AKAMAI

Student Internship Symposium

Celebrating 10 Years of the Akamai Internship Program

Hilo

August 9, 2012
IfA Hilo Auditorium

Waimea

August 10, 2012
W.M Keck Observatory
Hualalai Public Conference Room

Program Information
Intern Abstracts

Advancing Hawaii college students into science and technology careers.

2012 Akamai Internship Program

Akamai Workforce Initiative
Institute for Astronomy, University of Hawaii
Institute for Scientist & Engineer Educators, University of California Santa Cruz
University of Hawaii Maui College

Akamai – smart, clever

The Akamai Internship Program is a unique program that supports Hawai'i college students in completing an authentic science or technology project in a professional setting. Students are prepared through an intensive one-week short course, and then spend seven weeks at an observatory or industry setting where they complete a project under the guidance of a mentor. Throughout the entire eight-week program they complete a communication course that begins in the short course and continues through weekly meetings and intensive coaching sessions. The Akamai program uses an internship model designed by the Center for Adaptive Optics (CfAO) using National Science Foundation (NSF) Science and Technology Center funding, with the specific aim of developing a program to address the technical workforce needs in Hawai'i

The Akamai Internship Program includes:

40-hour short course
7-week project experience at a company, observatory, or government facility
Science & engineering communication course in which all interns prepare:
Oral presentation
Poster presentation
Technical abstract
Personal statement
Résumé
Symposium and many other opportunities for students to present their work
Ongoing educational and career support

2012 Big Island Host Organizations

- Hilo -

Gemini Observatory
Institute for Astronomy
Smithsonian Submillimeter Array
Subaru Telescope

- Waimea -

Canada-France Hawaii Telescope
W.M. Keck Observatory

- Kona -

Hawaii Natural Energy Laboratory of Hawaii Authority
Big Island Abalone

Akamai Workforce Initiative

Institute for Astronomy

Lisa Hunter (AWI Director), Jeff Kuhn (AWI Associate Director)
David Harrington, Lani LeBron, Samara Phillips
Garrett Elliott, Michael Nassir

University of California, Santa Cruz

Lisa Hunter, Jerome Shaw (AWI Associate Director)
Beth Walker

UH Maui College

Mark Hoffman (AWI Associate Director),
Elisabeth Reader

Air Force Maui Optical and Supercomputing Site

Joseph Janni

2012 Akamai Short Course Instructors

David Harrington - Lead Instructor
UH Institute for Astronomy

Andy Norton
University of California, Santa Cruz

Harald Ebeling, Heather Kaluna, Lauren Stephenson
UH Institute for Astronomy

Clay McKell
UH Manoa College of Engineering

Brooks Thomas
UH Manoa Physics

2012 Communication Instructors

Michael Nassir - Lead Instructor
University of Hawaii at Manoa, Institute for Astronomy

Garrett Elliott - Instructor
UH Institute for Astronomy

Special Thanks...

The leaders and staff of the Akamai Workforce Initiative would like to thank the following individuals for their commitment and support of the 2012 Big Island Akamai Internship Program:

Colin Aspin – UH Institute for Astronomy
John Baldwin – W.M. Keck Observatory
Greg Barrick – Canada-France-Hawaii Telescope
Steve Bauman – Canada-France-Hawaii Telescope
Jay Booth – Big Island Abalone Corp.
Randy Campbell – W.M. Keck Observatory
Chris Carter - Thirty Meter Telescope
Simon Chan – Gemini Observatory
Ryan Chilson – Smithsonian Submillimeter Array
Liz Chock – W.M. Keck Observatory
Cecilia Viljoen – Big Island Abalone Corp.
Bob Calder – UH Institute for Astronomy
Stephen Colley – Subaru Telescope
David Cook – Subaru Telescope
Bill Cruise – Canada-France-Hawaii Telescope
Sandra Dawson – Thirty Meter Telescope
Scott Fisher – National Science Foundation
James Gaines – Univ. of Hawai'I
Kim Gillies - Thirty Meter Telescope
Günther Hasinger – UH Institute for Astronomy
Klaus Hodapp – UH Institute for Astronomy, Hilo
Kevin Ho – Canada-France-Hawaii Telescope
Alan Honey – W.M. Keck Observatory
Shane Jacobson – UH Institute for Astronomy
Stuart Jefferies – UH Institute for Astronomy, Maui
Peggi Kamisato – W.M. Keck Observatory
Derek Kubo – Smithsonian Submillimeter Array
Ivan Look – Canada-France-Hawaii Telescope
Ramsey Lundock – Subaru Telescope
Luke McKay – UH Institute for Astronomy
Tim Minick – Gemini Observatory
Chris Morrison – Gemini Observatory
Craig Nance – W.M. Keck Observatory
Adrienne Notley – Gemini Observatory
Keith Olson – NELHA
Jung Park – UH Maui College
Elisabeth Reader – UH Maui College
Luca Rizzi – W.M. Keck Observatory
Chris Stark – Gemini Observatory
Mark Sirota - Thirty Meter Telescope
Jim Thomas – Canada-France-Hawaii Telescope
Jose Varas – Gemini Observatory
William Walters – UH Institute for Astronomy
Tom Winegar – Subaru Telescope
Kanoa Withington – Canada-France-Hawaii Telescope

Presentation Schedule

August 9, 2012
IfA Hilo Auditorium

Gemini Observatory
Institute for Astronomy
Smithsonian Submillimeter Array
Subaru Telescope

OPENING REMARKS

Klaus Hodapp
Assoc. Director, UH Institute for Astronomy

Lisa Hunter
Director, Akamai Workforce Initiative, UH Institute for Astronomy and Institute for Scientist & Engineer Educators

Gemini Observatory

Upgrading Gemini Observatory's Wireless Network to 802.11n Technology
Marissa Hirakawa — *Honolulu CC*

Initiating a Company-Wide Lion OS X Upgrade for Mac Users at Gemini Observatory
Kristin Pedersen — *UH Hilo*

A Data Center for the 21st Century: Developing an Implementation Plan for Replacement of Racks at Gemini Observatory's Data Centers
Kevin Kadooka — *Univ. of Portland*

Subaru Telescope

Restructuring Subaru's Archives
Juanchen Li — *Univ. of Southern California*

Investigating Web Technologies for Complex, Real-Time Instrument Displays
Kim Tokuuke — *UH Hilo*

Slew Rate Limiting of High-Voltage Signals to an AO System Deformable Mirror
Shaun Koide — *Cal Poly, San Luis Obispo*

- INTERMISSION -

Smithsonian Submillimeter Array

Radio Frequency Instrument Design and Testing
Ryan Wong — *Kaua'i CC*

UH Institute for Astronomy

A New Environmental Monitoring System for the UH 88-inch Telescope
Heather Prinzing — *Kaua'i CC*

Design of a Near-Infrared Spectrograph in SolidWorks
Styson Koide — *Northern Arizona Univ.*

Identifying and Monitoring Variable Objects in Star-Forming Regions Using Data from the Infrared Imaging Survey (IRIS)
Matthew Rappeline — *Kapi'olani CC / UH Mānoa*

ABSTRACTS

Upgrading Gemini Observatory's Wireless Network to 802.11n Technology

Marissa Hirakawa
Honolulu Community College

Gemini Observatory
Mentors: Chris Morrison, Simon Chan & Tim Minick

My project has been to upgrade the wireless network from IEEE 802.11g to IEEE 802.11n technology. The advantages of the IEEE 802.11n standard are faster speeds, stronger signal, and better throughput. While the project is currently focused on Gemini's Hilo Base Facility on the Big Island, the results of the project will also be applied to Gemini's sites in Chile. The challenge has been to upgrade the network with optimum placement of the wireless access points (WAP) and minimizing security risks from signal bleed (propagating signal into uncontrolled areas). We are using open-source software called NetSpot App to perform a site survey to analyze the current wireless network for signal strength, noise and interference. Taking advantage of NetSpot App, a method was developed to limit the signal bleed by turning down the antenna's transmission strength of the WAPs and confining the dBm level, which keeps the signal from traveling too far outside the facility. After determining the strength for the antennas, placement of the WAPs will be done one-by-one. A measurement of the signal will be taken, then a WAP will be placed near the edge, allowing some overlap of signal between WAPs for optimum coverage. Once the placement map is developed, the next step will be to proceed with the physical upgrade of the equipment in each of the facilities.

Marissa Hirakawa

Marissa Hirakawa is currently attending Honolulu Community College (HCC) as a Computer Electronics and Networking Technology (CENT) major. Marissa is in her sophomore year and has one more semester before graduating with an Associates of Arts (AA) degree. Her current education goal is to complete a AA degree at HCC then move on to a BA at the University of Hawaii West Oahu. Marissa's career goal is to become a network and systems administrator. She would like to be able to setup, manage, and maintain a computer networking system.

Initiating a Company-Wide Lion OS X Upgrade for Mac Users at Gemini Observatory

Kristin Pedersen
University of Hawai'i at Hilo

Gemini Observatory
Mentors: Jose Varas, Tim Minick & Chris Stark

Whenever Apple Inc. releases a new version of their operating system, support is discontinued to earlier versions. Discontinued support means technical and security risks for those system users, as well as others within the internal network. In order to conform to security practices at Gemini Observatory, all users of operating systems need to be upgraded to Mac OS X Lion (version 10.7), as OS X Mountain Lion (v10.8) was released on July 25, 2012. When a new operating system is installed, applications may fail to work. Steps to resolve this include compiling inventory of units, interviewing users, researching compatibility, testing, implementing, and resolving unforeseen issues without interrupting daily operations. Research for compatibility was done via the Internet by reading blogs, newsletters, forums, and Apple support. Software applications were installed on test machines along with Lion OS X v10.7.4 to test for compatibility before performing the upgrade on working units. The upgrade has been successful for the majority of users. Applications that are not compatible, but necessary to operations, have been replaced or upgraded. Conducting an operating-system upgrade for large companies will continue to be an issue in the future, as new ideas are developed and old software becomes a risk to users. For future reference, a policy is being written to detail the steps followed for this upgrade.

