

Automation of the self-made pinhole type planetarium projector

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In the “Seisakuhan” of our school's astronomy club, we project planetariums in school festivals and astronomical classrooms for the local residents, and have gained much popularity. However, there is a problem that it is difficult to perform various projections by changing the season or time zone in order to turn the projector manually. Therefore, in order to diversify the projection, we aimed to automatically rotate the projector using commercially available materials.

First, when rotating the projector automatically, it was decided at what speed to rotate it once. As an indicator, we manually turned the projector one turn at a speed that made us not uncomfortable. The results were averaged to set 28.7 s as the target time. Next, we discussed the mechanism to automate the projector. Got an idea from the movement of the caterpillar, we decided to rotate the projector using a motor-powered gearbox and belt. In order to rotate the projector at the target time, the gear ratio of the gearbox was changed and the time at each gear ratio was measured. By changing the gear ratio, it is thought that the rotational speed and rotational torque change, so that the power of the gearbox changes and the rotational speed of the projector changes.

As a result, in the gear box used this time, it became 8.5 s by gear ratio 1300.9: 1 which rotation speed becomes the smallest. This time was the longest time measured with other gear ratios. However, the target time of 28.7 s was not reached. Therefore, by changing the applied voltage from 3V to 1.5V with a gear ratio of 1300.9: 1, it was considered that the rotation time would be about 17s, which is doubled from 8.5s. As a result, the projector did not rotate and did not reach the target time.

This is considered to be due to the fact that the motor did not operate well at 1.5 V because the proper voltage of the motor was 3 V.

Future prospects include improvement of belt slack, measures for motor drive noise and discussion of how to reduce of rotational speed.

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