

## Project for ASTR 1010 honors contract

The specifications given by Dr. Robinson are as thus:

Develop 3 animations that show the motion of 'naked-eye' objects (Sun, Earth, Moon, & planets out to Saturn) in the solar system in 3 different models.

### 1. The Ptolemaic geocentric system:

- a. Earth at center
- b. Sun & other planets orbit around in circles at different speeds
- c. Moon & other planets have epicycles
- d. Mercury, Venus, and Sun should all orbit the Earth at speeds such that they stay 'in line' with each other (or at least their epicycles do).
- e. Mercury, Venus, and Sun should be joined with a line (like in Ptolemy's invisible rod).
- f. Trace the actual path of just one of the outer planets to show retrograde motion explicitly

### 2. The Tychonian hybrid system:

- a. Earth at center
- b. Sun & Moon orbit Earth in circles at different speeds
- c. Other planets orbit Sun in circles at different speeds

### 3. The Copernican heliocentric system:

- a. Sun at center
- b. All planets orbit Sun in circles at different speeds

These animated simulations were generated by Python scripts. One script was written to generate each of the three animations, and one script was written that contains methods used in each of the three specific scripts, making 4 scripts total. Several Python modules and external video-generating software have to be installed before the scripts can be run. The animations are saved as MPEG-4 movies and can be viewed on virtually any computer.