Kristin Pedersen

Kristin is a student at UH Hilo and has declared her major in Computer Science. She returned to school in 2010 to study math and computer science, not only because she enjoys it, but also to be a role model for her daughters. Kristin plans to return to Kona after graduation. Outside of school, Kristin enjoys reading, swimming, and learning the Hawaiian language. She is also a student of Halau Hula Te Ha'a Lehua.

A Data Center for the 21st Century: Developing an Implementation Plan for Replacement of Racks at Gemini Observatory's Data Centers

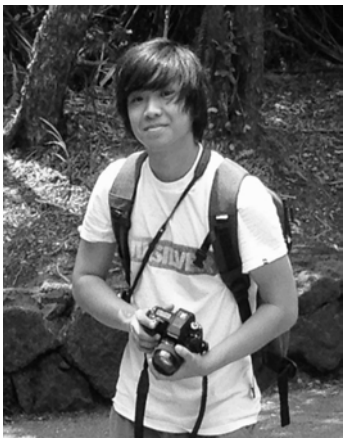
Kevin Kadooka
University of Portland

Gemini Observatory
Mentor: Tim Minick

Gemini Observatory's four data centers provide mission-critical networking, storage, and remote operation capabilities; however the facilities have remained virtually unchanged since their construction in the 90s. The server racks currently used in the data centers lack security, cable management, and modern mounting systems, and thus need to be replaced by a newer design. Moreover, the existing racks are ill-protected against seismic events. Warm air generated by the equipment is allowed to recirculate throughout the room, negatively impacting cooling efficiency. An investigation was performed at the Hilo Base Facility (HBF) data center to find solutions to these issues. Conducting an inventory revealed that the same amount of equipment can be fit into six new racks, rather than the eight existing racks, while maintaining a 20% margin for growth. Construction of a 3-D SolidWorks model of the HBF data center facilitated optimal placement of the new server racks in relation to ducting, cabling, and clearance constraints. Stress analysis showed that in the HBF data center, concrete anchors would provide an inexpensive solution for seismic restraint while fulfilling criteria set by the Universal Building Code. Airflow, and in turn, energy consumption will be improved by dividing the room into a "hot zone" and "cold zone" using a vinyl curtain. To minimize downtime during the migration, racks will be replaced one-by-one in a phased implementation, moving equipment in groups based on importance, function, and connectivity. These findings have been compiled into an implementation plan that sets the framework for renovation of the HBF data center later this year. Similar investigations must be performed at data centers at the Mauna Kea summit and at Gemini's sister facilities in Chile.

Kevin Kadooka

Kevin Kadooka was born and raised in Hilo and graduated from Hilo High School in 2009. He will be a senior this fall at University of Portland, where he is pursuing a B.S. in Mechanical Engineering with a minor in Mathematics. He plans to pursue a master's or doctoral degree after completing his undergraduate study. In his free time, Kevin enjoys photography, building cameras, and SOLO II Autocross racing.



. **Restructuring Subaru's Archives**

Juanchen Li
University of Southern California

Subaru Telescope
National Astronomical Observatory of Japan
Mentor: Tom Winegar

All of the data taken by the Subaru telescope is stored in large archives for future access. In order to more safely maintain this 40-TB archive, two copies of the archive are kept: one in Hilo, and the other in Mitaka, Japan. However, the systems of file paths used to store each of the two archives are different, which produces inefficiencies with accessing the files and working with their databases. The goal of this project was to align the file paths in order to streamline the archive. The solution that we developed was to perform a copy of all of the files in Hilo to their respective file paths in Mitaka, and then check to ensure the files' integrity. After evaluating multiple methods for checking file integrity, we chose to use "md5sum" to calculate MD5 values for all of the files. Afterwards, we created copies of the archive in Hilo to match the file paths in Mitaka. Finally, to ensure the integrity of the files, we performed md5sums on all of the new files.

Juanchen Li

Juanchen Li graduated from Waiakea High School in Hilo in 2010, and is currently a sophomore at the University of Southern California perusing a degree in computer science. After receiving his bachelors he intends to continue his education as a graduate student. Juanchen's goal is to have a career conducting research in computer science or related fields either as a professor or researcher for a technology company.

Investigating Web Technologies for Complex, Real-Time Instrument Displays

Kim Tokuuke
University of Hawai'i at Hilo

Subaru Telescope
National Astronomical Observatory of Japan
Mentors: David Cook & Stephen Colley

Advances in mobile technology, widespread availability of Internet access, and numerous devices containing modern Web browsers led us to explore complex, high performance, instrument GUIs using the latest Web technologies. Traditional GUIs often require a multitude of programs to be installed, making them platform-dependent. A Web-based solution would allow users to monitor data from anywhere with Internet access, without the hassle of downloading or installing additional programs. To explore this idea, we used the real-time monitor of the Subaru Adaptive Optics system as a benchmark. This display is very dynamic, graphics-intensive, and updates at least 15 times per second (15 Hz). We utilized SVG and HTML5 Canvas to render three orbs, each composed of 188 polygons. We relied on JavaScript to retrieve information from the server, process the data, draw the polygons in Canvas, and assign the data gray-scale colors. We programmed mouse-over events to display the element number and data for each polygon, Canvas sliders to highlight polygons outside of a specific range, and a Canvas strip chart illustrating light data changing over time. In conclusion, when comparing the functionality of our strip chart, orbs, and sliders to the Subaru monitor that contains similar components, we found that Web-based monitoring applications for real-time systems are very possible.

Kim Tokuuke

Kim Tokuuke was born and raised in Hilo, Hawaii. She is graduating from the University of Hawaii at Hilo in May 2012 with a degree in Computer Science. Her goal is to be a computer programmer because she enjoys the challenge of coding. In her spare time, she enjoys baking cupcakes and other sweet treats.

Slew Rate Limiting of High-Voltage Signals to an AO System Deformable Mirror

Shaun Koide
California Polytechnic State University, San Luis Obispo

Subaru Telescope
National Astronomical Observatory of Japan
Mentor: Stephen Colley

The 188 high-voltage signals controlling the curvature of Subaru Telescope's adaptive optics (AO) deformable mirror must have a slew rate no greater than 100 V/ms, as specified the manufacturer. If the slew rate of a signal is higher than the specified value, the mirror is at risk of fracturing or other damage. To limit the slew rate, the digital signals controlling the voltage outputs of 188 DACs need to be monitored. When needed, the data steam will be modified so there are no drastic changes over time. The smaller steps approximate ramping signals on the analog outputs of the DACs, which allow for slower surface-shape transitions on the deformable mirror. To do this, we have designed a digital logic system in VHDL, using Altera Quartus II software. This logic will be programmed onto the existing FPGAs on 5 rack-mounted boards, which are already in the system. The logic compares each of the 188 digital inputs from the real-time control computer to the previous signals sent to the DACs. The modified digital signals create a ramp between the two points with a 100-V/ms slew rate. Because the necessary hardware already exists, this provides a relatively simple and inexpensive safeguard for a complex and extremely expensive piece of astronomical equipment.

Shaun Koide

This fall, Shaun Koide will enter his junior year in Electrical Engineering at the California Polytechnic State University in San Luis Obispo, California. His academic interests include digital and radio-frequency aspects of electrical engineering, and he is considering a career in RF communications. Shaun is an active member of his college's amateur radio club, where he participates in nationwide communications contests, volunteers in community events, and helps to conduct amateur radio licensing sessions. He also enjoys going on adventures, hiking, photography, drawing, playing video games, keeping up with local, world, and technology-related news, and spending quality time with his family and friends.

Radio Frequency Instrument Design and Testing

Ryan Wong
Kaua'i Community College

Smithsonian Submillimeter Array
Mentors: Derek Kubo & Ryan Chilson

The SMA is an interferometer telescope operating at submillimeter wavelengths. With the advancement of technology, the SMA desires to increase the astronomical signal bandwidth, which would increase the sensitivity of the telescope array. In order to accomplish this, the SMA needs to upgrade existing hardware and design new hardware to support the increase in bandwidth. The Block Down Converter (BDC) is one of several new units that are required to process the increased signal bandwidth. The BDC is used to translate intermediate frequencies down to baseband frequencies for digitization, using high-speed analog-to-digital converters. This project involves the determination of the test and measurement methods for the BDC. There are three methods identified: the first is using a Noise Source (NS) and spectrum analyzer, the second is using a Vector Network Analyzer (VNA), and the third is using a signal sweeper and power meter. From these methods, we can determine the real transfer function of the BDC. My goal is to determine which test method to use, and to characterize the "real" transfer function. The BDC would probably not have an ideal transfer function; however, we could try getting as close as possible by moving or removing certain components, which could give better results for the output signal. Of the three test methods that we used on the BDC, only one test method gave us inherently accurate results. The preferred test method is to use the signal sweeper and power meter. The other two test methods gave us inherently inaccurate results; however, the VNA method did provide us with additional phase response information that the other two did not.

Ryan Wong

Ryan Wong grew up in Wailua on the island of Kauai and graduated from Island School 2008. He joined KCC's electronic program in 2010 and will graduate next fall semester. He plans to work for a year to gain more experience, then continue his education in electrical engineering at UH Manoa. He is interested in studying digital and electronic circuits. Ryan enjoys paddling, surfing, hiking, camping, and spending time with family.

A New Environmental Monitoring System for the UH 88-inch Telescope

Heather Prinzing
Kaua'i Community College

UH Institute for Astronomy
Mentors: Bob Calder, Luke McKay & Colin Aspin

The primary purpose of an environmental monitoring system ("weather station") located at an astronomical observatory is to provide accurate weather measurements of the current conditions. The data help to determine if the conditions are not only safe, but suitable for observing the night sky. In June 2011, the weather station located at the Univ. of Hawai'i 88-inch Telescope observatory building on Mauna Kea was destroyed by lightning. The aim of this project was to install a new weather station in an optimal location near the UH88" telescope on Mauna Kea. We used a Vaisala WXT520 weather transmitter to measure and record weather parameters at three different locations around the outside of the UH88" telescope. The recorded weather parameters were then compared with the data collected from other weather stations in the vicinity. From those results, we determined that the placement of the weather station in relation to the building is crucial in order to attain accurate weather data. We concluded that the best location for the new Vaisala WXT520 is on the top of the UH88" telescope dome. In the near future, the observatory plans to improve on the default software which collects the weather data. This improvement will provide greater control of weather parameters and warnings relating to the safety of the telescope prior to severe weather.

