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Problem-Solving through Computer Programming in Support of NASA EarthKAM

Proposal Identifier: RCEU19-ATS-REG-01

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Project Description

This project will fuse two disciplines – Earth Science and Computer Science – in support of a NASA-funded STEM education project called Sally Ride EarthKAM. The student will work with graduate and undergraduate students in the Earth sciences to research needs associated with this project, learn about NASA and proprietary software for International Space Station (ISS) telemetry, and use computer programming to find creative ways to streamline image processing from an instrument on board the ISS. The student will gain real-world experience working as part of a multi-disciplinary team and implementing their programming knowledge and experience acquired from course work. Sally Ride EarthKAM is a digital camera payload on the ISS that provides a platform for science, technology, engineering, and mathematics (STEM) outreach and education. Managed by the U.S. Space & Rocket Center and the University of Alabama in Huntsville, this nadir-facing camera system allows K-12 students around the world to control the camera and task it to take photographs of Earth, which they can then download and use in the classroom. An example requested image is shown below.



Figure 1: Example EarthKAM processed image with metadata, showing Seoul, South Korea

After acquisition, images are downloaded and pre-processed (which includes adding geo-coordinate information, color matching, and additional metadata creation). Images are then posted to the website where students and the public can view and download them. The current process is inefficient and this summer we would like to investigate new, more efficient ways of conducting image processing and improving the functionality of updating our

database. Our goal is to find creative ways to accelerate the delivery of these images from acquisition to student access.



Figure 2: The camera setup on the ISS (laptop not visible) at left and Mission Operations Center at the US Space and Rocket Center at right.

Student Duties, Contributions, and Outcomes

The student will develop more efficient and creative solutions for image metadata creation and linkages between image processing routines and database updates. He/she will contribute to the development of the EarthKAM program at UAH and the U.S. Space & Rocket Center. The student will evaluate needs with current graduate and undergraduate students, develop and evaluate programming solutions, learn SDK toolkit development routines, and propose solutions to the EarthKAM team.

Student Requirements:

Background in computer science and programming (REQUIRED) and should be a junior or senior (PREFERRED), experience in Java (REQUIRED)

Self-driven in problem solving (REQUIRED) and knowledgeable about NASA (PREFERRED).

Faculty Mentorship:

The student will be supervised throughout the duration of the project by Dr. Robert Griffin. Dr. Griffin has a PhD in environmental anthropology and has worked in the vein of applied GIS and remote sensing in the Earth sciences over a decade. He serves as the Science PI for the Sally Ride EarthKAM project. The student will be assigned a fully-equipped computer in Griffin's geospatial analysis lab with which to conduct his/her research. Supervision by Dr. Griffin will take place at the NSSTC facility where he and the student will establish best methodologies and review progress in weekly team meetings. Finally, Dr. Griffin's graduate assistants located in the NSSTC's Human Dimensions, Discovery, and Decision-Making Lab (HD3) and EarthKAM Lab will be present throughout the summer and will be available to assist the student as he/she moves through the phases of the proposed analysis.

Previous RCEU Support:

2018, *Indigenous Ways of Knowing: Mapping Resource Use in the Pacific Northwest* – joint w/ A. Frost (Emily Wichmann), poster and research to be presented Dec 2018 at regional conference.

2017, *Climate Data for Resilient Development in the U.S.* (Sara Amirazodi), subsequent employment as student specialist in support of NASA-funded research.

2016, *Developing ISS-based STEM Research Examples for the Earth Sciences* (Angela Burke), curriculum development and subsequent student specialist in support of NASA-funded research.

2015, *Using Satellite Imagery to Map Agricultural Land Use at Lake Titicaca, Peru-Bolivia* (Zachary Burkhardt), overview products which supported NASA-funded work in the region.

2014, *Archaeological Investigations using ISS ISERV Pathfinder Instrument* (Jeanne leRoux), demonstration of capabilities with ISS instrument development and subsequent employment as student specialist and currently research associate.

2013, *Integrated Earth Science, Geospatial Analysis, and Environmental Archaeology* (Kel Markert), led to employment as student specialist, then GRA, then employment as research scientist.

2012, *Sustainability “Green Index” for the UAH Campus* – joint w/ S. Christopher (Tiffany Webb), led to formation of UAH green club and subsequent graduate assistantship.

2011, *Creative Development for GIS Lab Tutorials using Real-world NASA SERVIR Datasets* (Kirstin Cooksey), supported development of relationship between UAH ESS and NASA SERVIR project.