

A new planetarium harmonized with natural starry sky

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ABSTRACT

This may be a new attempt in astrotourism and astronomical education. We project the starry sky on the ground at Misato astronomical observatory where we can see the beautiful natural starry sky. When tourists look at them from a tower veranda in our observatory, they can know that they live in the universe with spatial cognition.

1 Introduction

How should we develop an astrotourism business? People participate in astrotourism because they want to see the beautiful starry sky. However, the beauty of the starry sky strongly depends on the conditions at that time. Therefore, we should consider using interesting things other than beauty of nature.

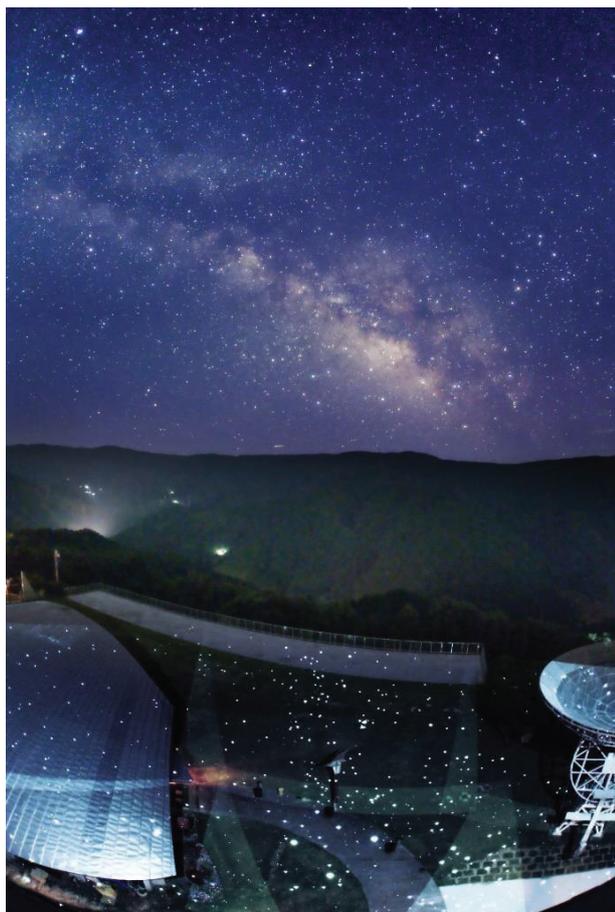


Fig. 1 Natural starry sky and a starry sky projected on the ground, taken from the tower veranda.

We focused on the problem of people's spatial cognition. That is, people generally do not spatially understand that they live in the universe. The sky should be the universe, but people do not recognize it as the universe because the sky is limited to 2π steradians. We noticed that this issue was an important theme in astronomical education.

One of the solutions to this problem is the astronomy apps on smartphones and tablets. For example, we can use the "Star Chart" app to see stars and constellations in the direction of the ground as well as the sky. Tourists are very interested in it when we show it with this app.

Misato astronomical observatory has an excellent natural environment and a tower. In addition, there is a veranda on the top floor of the tower, from which tourists can overlook a large area of the ground. Of course, they can also see the beautiful natural starry sky.

We started projecting a starry sky on the ground in our observatory to make some area of the earth transparent at starry night (Fig. 1).

2 Our projection system

Our projection system was developed by Amano laboratory of Wakayama University [1]. Nine CASIO XJ-V110W (1280x800pixels, 3500lm, 20000:1 contrast

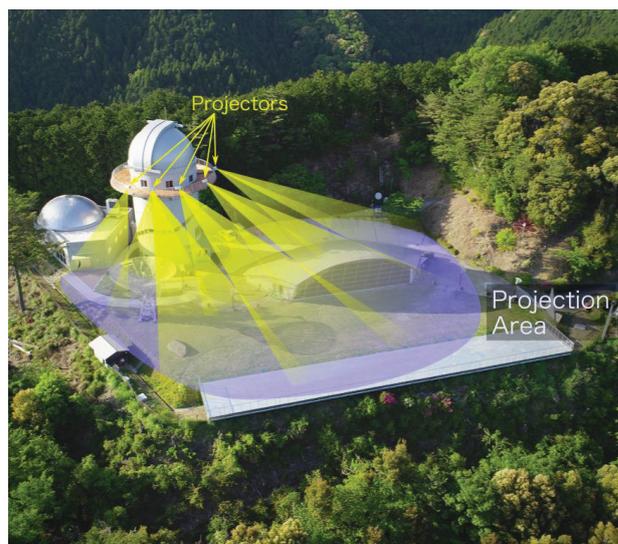


Fig. 2 Misato astronomical observatory and our projection system.