Heather Prinzing

Heather Prinzing was born in California, but raised on the beautiful island of Kauai. She has just completed an A.S. degree in Electronics Technology at Kauai Community College. She hopes to find a job in computer networking, possibly as a Network Administrator. In Heather's free time she enjoys cooking, hanging out with friends and family, and spending time outdoors- gardening, hiking, and camping.

Design of a Near-Infrared Spectrograph in SolidWorks

Styson Koide
Northern Arizona University

UH Institute for Astronomy
Mentors: Klaus Hodapp & Shane Jacobson

The UH Institute for Astronomy in Hilo is currently developing a near-infrared spectrograph for Subaru's eight meter telescope. This spectrograph will be capable of reading a broad wavelength coverage of 0.9–1.8 μm and have a spectral resolution of 70,000 (3-pixel sampling). This near-infrared spectrograph will be specifically designed to study objects using the radial velocity (RV) method with a velocity precision of 1 m/s. This will require the device to be fiber-fed, have sensitive thermal control, and have vibrational isolation from cooling units and other exterior forces. With this instrument, astronomers would have nearly complete spectral coverage in the near-infrared *J* and *H* bands, allowing efficient observation of objects that cannot be studied at optical wavelengths. Subaru plans to use this instrument to investigate planets in the habitable regions around low-mass dwarf stars, in the hopes of finding Earth-like planets. Since this project is still in the early stages of development, many design and mechanical choices are still left to be considered. Using previous schematics from past spectrographs, we were tasked with designing a new near-infrared spectrograph. By using previous designs and a 3D-modeling software package, SolidWorks, we were able to design some of the mechanical and structural components. This includes the modeling of the driving designs, which will be presented at a design review in early September.

Styson Koide

Styson Koide was born and raised on the Big Island of Hawaii and graduated from Honoka'a High School in 2008. After graduation, he attended the University of Hawaii at Hilo for two years while majoring in Pre-Engineering. While participating in the National Student Exchange program at Northern Arizona University, he decided to stay and pursue a degree in Mechanical Engineering. While not in school, Styson enjoys snowboarding, cooking, and watching movies.

Identifying and Monitoring Variable Objects in Star-Forming Regions Using Data from the Infrared Imaging Survey (IRIS)

Matthew Rappeline
Kapiʻolani Community College / University of Hawaiʻi at Mānoa

UH Institute for Astronomy
Mentor: Klaus Hodapp

Located at the Cerro Armazones Observatory in Chile, IRIS is a 0.8-meter telescope commissioned solely for the purpose of examining variability in star-forming regions. IRIS surveys the sky in three bands of the near-infrared region (NIR, ~1 to 5 microns): *J* (~1.25 μm), *H* (~1.65 μm) and *Ks* (~2.15 μm), though mainly in the *Ks* band. Infrared bands penetrate interstellar dust, producing magnitude (luminosity) data on embedded objects in star-forming regions. In this project, we analyzed the data collected over the past two years to obtain photometric data and identify highly variable objects. Images from IRIS, already reduced, were pipelined into the Image Reduction and Analysis Facility (IRAF) software, arranged by date. We wrote a script to rearrange the data by object and then "zero" each image with a null frame. Reference stars were selected around each object by cross-referencing the world coordinate system (WCS) of the object with the existing 2MASS database. The program stars were selected individually, as were other nebulous or extended objects. We modified existing IRAF scripts to mark reference stars, program stars, and nebulous objects in each image, and to extract instrumental magnitudes from these images. A modified C-language script converted the data from instrumental magnitudes to "true" magnitudes, which were used for numerical and graphical analysis. We identified several highly variable objects from this process and constructed light curves to monitor individual, variable objects. Continued analysis of the high quality photometric data from IRIS will produce more authentic magnitude readings. The manner in which these stars vary will give us deeper insight into the dynamics of star formation and stellar evolution.

Matt Rappeline

Matt Rappeline is going into his Junior year in the Physics department at the University of Hawaii at Manoa and Kapi'olani Community College. Matt is very interested in the applications of general relativity in cosmology and would like to pursue an M.S. and a Ph.D. in physics after completing his undergraduate degree. Matt plays basketball, spends time with his family and augments his knowledge of Star Wars daily.

Presentation Schedule

August 10, 2012
W.M. Keck Observatory
Hualalai Conference Center

Canada-France Hawaii Telescope
W.M. Keck Observatory
Natural Energy Laboratory of Hawaii Authority
Big Island Abalone

Opening Remarks

Hilton Lewis
W.M. Keck Observatory

Lisa Hunter
Director, Akamai Workforce Initiative, UH Institute for Astronomy and Institute for Scientist & Engineer Educators

Canada-France-Hawaii Telescope

Going Green: The CFHT Data Center Cooling Dilemma
Aaron Pigott — *Embry-Riddle Aeronautical Univ.*

Developing a Software Electronic Checklist for MegaPrime Instrument Procedures
Yu Xian He — *UH Mānoa*

W.M. Keck Observatory

Going Digital: Converting Paper Documentation to Digital Form for Collaboration at Keck Observatory
Jerry Adams — *Honolulu CC / UH Mānoa*

Creating Rule-Based Software for Assisting with Resolution of Telescope Faults
Kyle Cannoles — *Hawai'i CC / UH Hilo*

Designing KeOLA: The Keck Observation Log Archive
Ian Cunnyngham — *UH Hilo*

- INTERMISSION -

Natural Energy Laboratory of Hawaii Authority (NELHA)

Potassium Persulfate Oxidation vs. Photo Oxidation: Determining a Method for Evaluating Total Dissolved Nitrogen and Total Dissolved Phosphorus in Various Water Matrices
Katelynn Ho — *Univ. of Washington / Cornell Univ.*

Big Island Abalone Corp.

Designing Local Feed for Maximizing Abalone Growth
Christopher Sugai — *UH Mānoa*

Thirty Meter Telescope

EtherCAT Characteristics
Anthony Sylvester — *UH Mānoa*

ABSTRACTS

Going Green: The CFHT Data Center Cooling Dilemma

Aaron Pigott
Embry-Riddle Aeronautical University

Canada-France-Hawaii Telescope
Mentors: Ivan Look, Steve Bauman & Kanoa Withington

Data centers use a tremendous amount of power in their servers, uninterruptable power supplies (UPS), and computer room air conditioners (CRACs). While servers and UPSs are currently essential, the cooling of data centers is a topic worth "greening." It is estimated that an equal amount of power is used to cool a computer room as is used to power the computers. Canada-France-Hawaii Telescope's (CFHT) current CRAC system costs the company roughly $40,000 per year, using 98,000 kWh. A great deal of energy and money can be saved by using outside ambient air to cool the computers. At CFHT, the project began with shutting off two unnecessarily used backup CRACs. Second, plans were drawn of a proposed ducting route to bring outside ambient air into the cold aisle and duct hot exhaust air back outside. Third, hot aisle/cold aisle containment practices were discussed, using vinyl curtains and blanking panels to partition the room and eliminate the mixing of the air. The system uses two duct fans to bring in cool air from the enclosed courtyard and exhaust the hot air to the roof outside the building. Finally, a heat-load calculator was used to determine the required airflow and a proof of concept (POC) was conducted. The POC used two portable duct fans to simulate the planned final arrangement and ensure its success. Through the use of "free" cooling, we have proposed savings of 87,000 kWh and $35,000 per year. Measures should be taken globally to conserve energy by examining options for "green" cooling.

Aaron Pigott

Aaron Pigott was born in Honolulu and raised on the island of Kauai. Graduating from Kauai High School in 2010, Aaron decided to pursue a Bachelor of Science degree in Aerospace Engineering at Embry-Riddle Aeronautical University in Prescott, Arizona. Aaron's engineering interests include mechanics and Computer-Aided Design. His hobbies include surfing, swimming, soccer, flying, and triathlons.

Developing a Software Electronic Checklist for MegaPrime Instrument Procedures

Yu Xian He
University of Hawai'i at Mānoa

Canada-France-Hawaii Telescope
Mentors: Greg Barrick, Bill Cruise, Kevin Ho & Jim Thomas

One of the instruments at the Canada-France-Hawaii Telescope observatory is MegaPrime, a wide-field optical imager that includes MegaCam, a 340-megapixel camera using state-of-the-art Charge-Coupled Device (CCD) detectors. As good operational practice, rigid procedures are followed and checked off when installing and removing the instrument onto and from the telescope. A few of these procedures are manual and physical processes, while most others can be automated. Engineers currently utilize hard copies of the procedures and manually mark off completed steps in the procedures. A software electronic checklist program is being developed to streamline the process. This project started off with another instrument's checklist, which was modified for MegaPrime. Like a paper checklist, each item can be marked off at completion on the program's Graphical User Interface (GUI). Through this GUI, a user is able to retrieve MegaPrime's system statuses from a server and enter additional comments for each procedure. The program is now being finalized to incorporate functions to complete the automation. In addition, the checklist results will be archived for future reference. Utilizing this checklist is expected to improve the efficiency of completing MegaPrime's operations.

Yu Xian He

Yu Xian He was born in Guangzhou, China and moved to Honolulu when she was around six years old. She is currently a Physics major at UH Manoa, and she holds an Associate of Science degree in Computing, Electronics, and Networking Technology from Honolulu Community College and a Bachelor of Arts in Systems Administration from Hawaii Pacific University. Yu Xian is interested in becoming a telescope technician after finishing her physics degree, but she also has thoughts about pursuing a Masters in Astronomy. Some of her passions include drawing, dancing, and playing video games.

