Society of Physics Students Zone 12 Meeting at the University of Kansas

Report of Contributions

https://indico.cern.ch/e/888681

Contribution ID: **1** Type: **not specified**

An introduction to Variable Star Observing

As long as mankind has studied the cosmos, there's still much to be learned about it. One type of heavenly body astronomers worldwide are still trying to decipher is variable stars. They are named as such due to their tendency to change brightness from Earth's point of view, regularly or irregularly. Some of these stars don't actually change brightness, but merely appear to change brightness due to external factors, while others change brightness due to fluctuations in the star itself. This year, the SWOSU Physics Club is aiming to learn more about what makes variable stars and how to observe them. In order to do this, we must find at least one variable star that will be visible from our observatory for at least the next few months and learn various methods to determine how bright they are at a given time. This sounds simple enough, but the task involves several nuances that we will have to take the time to master. So far, we have had very limited opportunities to go observing, so our data is far from conclusive at this time, but we hope that we will eventually have some useful data and be able to share it with the American Association of Variable Star Observers (AAVSO), an organization dedicated to helping amateur astronomers learn how to study variable stars, and comparing their data to better understand them.

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Contribution ID: **2** Type: **not specified**

High Powered Rocketry

Since 2017, the Kloudbusters Rocketry Club in Argonia, Kansas has put on a rocketry competition open to Colleges and Universities. The goal is to fly a rocket to a minimum of 8000 feet and safely return the rocket to the ground, and its payload, a golf ball, to a specified location near the launch site. In order to reach 8000 feet, competition rockets need to reach speeds near or above the speed of sound, 770 miles per hour, within about two seconds after launch. The stresses and forces to reach these speeds make precision in design and construction critical. We are aided in the design phase by an open source program called Open Rocket, which allows us to simulate flights with various rockets and engines. In-flight parameters like velocity, acceleration, altitude, orientation, and GPS location are handled by on-board microcontrollers we have either purchased, or designed, built, and programmed. The design and testing of the payload delivery system is also challenging. We have multiple ideas for payload delivery including a drone, glider, a parasail, and controlled fall capsule.

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Contribution ID: **3** Type: **not specified**

The Dobsonian Telescope: An Outreach Exploration Part IV

We have reclaimed optical equipment from some of our older, unusable telescopes, which has been incorporated into new portable Dobsonian telescopes. First, we built a new Dobsonian base for a broken telescope. This took several attempts before we had a smoothly functioning piece of equipment, and we learned through trial and error how to be extremely precise with our measurements. Then, we built aion process. Every aspect of the 16-telescope, affectionately named "Tiny," is significantly more challenging and demanding than what we have experienced in the previous builds. The 16-inch telescope, when completed, will rival the automated telescope in the SWOSU observatory. In addition to using it for on-campus observing sessions, we hope to use this telescope as part of Physics Club community outreach by taking it to other towns.

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Contribution ID: **4** Type: **not specified**

Constructing Unmanned Aerial Systems

For various projects the SWOSU Physics Club has needed an Unmanned Aerial System (UAS) for aerial photography and other purposes. Rather than purchase one, we decided to build one based on the designs and software of Joop Brokking and the Arduino microcontroller. Our first attempt was a self-leveling drone that weighed about 2.7 lbs. (including the battery) and was about 19 inches from motor to motor. As the project advanced we began to need something more robust than
the Arduino's 8-bit processor to transmit flight metrics and video to the ground.
We selected the Pixhawk, an open source flight controller with a 32- bit processor. We are now constructing a 17 inch motor to motor quadcopter capable of taking cinematic video with advanced telemetry and GPS autopilot capability. After the completion of the quadcopter we plan to construct a 27 inch motor to motor hexacopter which can be used for standalone research projects using Light Detecting and Ranging (LiDAR), Hyperspectral imaging, and advanced aerial photography. The advantages of such a large slow-moving hexacopter frame are stability and efficiency, providing longer flight times and ultra-stable flight.

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Contribution ID: **5** Type: **not specified**

Advice for Graduate School Visits

In this write up, I give advice for visiting graduate schools as you decide on which to attend. This lists a series of questions to ask students/faculty and what information you should be getting from them. This is a highly personalized take on this whole process, so please also seek advice from your mentors.

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Graduate School Admission Process

An overview of the graduate school admission process at the University of Kansas Department of Physics & Astronomy. Much of this advice is general and can be applied to applying to most graduate schools. However, be careful, some of it is very specific for the University of Kansas Department of Physics & Astronomy. For example, Kansas has de-emphasized the GRE, while this is not true everywhere.

Nevertheless, these slides do give insight into what graduate admissions committees look for.

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