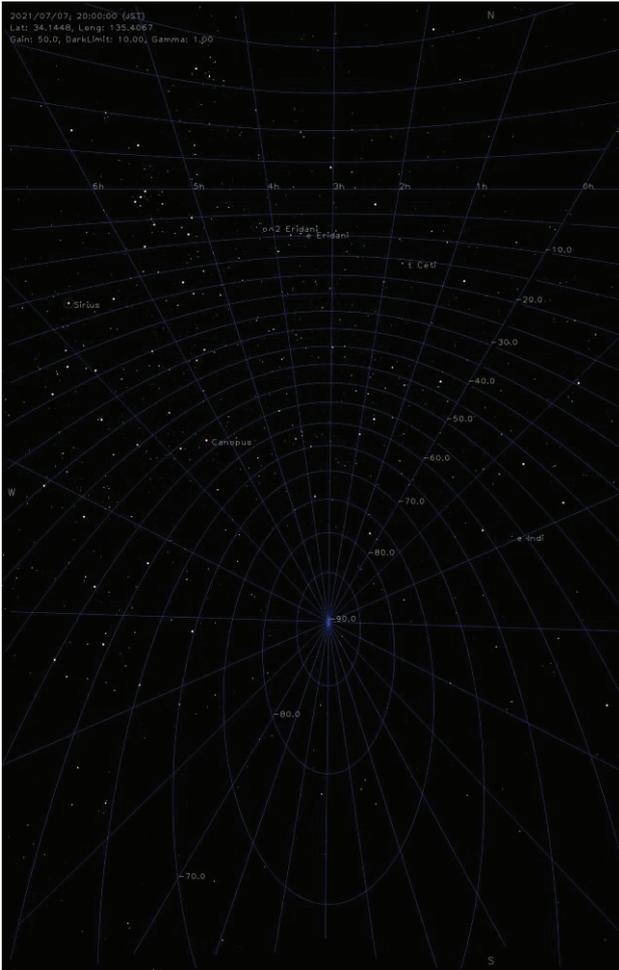


Fig. 3 Example of created bitmap image.

ratio) projectors were installed to the railing of the tower veranda (12.6m) in Misato astronomical observatory. The projection covers an area of approximately 72m x 60m on the ground (Fig. 2). We use the MadMapper [2] as our mapping software, and our original software with the SAO star catalog [3] to create a bitmap image representing the starry sky (Fig. 3).

We have night tours for tourists with the projection system, but there are no hardware problems. The maximum distance from the projector to the projection plane is about 30m, but we get a good focus. The light leaking from the projector does not interfere with astronomical observation such as using telescopes and binoculars on the ground (Fig. 4). Our inexpensive projectors can represent stars up to 2nd magnitude with 1x1 pixel. The model selection was perfect.

The software for creating bitmap images is not yet complete. We are just projecting the stars onto the ground without constellation lines, but tourist satisfaction is clearly improving.

3 Future plans

Our projection system has a variety of potential applications.



Fig. 4 Our night tour with the projection system. The ground is illuminated in orange by light leaking from the building.

A typical application is a reproduction of the starry sky on the Southern Hemisphere side. The Milky Way, Constellation lines, names and grid projections will be realized in the near future. This will achieve our first goal.

We also plan to build a lake. A mirror image of the starry sky will be projected on the ground. It is not possible to draw constellation lines or pictures in the actual sky, but it is possible on the ground. This leads to a clearer explanation of the constellations for tourists. It will also be useful for calibration in the representation of the starry sky.

It will be possible to project any contents using mapping techniques under our excellent natural environment.

References

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