Going Digital: Converting Paper Documentation to Digital Form for Collaboration at Keck Observatory

Jerry Adams
Honolulu Community College / University of Hawai'i at Mānoa

W.M. Keck Observatory
Mentors: Craig Nance & John Baldwin
Advisor: Peggi Kamisato

Organized and accessible information is key in any organization. The Operations and Infrastructure (OID) department at W.M. Keck Observatory seeks to compile two decades' worth of paper documentation into digital form. The need for this is so that anyone on Keck's staff can obtain the information quickly from potentially anywhere in the world. The documents are gathered, sorted and labeled at their location in the observatory on the Mauna Kea summit. The documents are then brought down to Keck's Headquarters and scanned using a Xerox copier into PDF file format. The files of the scanned documents are named a specific way to distinguish formal documents from informal documents. The files are then uploaded to a file repository called Keckshare and the links to the files are inserted on the proper Twiki web pages. The heart of the project is this Twiki website, a "wiki"-style website hosted on Keck's internal network. Twiki is the front-end where anyone on Keck's staff can easily access their documents. Here they can also edit the website, posting their documents or comments on the Twiki webpages, allowing for a flexible and collaborative environment. The OID department also wanted this information available "in the field" to its staff working on the summit. A rugged tablet was recommended for use, which would have the entire contents of the Twiki website stored locally, as wireless connections are not allowed on the summit. The Twiki content would be copied through a wired connection when the tablet is docked. For true accessibility, an outside computer could remotely connect to a PC on Keck's internal network using a program called Real VNC. This would allow access to the Twiki content and PDF documents from virtually anywhere in the world. A large part of this project has been to define a structured process that general staff can follow for getting the paper documentation into digital form on the website and on the tablet. The end result of this project is an organized catalog of documents that is easily accessible and allows staff collaboration. In the future, a better, more organized file repository system, such as the existing Keck Library Webcatalog, may work better. Also, implementing a true synchronization of the files onto the tablet would be beneficial.

Jerry Adams

Jerry Adams was born and raised in Aliamanu, Oahu. He graduated in spring 2012 from Honolulu Community College with an Associate degree in Computer Networking. He will be pursuing his Bachelors of Science degree at the University of Hawaii at Manoa. In his spare time he enjoys fixing computers, playing video games, reading, fishing and going to the beach.

Creating Rule-Based Software for Assisting with Resolution of Telescope Faults

Kyle Cannoles
Hawai'i Community College / Univ. of Hawai'i at Hilo

W.M. Keck Observatory
Mentors: Al Honey & Liz Chock

The W.M. Keck Observatory operates two telescopes atop Mauna Kea that take advantage of adaptive optics (AO) that employ laser systems to compensate for the Earth's atmospheric turbulence. Should the complex software and/or equipment fail, or conditions preclude observation, then the problem typically requires a prompt response in order to get the astronomer back "on-sky" as soon as possible. In order to improve upon the current system, a research study is in progress to determine whether or not an "expert system" would provide additional useful information to improve the operators' and engineers' ability to rectify problems. In order to test whether the expert system is a viable solution, a "sandbox" environment has been created, which includes the currently used Experimental Physics and Industrial Control System (EPICS) database system and associated Alarm Handler (ALH). The expert system is essentially a program written in Python which accepts different inputs, such as the name and group of the alarm, values from hardware such as temperature, and possibly other alarms. Using those inputs, the expert system will make an "educated" decision, based upon rules entered by a human expert, as to the cause of the problem. Lastly, the system will be able to suggest solutions to augment observatory staff's ability to resolve problems with the telescope more quickly, thereby decreasing astronomers' lost observing time. In the future, this project may expanded beyond the scope of just the AO system, and will be used for other systems of the telescopes as well.

Kyle Cannoles

Kyle Cannoles was born in Hilo, Hawaii. He graduated from Waiakea High School in 2009. He will graduate from Hawaii Community College with an associate's degree in Information Technology in the spring of 2012. His next goal is to acquire a bachelor's degree in Computer Science at the University of Hawaii at Hilo campus. In his free time, Kyle enjoys writing programs, learning more about computers, studying the Japanese and culture, and playing video games.

Designing KeOLA: The Keck Observation Log Archive

Ian Cunnyngham
University of Hawai'i at Hilo

W.M. Keck Observatory
Mentor: Luca Rizzi

In the course of any observing run, astronomers must keep track of many different pieces of information to effectively utilize their science data later. For each observation taken, they must track which object is being targeted, telescope configuration, where the frame is stored, and any notes they want to remember for later (among other things). Additionally, weather conditions, changes in seeing, and any other notes that apply to the night as a whole, must be logged. Currently, this is achieved through paper logs that the astronomer is responsible for filling out by hand and keeping track of afterwards. The goal of KeOLA is to create a software solution to replace these logs — tracking the data created in real-time, and filling in as many details as possible automatically — while achieving the same flexibility and ease of use as the paper logs. The software should provide a much more consistent and extensive archive for use by astronomers and support staff, mitigate gaps of information and errors, and save significant time. To achieve all the desired functionality, an entire software ecosystem had to be realized. A daemon to launch new logs based on the telescope schedule, a monitoring script to track new frames and extract all their FITS metadata in real time, a central database, an interface between the database and the user application, and a rich web client encompassing real-time log functionality, as well as administration tasks. All pieces were designed to be as logically independent and maintainable as possible, while still using cutting-edge technologies and techniques. Python was used for all server-side scripting; MongoDB, a document-based database, was selected due to its flexibility as the backend data store; a Python based microframework named Flask was utilized to serve data to the Web client; and a combination of sophisticated JavaScript libraries, including Backbone.js, were used for creating the browser-based client. As of now, the application has a majority of its core functionality in place, and is undergoing trials before being phased into normal use.

Ian Cunnyngham

Ian Cunnyngham grew up in Columbus, Ohio where he was immersed in computers from a young age, working as a web-designer and systems administrator during high-school and eventually co-founding a software company in 2005. After returning to school, he transferred from The Ohio State University to the University of Hawai'i at Hilo in 2009 and graduated in 2012 with a double major in Physics and Astronomy and a minor in Mathematics. Ian intends to enter the industry – working on problems of big data, machine learning, and distributed computing – and intends to attend graduate school down the line. His interests include futurism, playing music, meditation, and since moving to Hawai'i, spinning fire and free diving.

Potassium Persulfate Oxidation vs. Photo Oxidation: Determining a Method for Evaluating Total Dissolved Nitrogen and Total Dissolved Phosphorus in Various Water Matrices

Katelynn K. Ho
University of Washington / Cornell University

Natural Energy Laboratory of Hawaii Authority
Mentor: Keith Olson

Chemical and photo oxidation methods have been used in water quality labs to determine the concentrations of total dissolved nutrients in water samples. Most studies compare the results of the chemical and the photo oxidation methods in fresh water systems. The purpose of our research conducted at the Natural Energy Lab of Hawaii Authority (NELHA) is to determine and optimize the most accurate and efficient method in evaluating the total dissolved nitrogen (TDN) and the total dissolved phosphorous (TDP) in brackish groundwater and marine samples. We performed a comparison between Standard Method's SM 4500-NC, the potassium persulfate ($K_2S_2O_8$) chemical oxidation method, and NELHA's historical photo oxidation method. In both methods, the TDN/TDP of the oxidized glutamic acid and glycophosphate gravimetric standards were compared. In the SM 4500-NC chemical oxidation method, we prepared the $K_2S_2O_8$ reagent using the North Temperate Lake Ecological Research recrystallization procedure to remove the NH_3 contaminant. The standard samples were then autoclaved for 1 hour in the presence of ammonia-reduced $K_2S_2O_8$. Actual TDN and TDP concentrations were determined by an Astoria Pacific A2 segmented flow autoanalyzer and were graphed against theoretical nutrient concentration standards. A trend indicated that the higher the theoretical standard, the lower the actual value. Varying concentrations of the $K_2S_2O_8$ oxidizing reagent will be tested to optimize the chemical oxidation method, while sample time in the photo oxidation apparatus will be modified to optimize the photo oxidation method. This iterative study will determine whether NELHA should transition from the photo oxidation method to the chemical oxidation method in their water quality testing.

Katie Ho

Katie Ho was born in Hilo and raised on the Big Island. She graduated from Hawaii Preparatory Academy in 2011 and is looking to pursue a career in environmental science. Her interest in this field stemmed from taking AP Environmental science and her participation with the Energy Lab at her school. She is currently attending the University of Washington but is transferring to Cornell University in the fall. In her free time, she enjoys going to the beach, hiking and spending time with friends and family.

Designing Local Feed for Maximizing Abalone Growth

Christopher Sugai
University of Hawai'i at Mānoa

Big Island Abalone Corporation
Mentors: Cecilia Viljoen & Jay Booth

Abalone is renowned for its unique taste and is thus actively sought by top culinary artists from around the world. The rarity of these prized shellfish in the wild and numerous challenges to cultivate them on a large scale contributes to the high prices paid in markets and restaurants. Big Island Abalone Corporation is the first company to cultivate abalone in the Hawaiian Islands, utilizing a mix of imported feeds and seaweed grown on-site. A new feed, Abkelp, is to be tested by itself and in combination with grown seaweed, and compared with feeds used at the present time, to check if feed regimens can be changed to include Abkelp. It is believed that Abkelp does not yield abalone weights or lengths as large as the feed routine already in place.

Chris Sugai

Growing up in the Kona coffee fields on the Big Island, Chris Sugai learned what a hard day's work was from a young age. While working on the farm, he gained a great appreciation for the biology of the plants and life that surrounded him, and now plans to translate this passion into a career in the research field. Chris is graduating in the spring from the University of Hawaii at Manoa with a Bachelors of Science in Biology, and will be attending UH Manoa again to complete a Masters in the Molecular Biosciences and Bioengineering. In his spare time Chris enjoys bodyboarding, do-it-yourself projects, and playing musical instruments.

