

# Foundation for Development of RIT SPEX Astro Tracking Team

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**Abstract**—Astro Tracking is an important sub team of RIT SPEX and has tremendous room for growth. In order to expand it is crucial to improve current technology and create a foundation for astronomy based research. Thus a semester long session is proposed to firstly educate new members on the foundational principles of Astronomy and Astronomy research, secondly develop tools to aid in said research, and lastly to improve our showcase of work for Imagine RIT to assist in obtaining corporate sponsors.

## I. INTRODUCTION

The RIT Astro Tracking team formed in the Fall of 2016 and was designed for the purpose of Astronomical research and the tracking of artificial satellites. Considerable growth has been made in regard to general Astronomy skills with a number of quality images and the improvement of general astrophotography skills. Clear pictures of Jupiter, Saturn, and other objects have been taken by members and showcased at various SPEX related events. In addition the team has developed software for the automation of its primary telescope, the Meade LX200, where it can be controlled from any location with wireless connectivity.

The team has accomplished much since its inception and the next logical step would be to improve the skills developed as well as begin preliminary tracking of both artificial satellites and other celestial objects. In order to begin new members will firstly have to be educated on basics, technology to assist in tracking must be developed, and technology must be developed for the maintenance of current equipment.

## II. PRIMARY OBJECTIVE

### A. Tracking Mount

This project involves the research and development of an active tracking mount for taking pictures with a DSLR of celestial objects. In order to get pictures of stars the camera needs to take in a lot of light. However, stars move very fast and will appear as blurred lines if the shutter is not fixed on them for the duration of a long exposure shot. The mount allows the camera to move along with the stars and capture more light which results in photos otherwise not to be seen with the naked eye.

### B. Orion Mount

This project involves the research and development of a new mount for the Orion telescope. It is up to the team to determine a style for the mount and create said mount. It would also be of preference to have this later able to be automated.

### C. Tracking Software

This project involves creating software to handle the equations to convert two line elements into a format the telescope understand. This will involve converting the equations to Cartesian form and plotting the orbits in a 3-Dimensional space. Will then need to be interfaced with the telescopes

### D. Group Research

This project will contain a group of 3-4 students who propose a research proposition that is related to astro tracking. They will then conduct the research, analyze their results, and present their findings.

### E. General Marketing

In order to garner new interest a marketing campaign for new members will be proposed. New posters will be created that are astro tracking specific to try and garner new membership.

### F. Star Outings

In order to continue to improve our general astronomy skills four trips will be planned for general observation throughout the semester. In addition one trip to the RIT observatory will be planned.

## III. BENEFIT TO SPEX

The benefits to SPEX are two-fold. Firstly this will give the members new tools and technologies to conduct astro tracking related research. Secondly it will provide items for the astro tracking team to showcase at events like Imagine RIT.

### A. New Technologies and Equipment

1) *Tracking Mount*: Mount to assist in astrophotography without telescope will allow for students to take pictures that were otherwise not able to be taken with current equipment.

2) *Orion Mount*: Extra telescope mount to use during star-gazing sessions will allow more students to get hands on experience with the telescopes when they are taken out.

3) *Tracking Software*: Software to help with tracking of artificial satellites will allow members to conduct research in the future.

#### *B. Showcase Pieces for Imagine*

Two new mounts will be developed which are physical items that can be used to start conversation with event attendees. This will appeal to more mechanical individuals who are not directly interested in software. New pictures will also be taken that will outline the capabilities of both the members and the new technologies developed. These showcase pieces will help improve the credibility of the RIT SPEX Astro Tracking team and increase the chances of future sponsorship for SPEX as a whole.

### IV. IMPLEMENTATION

#### *A. Timeline*

*Week 3*: Project plans. An outline of the steps each team will take to complete their sub-project

*Week 5-7*: Progress Updates. Update on progress of project

*Week 8*: Mid presentation. Give an in-depth analysis of the project. Will outline project status, roadblocks, and what is left to do.

*Week 12*: Projects ideally will be completed, or near-completion, at this point for showcasing at Imagine RIT.

#### *B. Deliverables*

Deliverable items for this project include a small mid-semester presentation to outline where each of the projects are at and what needs to be done in order to complete them. Then each team will deliver their final projects. For each of the mount teams their respected mounts will be the delivery. The tracking mount should also present pictures taken of celestial objects to indicate it works as desired. The team working on the software will provide the finished code as well as a presentation outlining how to use it, how it works, as well as the technologies used. Lastly the research team will present their findings to the group as well as create a small paper that will be reviewed by the team and, ideally, be pushed forth for publication.

### V. EXTERNALITIES

#### *A. Prerequisite Skills*

Many of these projects are interdisciplinary but between them will require from ten to twelve members. Each respected team will get anywhere between two to four members depending on the complexity and skill set of each team. Ideally for the mounts there should be an upperclassman mechanical engineer. For the research team there should be at least one physics related major. Lastly for the software team it will be recommended to have one member familiar with orbital mechanics and another with general software development.

#### *B. Funding Requirements*

Funding requirements for these projects should be kept to a minimum. The mount teams will not exceed 50 dollars in materials for each respective mount and the software/research teams will require no additional funding.

#### *C. Faculty Support*

No faculty have explicitly expressed interest in these projects. However they can be consulted if questions do arise in any stage of development. While it is certainly feasible to do these projects without professor help it would greatly benefit the members to develop relationships with professors to help in development.

#### *D. Long-Term Vision*

Once new technologies are developed the Astro Tracking team will be better prepared to conduct research in the future. The mounts allow for obtaining better data during observations, the software will allow for the pursuit of tracking artificial satellites, and the research team will help provide a framework for how to conduct future research.

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### REFERENCES