

Eclipsing binary research with mini telescopes

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Received: October 31, 2019; Accepted: January 8, 2020

Abstract. Bright variable stars became neglected in the epoch of CCD cameras. In addition, in most surveys bright stars are not measurable, apart from specialized projects like *BRITE* and *SMEI*. In this poster we present an inexpensive solution to observing bright variable stars accessible to students, small observatories and amateur astronomers. We also present some results.

Key words: binaries: eclipsing – photometry – mini telescopes

1. Introduction

The history of photometric observations in astronomy is characterised by revolutionary changes. The first one was the usage of the telescope at the beginning of 17th Century. Then at the end of the 20th Century we had CCD cameras, and now since recently CMOS cameras. Nowadays many observatories and amateur astronomers can measure the brightness of faint stars (>10 mag) with an accuracy of up to several mmag, even with small telescopes (<1 m). However, stars brighter than 5-6 mag are usually too bright for the use of telescopes and cameras, or lack appropriate comparison stars near the target of interest. Such stars are also mostly too bright for the majority of surveys. Only thanks to projects like the set of nanosatellites of *BRITE*, we have new photometric measurements of these stars. However, how can we organize and manage follow-up observations after the *BRITE* mission?

We found an easy, inexpensive alternative solution. We can return to Galileo-sized telescopes (several centimeters in diameter) equipped with a CCD camera, a filter wheel and a set of photometric filters. Such a mini telescope can do an excellent job of photometric measurement of bright stars.

2. Mini telescopes

Our mini telescopes consist of old photo-objectives with an aperture up to 6 cm. We use small CCD cameras like ATIK16IC or Moravian instruments G2-402, eventually G2-4000. The mount is the table mount EQ1, EQ2-3, or the GO-TO mount AZ-GTI in EQ mode. The simplest set-up for photometry costs only about 500 EUR (excluding a laptop), weighs less than 5 kg and is quite



Figure 1. A mini telescope working from the window at a corridor.

small. Fig. 1 shows an example of a mini telescope set-up. Such a set-up has the following advantages:

- it is accessible to small astronomical clubs, schools, and amateurs, and not only in developed countries;
- it can be easily transported;
- it can be used for “window/balcony astronomy.”

3. Photometry

The photometry obtained with these mini telescopes attached to CCD cameras is fully comparable with that obtained by large telescopes equipped with photoelectric photometers (see Fig. 2.)

4. Conclusions

Mini telescopes consisting of a photo-lens, CCD camera and simple mount have great potential.

On one side they help scientists doing follow-up observations or long-term monitoring of bright stars. Surveys that are capable of observing bright stars are usually done in one spectral band. Mini telescopes can make use of multi-colour photometry.

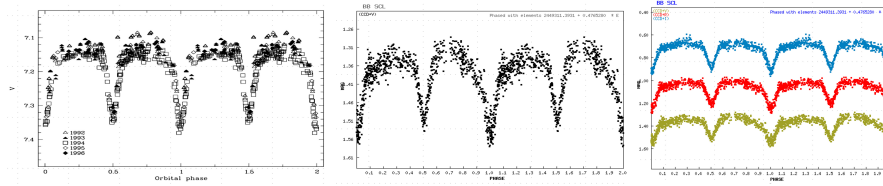


Figure 2. Light curves of BB Scl taken with the 0.6-m telescope at Mt. John observatory (Watson et al.,2001) (on the left) and the 0.5-m telescope at SAAO, Sutherland (in the middle) – both equipped with a one-channel photoelectric photometer. On the right, CCD observations made by a 4-cm telescope (Liška, 2011). The larger scatter in the light curve maxima is caused by real variability in BB Scl.

On the other side these mini telescopes can help raise new generations of scientists, attract pupils and students to the natural sciences. They can do their observations, process the frames, analyse the data, interpret the results and prepare a report on the results. This base in scientific work will facilitate their future studies and work in any branch of science.

References

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