EtherCAT Characteristics

Anthony Sylvester
University of Hawai'i at Mānoa

Thirty Meter Telescope
Chris Carter, Kim Gillies, Mark Sirota

Ethernet for Control and Automation Technologies (EtherCAT) is known as a high-performance industrial communication protocol with predictable timing, high data-transfer rates, and precise synchronization. Common uses of EtherCAT are in industrial automation and motion control operations. The unique design of EtherCAT allows it to function over standard Ethernet cabling, and it is offered by an increasing number of manufacturers, thus making it an economical option. The main purpose of this project was to determine the operational characteristics of an EtherCAT system, and its applicability toward the controls subsystem of a land based astronomical telescope. Secondary objectives were to determine the compatibility between hardware and software components from various EtherCAT hardware manufacturers, such as National Instruments (NI) and Beckhoff Automation, while operating over the EtherCAT protocol. Throughout this project, numerous experiments were performed to analyze the timing and data transfer properties of an exploratory EtherCAT system. The most critical aspects tested were the simultaneity, jitter, latency, and throughput. These were the determining factors of whether this technology could be adapted to the Thirty Meter Telescope (TMT) Project. A series of different hardware configurations were tested with varying results. It was determined that some hardware configurations operating over EtherCAT are adequate for use at TMT, while others are not. A report was then generated which included a comprehensive description of the experiments conducted, and an advisory of recommended EtherCAT implementations. This report will be made available for use by the TMT design staff.

Anthony Sylvester

Anthony Sylvester grew up on the east side of the Big Island and graduated from Waiakea High School in 2008. He will soon be finishing a Bachelor of Science degree in Mechanical Engineering at University of Hawai'i at Manoa. After completing his bachelor's degree, he hopes to continue on toward a master's degree. Anthony participated in the Akamai program in 2011, completing a project at Canada France Hawaii Telescope, and in 2012 spent the summer in Pasadena, California interning at the Thirty Meter Telescope (TMT) in a new TMT/Akamai pilot internship program.

Akamai Workforce Initiative

University of Hawai‘i Institute for Astronomy (IfA)
University of California, Santa Cruz Institute for Scientist & Engineer Educators (ISEE)
UH Maui College

The AWI advances Akamai (smart, clever) students into the Hawai‘i technology workforce. AWI partners industry, observatories, educational institutions, and community to meet needs in astronomy, remote sensing, and other science and technology industries in Hawai‘i. The AWI includes internships, the Professional Development Program, the Teaching and Curriculum Collaborative, development and teaching of the UHMC engineering technology program, and outreach to high schools.

2012 Maui Akamai Internship

Akimeka, hν Photonics, Institute for Astronomy, Maui High Performance Computing Center, Pacific Defense Solutions, Pacific Disaster Center,
Pacific Joint Information Technology Center, Trex Enterprises

2012 Hawai‘i Akamai Internship

Canada-France-Hawaii Telescope, Gemini Observatory, Institute for Astronomy, Smithsonian Submillimeter Array, Subaru Telescope, W.M. Keck Observatory
Hawaii Natural Energy Laboratory of Hawaii Authority, Big Island Abalone Corporation

The AWI has received funding from:

The National Science Foundation (AST#0836053)
Air Force Office of Scientific Research (FA9550-10-1-044)
University of Hawaii
Air Force Research Laboratory
Kamehameha Schools
Thirty Meter Telescope Corporation
National Solar Observatory

For more information please contact:

Lisa Hunter, Director, Akamai Workforce Initiative
UH Institute for Astronomy and UCSC Institute for Science & Engineer Educators
(808) 573-9542, hunter@ifa.hawaii.edu

Lani LeBron, Program Coordinator, Akamai Workforce Initiative
(808) 573-9534, klebron@ifa.hawaii.edu

Akamai Workforce Initiative Headquarters

IfA Advanced Technology Research Center
34 Ohia Ku Street * Pukalani, HI * 96768

Lisa Hunter, Director, Akamai Workforce Initiative
808-573-9542 * hunter@ifa.hawaii.edu

Lani LeBron, Program Coordinator, Akamai Workforce Initiative
808-573-9534 * klebron@ifa.hawaii.edu

Samara Phillips, Program Assistant, Akamai Workforce Initiative
808-573-9533 * sphillips@maile.ifa.hawaii.edu

http://akamaihawaii.org

AKAMAI

Maui Internship Symposium

Celebrating 10 Years of the Akamai Internship Program

August 7, 2012
Wailea Marriott Resort
Lokelani Ballroom

Program Information
Intern Abstracts

Advancing Hawaii college students into science and technology careers.

2012 Akamai Internship Program

Akamai Workforce Initiative
Institute for Astronomy, University of Hawaii
Institute for Scientist & Engineer Educators, University of California Santa Cruz
University of Hawaii Maui College

Akamai – smart, clever

The Akamai Internship Program is a unique program that supports Hawai'i college students in completing an authentic science or technology project in a professional setting. Students are prepared through an intensive one-week short course, and then spend seven weeks at an observatory or industry setting where they complete a project under the guidance of a mentor. Throughout the entire eight-week program they complete a communication course that begins in the short course and continues through weekly meetings and intensive coaching sessions. The Akamai program uses an internship model designed by the Center for Adaptive Optics (CfAO) using National Science Foundation (NSF) Science and Technology Center funding, with the specific aim of developing a program to address the technical workforce needs in Hawai'i

The Akamai Internship Program includes:

40-hour short course
7-week project experience at a company, observatory, or government facility
Science & engineering communication course in which all interns prepare:
Oral presentation
Poster presentation
Technical abstract
Personal statement
Résumé
Symposium and many other opportunities for students to present their work
Ongoing educational and career support

2012 Maui Host Organizations

Akimeka
HNu Photonics
Institute for Astronomy
Maui High Performance Computing Center
Oceanit
Pacific Defense Solutions
Pacific Disaster Center
Pacific Joint Information Technology Center
Trex Enterprises

Akamai Workforce Initiative

Institute for Astronomy

Lisa Hunter (AWI Director), Jeff Kuhn (AWI Associate Director)
David Harrington, Lani LeBron, Samara Phillips
Garrett Elliott, Michael Nassir

University of California, Santa Cruz

Lisa Hunter, Jerome Shaw (AWI Associate Director)
Beth Walker

UH Maui College

Mark Hoffman (AWI Associate Director),
Elisabeth Reader

Air Force Maui Optical and Supercomputing Site

Joseph Janni

2012 Akamai Short Course Instructors

David Harrington - Lead Instructor
UH Institute for Astronomy

Andy Norton
University of California, Santa Cruz

Harald Ebeling, Heather Kaluna, Lauren Stephenson
UH Institute for Astronomy

Clay McKell
UH Manoa College of Engineering

Brooks Thomas
UH Manoa Physics

2012 Communication Instructors

Michael Nassir - Lead Instructor
University of Hawaii at Manoa, Institute for Astronomy

Garrett Elliott - Instructor
UH Institute for Astronomy

Special Thanks . . .

The leaders and staff of the Akamai Workforce Initiative would like to thank the following individuals for their commitment and support of the 2012 Maui Akamai Internship Program:

David Askov – Pacific Disaster Center
Louis Bedal – HNu Photonics
Michael Bush – Oceanit
Rita Cognion – Oceanit
Ned Davis – Trex Enterprises
Sandra Dawson – Thirty Meter Telescope
Dennis Douglas – Pacific Defense Solutions
Mike Engelmann – Trex Enterprises
D.J. Fabozzi – Akimeka
Scott Fisher – National Science Foundation
James Gaines – Univ. of Hawai‘i
Cindy Giebink – UH Institute for Astronomy
Günther Hasinger – UH Institute for Astronomy
Klaus Hodapp – UH Institute for Astronomy, Hilo
Tara Holm – 2c4 Technologies
Jeff Huebotter – Trex Enterprises
Stuart Jefferies – UH Institute for Astronomy, Maui
Steve Kunitzer – Pacific Disaster Center
Derrick Lahrman – Akimeka
Todd Lawson – 2c4 Technologies
Scott Libert – Oceanit
Colin Lindeman – Pacific Disaster Center
Sharon Mielbrecht – Pacific Disaster Center
Daron Nishimoto – Pacific Defense Solutions
Adrienne Notley – Gemini Observatory
Dan O’Connell – HNu Photonics
Dan O’Gara – UH Institute for Astronomy
Jung Park – UH Maui College
Richard Puga – HNu Photonics
Elisabeth Reader – UH Maui College
Michael Reiley – HNu Photonics
Joseph Ritter – UH Institute for Astronomy
Isabelle Scholl – UH Institute for Astronomy
Dave Schultz – Pacific Defense Solutions
Ryan Swindle – UH Institute for Astronomy
Dee Symonds – Trex Enterprises
Stan Truitt - Consultant
Mikol Westling – 2c4 Technologies
Skip Williams – Air Force Research Laboratory

Presentation Schedule

OPENING REMARKS

Jeffrey Kuhn
Associate Director, Akamai Workforce Initiative, Institute for Astronomy

Lisa Hunter
Director, Akamai Workforce Initiative, Institute for Astronomy and Institute for Scientist & Engineer Educators

CONCURRENT SESSION I

UH Institute for Astronomy

Design and Automation of a Solar Occulting System for an All-Sky Imager
Christopher Escalante - *UH Mānoa*

Determining Conic Surface and Deviation Points of a Telescope Mirror Using Laser Tracking Technology
Marco Bucao - *Kaua'i CC*

Off-Axis Telescope Mechanical Structure Design and Analysis
Mikhail Coloma - *UH Mānoa*

Haleakala Summit Weather Data Storage and Retrieval
Jordan Gartner - *Northern Arizona Univ.*

- INTERMISSION -

Pacific Disaster Center

Web Server Analysis and Summarization
Rachel Pang - *Northern Arizona Univ.*

HNu Photonics

A Battery Management System for Energy Storage
Corynne Umeda - *UH Mānoa*

Akimeka

Unified Modeling Language (UML) for Legacy Software
Katrina Schenk - *UH Maui College/UH Mānoa*

Creating a Remote Access Utility to Allow Instant Updates to User Accounts in a Network of Databases
Joey Andrews - *UH Maui College*

CONCURRENT SESSION II

Pacific Defense Solutions & Maui High Performance Computing Center

Providing Daylight Data Collection with a 14-inch Telescope through the Implementation of a Chopper Device that Applies Offsets in the Telescope's Line-of-Sight
Aaron Ahue - UH Maui College

