** and upload it to canvas.

(10 points) You also need to provide a description of your time-lapse/gif. The description should include the location, date and time of your observation. You also need to describe the phase of the moon, and explain it with a sketch of the position of the Sun, Earth and Moon in a similar fashion as <https://ccnmtl.github.io/astro-simulations/lunar-phase-simulator/>.

Submit the description in a pdf file, named **Moon_Motion_Description_YourLastName.pdf** and upload it to canvas.

Extra credit (10 points): If the roles of Earth and the moon were reversed, i.e. Earth orbits the moon as shown in the diagram below, draw the phases of the moon we'd see from Earth at the 4 Earth locations in the diagram below. Upload your sketch as either pdf, jpeg or png, named **extra_credit_YourLastName**.



Part 2. Stars

In class we discussed that the altitude of the celestial pole in your local sky is the same as the latitude of your location. We also discussed how you could use your fist to roughly estimate altitude (one fist with the arm stretched out is about 10 degrees).

(10 points) Make a short video of you estimating the altitude of the celestial pole using your fist. Narrate what you are doing in the video. At the end of the video, state your estimated latitude, and how it compares to the actual latitude. You don't have to show your face in the video if you don't want to, as long as the fists and arms are visible and the narrative is clear.

If you are in an area dark enough to see Polaris (for north celestial pole) or stars near the south celestial pole, use their locations directly. If it is not possible to see stars around the pole, you can use free phone apps (such as SkyMap or SkyView Lite etc. depending on the phone system) to find the position of the celestial poles.

Submit your video in mp4 format, named Pole_Altitude_YourLastName.mp4.

Optional activity if interested and feasible:

Because not everyone has access to night sky that is dark enough for photographing stars, **to ensure fairness, no credit will be given for this activity.** It is purely optional if you are interested and are in a region dark enough.

Capture the motion of stars and make a star-trail image, ideally around the celestial pole, as the one shown in class.

Some of the phone cameras (e.g. google pixel) have astrophotography mode built in, where you can carry out long exposures.

Submit your star-trail image as either pdf, jpeg or png, name Star_Trail_YourLastName.