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ASTRONOMY WITH SMALL TELESCOPES

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ABSTRACT

We have designed and built three cost effective observatories, in distinct models, which can house Schmidt – Cassegrain type small telescopes having aperture sizes up to 16 inches. Using the available small telescopes, we provided the people of Manipura State in the far north-east corner of India the opportunity to observe directly with their own eyes the rare, spectacular events of the solar eclipse of January 15, 2010, lunar eclipse of December 10, 2011 and the transit of Venus of June 6, 2012. Apart from sharing a platform with the public for astronomy education and popularization through public outreach programs such as workshops, seminars and night watch programs, we have also developed a laboratory infrastructure and gained expertise in observational techniques based on photoelectric photometry, CCD imaging, CCD photometry and spectroscopy. Our team has become a partner in the ongoing international 'Orion project' headquartered in Phoenix, Arizona, USA which will be producing high quality photometric and spectroscopic data for five stars in the Orion constellation, namely Betelgeuse (alpha Orionis), Rigel (beta Orionis), Mintaka (delta Orionis), Alnilam (epsilon Orionis) and Alnitak (zeta Orionis). In the present paper, the authors would like to give a detailed report of their activities for the growth of astronomy in the state of Manipur, India.

Key words: observational facilities: astronomical events: Orion project

1. INTRODUCTION

For meeting our basic requirement for housing three telescopes (Celestron CGE925, Meade 12 LXGPS and Celestron CGE1400), we have innovatively designed and constructed three observatories, each costing a few hundred USD. These observatories are completely different in design and are found to be perfectly usable for doing serious work for astronomical observations and measurements. Since January, 2012, we have been using the observatory with the Celestron CGE1400 telescope as one of the observatories for the 'Orion Project', an international mission headquartered at Phoenix, Arizona, USA dedicated for photometric and spectroscopic observations of five bright variable stars of the Orion constellation. (The web link for the international project is http://www.hposoft.com/Orion/Orion.html). Our photometric data were presented and discussed in the 33rd Annual Conference of the Society for Astronomical Sciences: Symposium on Telescope Science held at Ontario, California, USA during June 12-14, 2014, (see Hopkins 2014). Our CCD cameras have been tested by taking CCD images of the Moon, Jupiter and Saturn and our spectrographs tested with standard light sources, and they are ready to be used as integrated components of our observatories. We have also been using our observational facilities for increasing astronomy popularization and education in our state, Manipur (longitude = $93^{circ}8'$ E; latitude = $24^{circ}4'$ N; altitude = 782m), a state situated in North East part of India bordering Myanmar. We have successfully performed live shows of three spectacular astronomical events to the state; the solar eclipse of 15th January 2010, lunar eclipse of 10th December 2011 and transit of Venus of June 6, 2012. Besides these, we have conducted a number of seminars and workshops for training and research in astronomy. We are also playing a lead role in the state for the growth of astronomy and its quality of teaching and research in the university and college sectors.

2. SELF-BUILT OBSERVATORIES

Figures 1, 2 and 3 show the three observatories of different models that we constructed for housing our three small telescopes: a Celestron CGE925, Meade 12 LXGPS and Celestron CGE1400. The observatory shown in Figure 1 is a dome-type and it was constructed in 2009 at a cost of about 700 USD for housing the Celestron CGE925 telescope. The unique feature of this observatory is that it has a hemispherical roof with a collapsible strip, which can rotate along a circular groove running on the top the main cylindrical body. Opening the strip and rotating the dome can make the entire sky

Figure 1. Dome-type observatory housing a Celestron 9.25 inch telescope

Figure 2. Hut-type observatory housing a Celestron 14 inch telescope

accessible to the telescope housed inside the structure. The observatory shown in Figure 2 is a hut-type and it was built in 2011 at a cost of just USD 200, for housing the Celestron CGE1400 telescope. It has a main entrance door. The structure as a whole is movable with 4 pairs of wheels: 2 pairs in the front and 2 pairs in the back. Keeping the main door open, the structure as a whole can be taken away from the in-housed fixed telescope so that the entire sky is accessible to the telescope. Figure 3 is a picture of the self-built bullet-type observatory used for housing the Meade 12 inch telescope. This observatory, which was built in April, 2014 at a cost of about USD 200, is typically a bullet-type with a tin roof head. Its lower portion is fixed while the upper portion i.e., the tin roof head, is movable on a pair of rail tracks by means of 4 wheels fixed on the base foot of the roof head. It has an entrance door. By moving the upper portion, the telescope can see the whole sky.

3. THE INTERNATIONAL 'ORION PROJECT'

The 'Orion Project' is an international mission headquartered at Phoenix, Arizona, USA dedicated to the photometric and spectroscopic observation of five variable stars of the Orion constellation; Betelgeuse (alpha Orionis), Rigel (beta Orionis), Mintaka (delta Orionis), Alnilam (epsilon Orionis) and Alnitak (zeta Orionis).

Figure 3. Bullet-type observatory housing a Meade 12 inch telescope

Since January 2012, the MU observatory has been participating in the Orion project as the lone member from India. As of September 2, 2014, eighteen observatories across the globe (twelve from USA, one each from India, UK, France, New Zealand, Austria, Germany) are taking part in the Orion Project. (The details of these participating observatories will be found in the web link http://www.hposoft.com/Orion/Observers.html.) The primary goal of the project is to generate an excellent archive of photometric and spectroscopic data for the five Orion stars. The photometric data obtained from our observatory for the Orion project were presented in the 33rd Annual Conference of the Society for Astronomical Sciences: Symposium on Telescope Science, held at Ontario, California, USA during June 12-14, 2014, Hopkins (2014). Meissa was used as the comparison star.

4. ACTIVITIES FOR ASTRONOMY EDUCATION

Besides conducting a number of night sky watch programs, workshops and seminars, We have successfully performed live shows of three spectacular astronomical events to the state; the solar eclipse of 15th January 2010, lunar eclipse of 10th December 2011 and transit of Venus of June 6, 2012. Our observation of the Transit of Venus on June 6, 2012 was spectaculary successful as thousands of people participated in observation of the event. One Meade 12 inch telescope fitted with a Coronado SolarMax II 90 mm Hydrogen alpha filter and a DSLR Camera was used for the observation. Some photo snaps and a video recording of the observation of the Transit of Venus were published in the youtube network (http://www.youtube.com/watch?v=DJiTr4D3kLg and http://www.youtube.com/watch?v=MztHnUIKZmM). A news report of the observation of the event is available at the network (http://e-pao.net/GP.asp?src=17..070612.jun12).

5. CONCLUSIONS

We have innovatively designed and constructed three observatories of different models for housing three small telescopes. We are the lone team from India participating in the international 'Orion Project' and have been producing SSP3 VBRI photometric data for the the project. In the recent past, we have observed many spectacular astronomical events including the Transit of Venus of June 6, 2012. We have taken up a number of measures for astronomy education including research.

REFERENCES

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