Analysis and Optimization of Daylight Telescope Images
Nathan Hara - Cal Poly, San Luis Obispo

Trex Enterprises

Determining the Reactions of How the Air Worthy Magnetic Winch Gear System Operates
Jasmine Maru - Windward CC / UH Mānoa

Building a Control System to Test a Magnetic Gear Winch
Noelle Takahashi - UH Mānoa

Developing and Integrating Electric Brake Control System to Characterize a Magnetic Gear Winch
Julia Chen - Univ. of Southern California

- INTERMISSION -

2c4 Technologies / Pacific Joint Information Technology Center

Redesigning Elements of the ITEC Website
Haley Adamic - Kaua'i CC / Boston College

A Secure Web Form for ITEC Clients
Nathan Brandes - Univ. of Washington

Oceanit

Method of Consistently Updating Oceanit's GEO Satellite Tracking Software Test Platform
Spencer Eldred - UH Maui College

MODTRAN Atmospheric Transmission Modeling for Daylight Satellite Tracking Site Assessment
Marley Rutkowski - Univ. of Portland

ABSTRACTS

Design and Automation of a Solar Occulting System for an All-Sky Imager

Christopher Escalante
University of Hawai'i at Mānoa

UH Institute for Astronomy
Mentor: Ryan Swindle
Advisor: Jeffrey Kuhn

The Wavelength-Adaptable All-Sky Polarimeter (WAASP) is an all-sky imager engineered to characterize the circular and linear polarization of the full sky at various wavelengths. The instrument will be used mainly at the Haleakalā High Altitude Observatory for calibrating polarimetric images such as those from the 3.67-m Advanced Electro-Optical System (AEOS) telescope. WAASP makes use of a 1.4-mm, 185˚´185˚ field-of-view fisheye lens that is especially susceptible to lens flare. In order to mitigate the unwanted effects of lens flaring, we designed and automated a solar occulting system that tracks the Sun's position and blocks its excessive light. The occulter itself is an east-west oriented semicircle aluminum strip angled at 20.7˚ from the zenith. Powered by a stepper motor, the occulter's motion mimics the movement of the Sun as its declination changes throughout the year. The occulter's tracking routine is written in IDL and uses the Julian Date to calculate the Sun's declination to a resolution of 12 arcminutes. Our occulter design allows an elimination of lens flare by blocking only a few degrees of the sky.

Christopher Escalante

Christopher Escalante was born and raised in Honolulu, where he graduated from William McKinley High School. He currently attends the University of Hawai'i at Mānoa, where he plans to graduate with a BS in Mechanical Engineering. Besides being an engineering student, Christopher is also a senator-at-large in the Associated Students of the University of Hawai'i at Mānoa (ASUH), a peer advisor, and a physics tutor. His career goal is to work in the field of renewable energy and help Hawai'i in its sustainability efforts.

Determining Conic Surface and Deviation Points of a Telescope Mirror Using Laser Tracking Technology

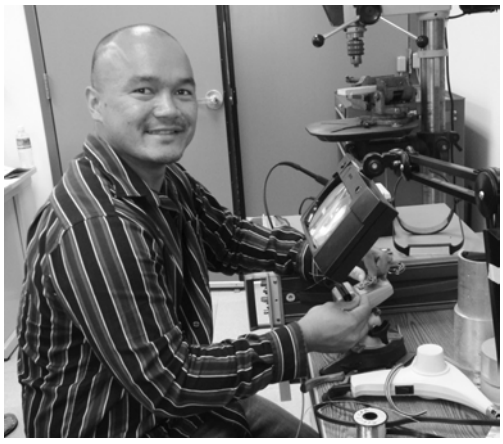
Marco Bucao
Kaua'i Community College

UH Institute for Astronomy
Mentor: Jeffrey Kuhn
Collaborator: Joseph Ritter

This is a metrology effort to support a two-meter off-axis primary mirror for the PLANETS telescope. The Institute for Astronomy's interferomic laser tracker is used to determine the deviation points and conic surface of a mirror to be used in telescopes. This metrology tool is accurate to within a few microns of measurement. The laser tracker measures a cluster of points on the surface of a mirror. The deviation of the surface of the mirror from ideal can be precisely quantified. That data is piped into a program Jeff Kuhn is writing using Interactive Data Language (IDL) to characterize the deviation of the mirror surface and also create a graphical representation of the results. Eventually this data would feed into the polishing process. So far we have measured the same mirror three times but only used the best data to create the IDL program, which is still being worked on. Currently we are designing a linear xy-axis moving stage to move the corner reflector to provide a systematic way of measuring mirrors. Mirrors would then be sent off for polishing. It would take a considerable amount of time to polish the mirrors by using a water jet stream technology. In the end, this program would help accurately locate deviation points and help determine a telescope's conic surface.

Marco Bucao

Marco Bucao was born in 1984 and raised on the island of Kaua'i, where he graduated from Kaua'i High School in 2002. He originally attended Kaua'i Community College for two years, majoring in Liberal Arts, then one year at Honolulu Community College in the Computing Electronics Networking Technology (CENT) program. Marco's college studies were put on hold as he enlisted in the U.S. Army for six years as an Engineer Mechanic, deploying twice to Iraq. Now, Marco is back at Kaua'i Community College where he plans to complete his Associate of Science degree in Electronics Technology, then transfer off-island to obtain his Bachelor's. Marco enjoys diving, surfing, fishing, and trucks.



Off-Axis Telescope Mechanical Structure Design and Analysis

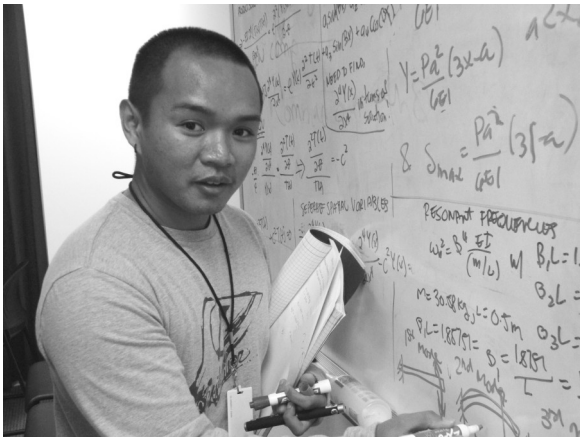
Mikhail Coloma
University of Hawai‘i at Mānoa

UH Institute for Astronomy
Mentors: Jeffrey Kuhn and Isabelle Scholl

A study was conducted to design and numerically analyze a telescope mount for the PLANETS (Polarized Light from Atmospheres of Nearby Extra-Terrestrial Systems) telescope that will be built atop Haleakalā, Maui. Using the design concepts of standard trusses, a SolidWorks finite element analysis (FEA) is used to calculate and optimize the resonant frequencies, theoretical weight, and deflection. The results for the current design show a maximum resonant frequency of 30.15 Hz, a minimum weight of 2365 kg, and a minimum deflection of 1.774 mm. This depicts the mechanical behavior and characteristics of the 1.85-m off-axis equatorial PLANETS telescope mount. With more extensive computational computing of the truss geometry, a higher resonant frequency, lower weight, and lower deflection can be achieved. Also, further study can be done on the PLANETS telescope mount by introducing a tensegrity design to compare with the truss structure.

Mikhail Coloma

Mikhail Coloma was born and raised on the island of O‘ahu. He recently completed his B.S. degree in Mechanical Engineering and a minor in Mathematics at UH Mānoa, where he was a McNair Scholar. This fall, Mikhail will enter the doctoral program in Mechanical Engineering at Binghamton University. He is interested in computational sciences and methods, particularly as applied to heat transfer and fluid mechanics. Mikhail enjoys studying mathematics, reading textbooks, writing papers, and doing homework. In his spare time, he pursues robotics, event planning, philosophy, and sewing.



Haleakala Summit Weather Data Storage and Retrieval

Jordan J. Gartner
Northern Arizona University

UH Institute for Astronomy
Mentors: Cindy Giebink & Dan O'Gara

The Institute for Astronomy has collected weather data from the Mees weather instruments for the past 18 years. The current weather is hosted on the IfA website as well as composite plots of the past 24 to 48 hours of data. These plots are created using IDL code and based on flat text files. The means of collecting and storing data was changed when PS1 came into the picture rendering the current weather page system. There were too many points of failure, and for the first time in 18 years, the weather pages were not dependable. Additionally, if researchers wanted large amounts of archived weather data, they would have to contact the IfA and make special arrangements. Our goal was to redesign the collection of data and the weather hosting pages and to make the archived weather data more accessible. We created a MySQL database. The first task was to import the past 18 years of data stored in text files into the database. Then we implemented a program that added the new weather data once every ten seconds. Using PHP and JavaScript plug-ins, it is now possible to create interactive graphs online given the date and other parameters that the user wishes to be displayed. It is also now possible to download all data one year at a time, eliminating the need to contact IfA and request the information. With more time, we will develop a mobile phone application to easily access the current summit weather on the go.

Jordan Gartner

Jordan Gartner was born in Canada, but moved to O'ahu at the age of three. He graduated from Kaiser High School and will be a junior this fall at Northern Arizona University. He is working toward a Bachelor's degree in Computer Science.

Web Server Analysis and Summarization

Rachel Pang
Northern Arizona University

Pacific Disaster Center
Mentors: David Askov, Steve Kunitzer & Colin Lindeman

The Pacific Disaster Center (PDC) displays real-time natural disaster maps in its interactive Web application, DisasterAWARE. This application is used by emergency managers worldwide to graphically display the location and track the progress of global disasters. Although PDC tracks visitor counts to the application itself, there is presently no mechanism to track the number of requests made by a DisasterAWARE user to PDC's map servers, much less to analyze which maps the user is viewing, or the maps' extents. The goal of this project is to create a Java program to parse the information in the Web server's log files and store it in a database. Once stored in a relational database, it is possible to generate summary statistics showing visitor counts to PDC's map services over a given time period, as well as the processing time taken to serve those requests. The location of the map request is also stored in a relational database, enabling PDC to analyze the most frequently requested map extents. Understanding how the application's users interact with the geospatial data, especially during a disaster, will enable PDC to improve the application by tailoring it to the information that users find the most useful in their decision-making process.

