

1 CCD-Photometry of α Orionis (Betelgeuse)

Betelgeuse is one of the most recognizable and astronomically suitable target to study when using a small telescope. This is because it is a bright, $V = 0.42$ (Johnson H.L. et al 1996), red supergiant evolving nearer to the end of its life. As a primary landmark in the constellation of Orion, it serves as a natural laboratory for studying the final, violent stages of stellar evolution. Current studies showed that Betelgeuse is very dynamic with recorded semi-regular variability (see Lloyd C., 2020).

2 Objective

The main aim of this project is to monitor the brightness variability of Betelgeuse over several nights. In addition, a student will also learn how to use a telescope and record measurements, how to handle astronomical data via various stages of processing and interpretation, and finally a student will learn how to code with python programming language while analyzing ccd images.

3 Apparatus

- **Telescope:** Celestron NexStar SE6.
- **CCD camera:** NEXIMAGE10 camera with 10.7MP and $1.67\mu\text{m}$ pixel size.
- **Eyepiece:** Low power (20 mm - 40 mm) to provide a wide field of view.
- A star chart of Orion constellation.
- A power supply (**BLUETTI-EB3A:** 600W, 268Wh) with 12V-2A DC-adapter.
- Laptop with SharpCap software installed.

4 Why is this project important?

Studies done on Betelgeuse showed that it is important to monitor its behavior constantly because it is near its fateful end, supernova. In 2019, Betelgeuse was observed to have undergone a significant dimming as low as $V = 1.6$ (Lloyd C., 2020). Small telescope Observers were reported to have made it possible to identify an ejection of a giant dust cloud from the target. Therefore, constant monitoring of this star will provide necessary information about the star in its end days, and hence provide data necessary for improving stellar evolution models.

5 References

- Johnson H.L., Mitchell R.I., Iriarte B.vWisniewskivW.Z.; UBVRIJKL Photometry of the Bright Stars; Communications of the Lunar and Planetary Laboratory; 1966, Vol 4; pg 99-110.
- Christopher Lloyd; Betelgeuse: A Century and More of Variation; VSS Circular (Journal of the British Astronomical Association, Variable Star Section); 2020; no. 84, pp. 22-28.