The star tracker mount for the DSLR/Mirrorless Camera

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Abstract

This project is the design and process of creating a star tracker mount for the DSLR/Mirrorless camera. The design of the structure is made through SOLIDWORKS Student Design Kit, electrical and circuitry through EasyEDA and programing by Arduino IDE. Then tested with Sony A7II camera. By increasing the exposure time 30 seconds each time until the star trails appear. In conclusion this tracking mount has maximum tracking time within 180 seconds. And the flaw in the system has been caused by misalignment of the mount and defect in the gear assembly.

1. Introduction

We use camera to photograph dim celestial objects. Due to the long exposure time and the Earth is rotating, this would cause a star trail to appear in the image. Which could be eliminate by rotating the camera around the same axis and same angular velocity as the Earth rotate. But in the opposite direction. The currently available telescope mount is not suitable for amateur photographer who uses DSLR/Mirrorless camera.

2. Methodology

1) Calculate the stepping speed of the stepper motor with the gear ratio of 60 : 1 (4.4566 Step/Second), design the algorithm of the system, then design and etch electrical PCB.
2) Design the structure and gear supporter (Figure 1). Then fabricate the part at local metal workshop.
3) Assemble all part and circuitry together, test the system and troubleshoot the problem.
4) Test the mount by taking image of Spica with Sony A7II. The first image has been taken without tracking for control. Then engage tracking and increase the exposure time by 30 seconds until star trail appear.
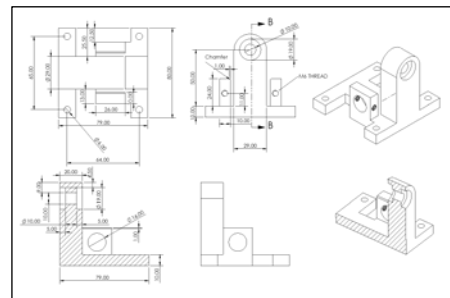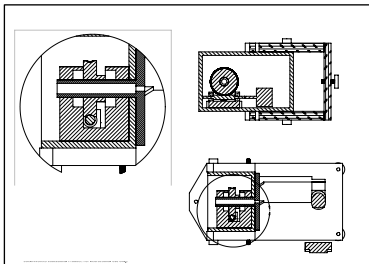

Fig 1: Gear support column
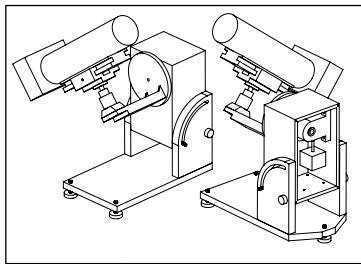

Fig 2: Cross-section of the gear assembly

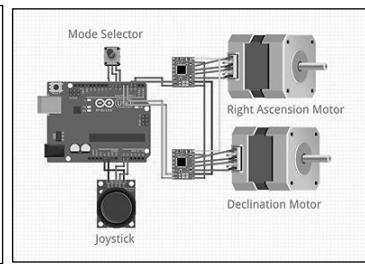Fig 3: Overview of tracking mount
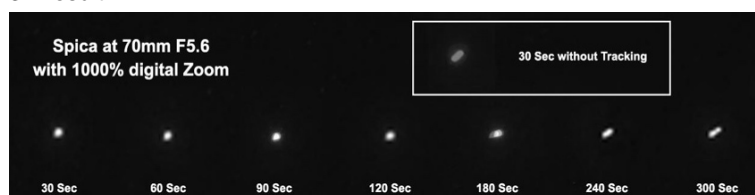

Fig 4: Electronic circuit design

3. Result

Fig 6 : The result image of Spica with different exposure time.

Fig 5 : The finished tracking Mount with Sony A7II camera attached.

From figure 6, image from the exposure of 180 seconds and 300 seconds has a strange star trail that indicate the unevenness motion of the tracker. Software and stepper analysis have been conducted and the stepper works flawlessly. With further analysis of the gear assembly conclude that the problem has been caused by a defect in the worm gear due to quality issues.

4. Conclusion

Based on the result. This tracker has 180 seconds exposure time capability. But could be further improve with better worm gear assembly or the correction via software programming in the future.

5. Acknowledgement

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6. Reference

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