.

Rachel Pang

Rachel Pang was born and raised on the island of O'ahu and graduated from Saint Andrew's Priory in 2010. Entering her junior year this fall at Northern Arizona University, she intends to obtain a Bachelor's degree in Computer Science and to minor in Mathematics and Asian Studies. Rachel is currently the club president of NAU's chapter of Association for Computing Machinery.

A Battery Management System for Energy Storage

Corynne Umeda
University of Hawai‘i at Mānoa

HNu Photonics
Mentors: Louis Bedal & Richard Puga

In ideal weather, the sun would shine bright all day, everyday. Unfortunately we do not live in a perfect world with consistently beautiful weather and this affects the production of solar energy. At HNu Energy, batteries can be used to power a home during gaps of low or no sun. They can also be used to even out fluctuations delivered to the power grid due to inconsistencies from solar power and other renewable energies. HNu Energy requires a more efficient battery management system (BMS) for these batteries. My objective is to create a BMS to ensure the batteries stay within a safe voltage and temperature range. It will be able to measure the voltage, current, and temperature, which will allow us to determine the state of charge of a battery. To accomplish all of this, a circuit was designed to test different loads, monitor the batteries and control the charge and discharge of a battery. We are using relays to switch from “discharging” to “charging” to “off” based on the results from the voltage, current, and temperature measurements. In the future, we will develop algorithms to determine batteries’ state of charge and know when to replace the battery. This battery management system will help make batteries safer and more manageable.

Corynne Umeda

Corynne Umeda was born and raised on O‘ahu and graduated from Roosevelt High School in 2011. She is attending the University of Hawai‘i at Mānoa, majoring in Electrical Engineering, and is interested in renewable energy. During her free time, Corynne enjoys running, playing soccer, baking, and hanging out with friends and family.

Unified Modeling Language (UML) for Legacy Software

Katrina Schenk
Univ. of Hawai'i Maui College

Akimeka, LLC
Mentor: D.J. Fabozzi

UML reverse-engineering programs provide a fast way to interpret a program by taking in source code and deriving graphic models of the program structure. A cross-domain, language-independent program was created to reverse-engineer legacy software. We began building on a preliminary program that generated class shells and extracted class names and attributes from files. Methods were then written to determine class variables, variable types, and methods of subroutines. Each line is read in from the file, then parsed to be written into corresponding class shells. Then we searched through each file in the directory to obtain the called methods and header files used within each file. Class relationships — such as aggregation, association, and inheritance — are inferred from the code, and all of the data is displayed graphically as UML. In the future, the program can be improved upon to handle source-file formatting differences.

.

Katrina Schenk

Katrina Schenk was born and raised on Maui and graduated from H.P. Baldwin High School in 2010. She has spent two years at UH Maui College, and this fall, she will enter her junior year of college at UH Mānoa to pursue a BS in Computer Science. After graduating in spring 2014, Katrina plans to work in the tech field for a few years before returning to school for a Master's degree.

Creating a Remote Access Utility to Allow Instant Updates to User Accounts in a Network of Databases

Carl Joey Andrews
University of Hawai'i Maui College

Akimeka, LLC
Mentor: Derrick Lahrman

The current process for making changes to user accounts in Akimeka databases requires more time — a week or more in some cases — more steps, and more people than is desirable for a task that is required several times per day with only one person currently responsible for implementing those changes. We believe we can create an easy-to-use utility that will give individuals the ability to make their own instant updates to any available network database. We are writing SQL and PL/SQL code to create a series of database links along with procedures to read and write information to those databases. We are using Oracle Application Express to create a Web-based graphical user interface, driven by our SQL procedures, which will allow users to immediately accomplish a variety of tasks: create or edit database links, create new user IDs, change passwords and set expiration dates, activate or deactivate accounts, and assign user roles and facility IDs. We currently have a working application that can accomplish most of the intended tasks. Future work will be to implement feature requests and polish the interface for intuitive use. Once complete, our product will allow users to accomplish a task that once might take a week, in minutes.

Joey Andrews

Originally from Indianapolis, Carl "Joey" Andrews has been a Maui resident for the past 18 years. Since graduating from Baldwin High School, he has worked in various fields on-island, including as an entertainer for local resorts, corporate parties, and charities, and as a freelance PC-repair technician and Web designer. Joey is currently a sophomore at UH Maui College, pursuing a Bachelor's degree in Electronics & Computer Engineering Technology (ECET), while also working as the computer technician at the campus library. In his spare time, Joey enjoys discovering new music, playing guitar, reading, playing basketball, and studying comedy.

Providing Daylight Data Collection with a 14-inch Telescope through the Implementation of a Chopper Device that Applies Offsets in the Telescope's Line-of-Sight

Aaron K.M. Ahue
University of Hawai'i Maui College

Maui High Performance Computing Center
&
Pacific Defense Solutions
Mentors: Daron Nishimoto, Dave Schultz & Dennis Douglas

There is a need for a 14-inch telescope to support daylight data collection. In order to do this, a device known as a chopper has been implemented into the telescope system. The chopper is capable of applying small offsets in the telescope's line-of-sight by controlling the tilt of a window in the optical path. The chopper also has the ability to provide real-time interrupts to the system if a user deems it necessary to make adjustments. We have developed the chopper device to incorporate two digital servos controlled by an Arduino Uno microcontroller. The first task of this project was to build all of the necessary hardware components for the Arduino and the servo housing units. Then the Arduino was programmed to support multiple states of operations by controlling the servos to give the proper positions of alignment. In addition, we have developed a graphical user interface (GUI), which provides a user the ability to interrupt the system via an easy-to-use interface. Testing of the chopper unit has been conducted before being incorporated into the telescope system. Based on these test results, additional functionality of both the chopper and its GUI will be addressed in future development.

Aaron Ahue

Part Native Hawaiian and raised on Maui, Aaron Ahue graduated from H.P. Baldwin High School in 1997. He served six years in the United States Army, receiving an Honorable Discharge in 2007, as a microwave systems maintainer and operator in the communication field, with the rank of specialist (E-4). With the completion of his Akamai internship, Aaron will earn his Associate degree in the Electronics & Computer Engineering Technology (ECET) program at UH Maui College, where he will to continue on with the Bachelor's degree program in Engineering Technology. He plans to pursue a career in the engineering and electronics field here on Maui.

Analysis and Optimization of Daylight Telescope Images

Nathan Hara
California Polytechnic State University, San Luis Obispo

Pacific Defense Solutions
Mentors: Dave Schultz & Daron Nishimoto

The majority of images taken from telescopes occur at night when the contrast between the background and target object is at its greatest. The major issue with daylight images deals with light from the Sun and daytime sky saturating the image's background, making it much brighter than the light produced from or reflected off of an object. To improve these images, we developed a program that enhances the contrast of daylight images using a method called frame differencing. Frame differencing subtracts one image of the object from another image of the same object, which is moved within the frame between the two exposures. The resultant image has greatly reduced background light and fixed-pattern noise, and preserves the object as both a positive and negative component due to the frame subtraction. The process is then repeated and the resulting frames are stacked and summed up in order to enhance the magnitude of the object's light signal. We also used MATLAB to produce a graphical user interface (GUI) in which the user can select the directory containing the data to be analyzed. The program reads in the images depending on their filename extension and processes the images using the frame differencing method. The GUI also has the ability to automatically run through as many images as the directory contains, instead of manually stepping through the images one at a time. Future updates for this project would be to apply this method for real-time data analysis rather than stored data analysis.

.

Nathan Hara

Nathan Hara was born and raised on the island of Maui and graduated from Seabury Hall in 2007. He is currently majoring in Electrical Engineering at California Polytechnic State University, San Luis Obispo. Nathan is a member of the Renewable Energy Club and plans to work in the field of Sustainable Energy after graduation. When home, he likes to go to the beach and catch up with old friends.

Determining the Reactions of How the Airworthy Magnetic Winch Gear System Operates

Jasmine Maru
Windward Community College/University of Hawai'i at Mānoa

Trex Enterprises
Mentors: Ned Davis & Mike Engelmann
Collaborators: Julia Chen & Noelle Takahashi

The objective of this project is to design, develop, and test an airworthy magnetic-gear-based gearbox for utility actuation winch applications. We have designed and built two carts to hold the magnetically geared winch system and provide variable loading to it for testing purposes. The test cart configuration will consist of two physically separate carts, one for the winch and one to provide a load. Each cart will consist of its own specifically designed steering mechanism for each individual cart. The first rover cart is designed to securely hold the gear system that weighs approximately 300 lb. The steering system on the first cart functions like a wagon. This particular system allows us move the cart from different locations for testing purposes. The second cart was designed to carry a 1600-lb load. The load cart provides a flat platform that will allow us to have access to shift the weight plates. This particular cart was very difficult to integrate because of the amount of weight it must carry. Testing the magnetic winch's capability will allow us to visually see the efficiency of this gear system.

.

Jasmine Maru

Throughout her childhood, Jasmine was very interested in robotics, mechanics, and aerospace studies. She planned one day to enter the field of engineering, and during high school was involved in the robotics club, and the math team. After graduating, she began a fellowship with NASA working on developing rockets and designing scientific payloads. She later joined the NASA COSMOS project, working on designing satellites. Her future goal is to design jet engines. She hopes to obtain a job working with Lockheed Martin, Boeing, or General Electric.

