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Education

Northwestern University **2023**

B.A. Physics, Astronomy concentration
B.A. Computer Science

Research Experience

Undergraduate Research, Northwestern University **June 2020 - Present**

Department of Physics and Astronomy, High Energy Physics Group
Advisor: Eric Dahl

- Developed the imaging system for the Scintillating Bubble Chamber:
  - Created a camera calibration program using OpenCV in python. Wrote documentation describing its operation and step by step instructions on its use including potential errors and their solutions.
  - Developed and tested a robust event builder which handled the logic and operation of the camera array. It automated the simultaneous capture of a bubble across all cameras while validating that all parts of the system were operational. It included an image buffering system to increase frame rates and speed of acquisition. Also included an intuitive user interface to view system status, change settings, and view captured events.
  - Built a mock bubble chamber to test the imaging quality of different lighting setups. This required the collection and analysis of several combinations of wavelengths of illumination and reflector materials. Determined that initial assumptions about chamber lighting requirements were false.
  - Improved bubble detection and tracking using a hough-transform based approach instead of simple image subtraction. This decreased false detections, improved reliability of detection for edge cases, and provided better positional accuracy.

Relevant coursework

Astrophysics

Observational Astrophysics, Stellar Astrophysics, Extragalactic Astrophysics and Cosmology

Computer Science

Computational Optics, Programming Massively Parallel Processors with CUDA, Intermediate Computer Graphics, Machine Learning, Compiler Construction

Selected Projects

- Wrote a compiler for a C-like language using C++ that iteratively converted code down to assembly through multiple intermediate representations and implemented several algorithms to make the generated assembly code run faster.

- Created a navigable animated 3D scene in WebGL using JavaScript which allowed the user to explore different lighting methods and material properties using different shaders.
- Used Numpy, Pandas, Astropy, and Astroquery, to calculate the distance to the Large Magellanic Cloud using data from GAIA and OGLE.

Skills

Python, C, C++, Javascript, HTML, CSS, WebGL/OpenGL, LaTex