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STARTRCKR - 3 AXIS OPEN-SOURCE NIGHT SKY TRACKING DEVICE

Abstract

With advancements in digital photography and high-end equipment becoming less expensive, more and more amateurs are getting into astrophotography. Some of the work can be done with just a camera and a tripod but taking more advanced pictures, of objects that are light years away, require special equipment like star trackers, able to precisely compensate for Earth's rotation, to capture long exposure images of the night sky. Usually, the equipment is expensive; thus, most amateurs can not afford it.

The aim of the project is to design and build an inexpensive, easy-to-build, and open-source star tracker. Relying on popular components that are easy to buy worldwide and 3D printed parts. The project's reduction in cost and availability is just one component. The actual innovation of the approach is the use of a 3-axis system in conjunction with special algorithms to streamline workflow for the user as well as enable further advancement and facilitate tracking of other objects. StarTrckr is not mechanically aligned with the Earth's rotation axis, unlike conventional solutions, but it is also not susceptible to the issue of field rotation. The system can become totally autonomous, eliminating the need for manual polar alignment, with a few extra sensors added that are not present in the current version but are planned for the future.

Project was developed from scratch solely by the author including mechanical design, electronics design, and programming. Before the design stage began author performed research to find similar solutions and parts best suitable for the project. In order to test and validate the system's performance, field tests were conducted at the very end and sample long exposure photos up to 600 seconds long were obtained.

StarTrckr was developed as a bachelor thesis project at the Silesian University of Technology and was successfully defended in February 2023. Further development of the projects is planned by the author to create a completely automatic solution and improve the biggest flows of the design. Since the beginning of the project, it was decided that it will be open source and shared with everyone for free to contribute to the development of astrophotography. All files and description of the project can be found on GitHub where it is regularly updated as the work progresses.