Building a Control System to Test a Magnetic-Gear Winch

Noelle Takahashi
University of Hawai'i at Mānoa

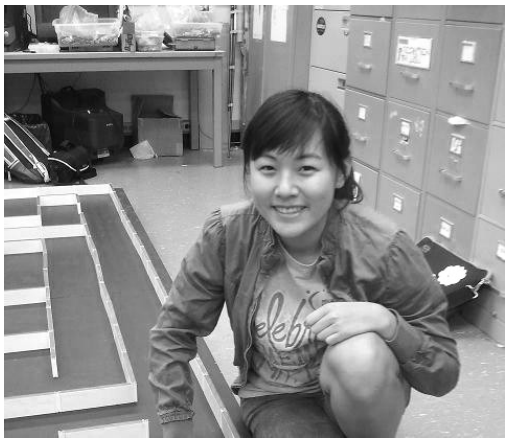
Trex Enterprises
Mentors: Ned Davis & Michael Engelmann
Collaborators: Jasmine Maru & Julia Chen

Magnetic gears are frictionless, have a long life span, and have many other benefits over traditional gears. Trex Enterprises has created a "sandwich gear" that will be compatible with Naval Air Systems Command (NAVAIR) helicopters. To test the new magnetic gear, a cart was built to carry various loads at different speeds. We created a control system for the cart which dynamically adjusts the brakes at all four wheels, allowing the cart to be pulled under a specified load. A load cell, Hall-effect sensors, and LabJack device are used to acquire data about the instantaneous load and speed of the cart. A circuit was created to automatically control the brakes given a specified set point load for the cart. Java was used to program the LabJack device and to create a graph using the data from the speed and load. In the future, Trex Enterprises would like to fully characterize the speed vs. load performance of its magnetic-gear-based winch designs up to the maximum load capacity of the device under test.

.

Noelle Takahashi

Noelle Takahashi is from Wailuku, Maui, and graduated from Baldwin High School in 2010. She is attending the University of Hawai'i at Mānoa, majoring in Computer Engineering. After graduating, she plans on attending graduate school. In her free time, she enjoys hanging out with friends, hiking, and reading.



Developing and Integrating an Electric Brake Control System to Characterize a Magnetic-Gear Winch

Julia Chen
University of Southern California

Trex Enterprises
Mentors: Ned Davis, Michael Engelmann & Jeff Huebotter
Collaborators: Noelle Takahashi & Jasmine Maru

Magnetic gears are an innovative concept that has many advantages over traditional gears: no friction between gears, low maintenance, no debris from lubricants, and quiet operation. In order to test that the magnetic-gear winch designed by Trex Enterprises meets the standards of its client, we designed and built two carts—one carrying the winch, and the other a set of weights. The load cart has a programmable braking system that controls the pulling force or speed of the winch and sends feedback to the computer. Besides building the electric control system, one of the central issues was integrating it with the mechanical parts and the software. We connected the circuit to a LabJack and the electric brakes, and ensured that the circuit received signals from the program and sent them to the brakes to maintain an actively controlled load. This was accomplished through a proportional-integral-derivative (PID) controller that uses a load cell to provide real-time information on the pulling force in volts. The PID controller was tuned to minimize oscillations and stabilize the load set-point. In addition, the output current from the PID was amplified using a buffer and a Darlington configuration to drive the electric brakes. During testing, the winch cart was anchored and pulled the load cart in a straight line as a program collected pull force and speed data. We established a load set-point to observe the changes in the speed until a steady reading was attained. This was repeated for various set points. As a result, we were able to fully characterize winch performance over its full range of operations. Future work with the carts will involve testing winch designs that are currently in process.

Julia Chen

Julia Chen was born and raised in Honolulu, where she graduated from McKinley High School in 2011. She is currently majoring in Electrical Engineering at the University of Southern California. Following the completion of her degree at USC, Julia plans to start her career in the field of engineering, and later attend graduate school for a Master's degree in Electrical Engineering. In her free time, she enjoys spending time with friends and family, drawing, and listening to music.

Creating, Researching, and Writing Documents to Enhance the Young Government Facility, Pacific JITC ITEC

Haley Adamic
Kaua'i Community College/Boston College

2c4 Technologies
Mentors: Todd Lawson, Tara Holm & Mikol Westling

Every start-up company has things that it needs to get started and get organized so it may develop. The Pacific JITC ITEC is a start-up government facility that still needed several different things to become more efficient and to be able to handle a larger amount of customers. Different things the Pacific JITC ITEC needs are a deliverables process document to enhance efficiency, a cost model for easier financing, a more efficient way to provide help and support for the ITEC's customers, and a webpage. A deliverable is the requirements for the ITEC's customers to complete their project. For the ITEC to run more efficiently, a deliverables process document to be followed by the ITEC employees has to be created. Through examination of the ITEC's system with its customers and its facility, the most ideal deliverables process was created. A cost model that classifies past and future expenditures was also needed. By looking through past purchases, a cost model was created. Customers using the ITEC's facility often have issues with connection to our servers and firewall issues. Every time an ITEC customer has a question or an issue, he or she must create a ticket, which is sent to an ITEC engineer or manager. If a help desk page could be accessible to the ITEC's customers, the number of tickets received would be significantly reduced, which would allow more customers to use the ITEC's facility. Therefore, I classified common issues the ITEC's customers have had to provide groundwork for a help desk, which will be created sometime in the future. Finally, a webpage needed to be created since no website for the ITEC existed before. Through research of the company, content was written, which laid the groundwork for further development. However, due to time limitations, the website is still not available to the public. These four different projects done at the ITEC have increased its efficiency and provided the groundwork for its employees to further enhance this facility. If I had more time and resources, I would further my work on the website and continue work on the help desk to the point that the customers are actually able to access it.

Haley Adamic

Haley Adamic grew up in California, graduated from Kaua'i High School in 2010, and has been attending Kaua'i Community College. This fall, she will be transferring to Boston College to double-major in Mathematics and Biology. Haley plans to attend medical school or to attain a doctorate in Mathematics, and afterward, pursue a career either in research or teaching. Haley also enjoys performing arts and Bikram Yoga in her spare time.

A Secure Web Form for ITEC Clients

Nathan Brandes
University of Washington

2c4 Technologies
Mentor: Todd Lawson

2c4 Technologies requires potential clients to fill out an application that defines their project goals, development process, and required resources. This is the first step clients must take in order to gain access to the ITEC (Integrated Technology Evaluation Center) resources. The previous application process was electronic but not automated. Clients were emailed a project application form to fill out. For a typical-use case, a client would misunderstand a few portions of the application or misinterpret what was being asked. It was also typical for clients to overestimate the number of resources they required. Each application would be reviewed by an employee at 2c4, and the errors would be rectified through a laborious series of emails, calls, and meetings. In response to the application process's inefficiencies, we developed a Web application that automated the client application process. The Web application architecture consists of a standard HTML/JavaScript user interface that interacts with server-side PHP. The server communicates with an SQL database that then sends the stored data back to the user or submits the acquired data to a secure private server where 2c4 employees can safely access and review the data. By designing an accessible and secure Web application that guides clients through an electronic form, we have ensured that clients receive immediate and automatic feedback to their responses. The application also educates clients and provides specific detail about the resources they are interested in using. Any communication between the client and 2c4 employees is managed through a single medium, so information loss and inconsistency are minimized. The Web application has dramatically reduced the time it takes to get from beginning the application process to starting the actual project

Nathan Brandes

Nathan Brandes grew up in Kula, Maui, and completed his secondary education at Seabury Hall, graduating in 2010. He is a Computer Science and Engineering major at the Univ. of Washington, where he also teaches a section of the introductory undergraduate computer science course. His current undergraduate research interests focus on finding ways to apply Computer Science concepts to Global Health topics. Since January 2012, he has been collaborating with a group of students to develop a mobile-app-based child immunization registry for resource-constrained environments. He also enjoys playing volleyball, climbing, and playing music.

Method of Consistently Updating Oceanit's GEO Satellite Tracking Software Test Platform

Spencer Eldred
University of Hawai'i Maui College

Oceanit
Mentors: Michael Bush & Scott Libert

Oceanit's GEO Satellite Tracking infrared astronomical camera development is entering the final stages of development and testing. The final software will have processes running on four separate servers to provide a Graphical User Interface (GUI), control of the camera hardware, image processing, and user login authorization. In order to accurately provide feedback to the software developers on the functionality of the GUI prior to the final integration with the hardware, the project software has to be consistently built and reliably deployed to the test environment. The project is automatically being built nightly using Ant scripts in the Hudson / Eclipse Software Integration platform. The use of shell scripts can perform the tasks of reliably updating the test system environment. Bash shell scripts were developed to automate and control the deployment of the different software elements to the various servers, to control the starting and stopping of the different server processes while recording each activity in a setup log file. A list of software code version numbers for the software build to be tested is archived for project tracking. The scripts are presented in an easy to use menu format that controls the sequence of events. Key steps in the setup are recorded in separate log files for review if necessary. The scripts developed for this project provide a consistent and reliable way to deploy the latest software updates for GUI testing and can be modified to provide this same function for future projects.

Spencer Eldred

Spencer Eldred was born in San Francisco and grew up in the Bay Area. He earned a BS degree in Electrical Engineering and Computer Science from the University of California at Berkeley in 1980. He worked for a semiconductor company in Silicon Valley for 20 years before moving to Maui in 1999. He has returned to college after 30 years to sharpen his technical skills. He is currently a senior at the University of Hawai'i Maui College, working towards graduating in May 2013 with a BS in Engineering Technology. Spencer hopes to find a job in Hawai'i as an optical engineer or software engineer.

MODTRAN Atmospheric Transmission Modeling for Daylight Satellite Tracking Site Assessment

Charles Marley Rutkowski
University of Portland

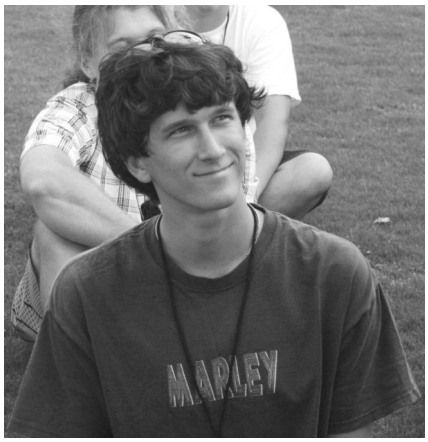
Oceanit
Mentor: Rita Cognion

Observing satellite movement against a bright daytime sky is difficult, therefore optimal viewing conditions are essential. MODTRAN (MODerate resolution atmospheric TRANsmission) is a computer program designed to model the propagation of electromagnetic radiation through the atmosphere. By modeling potential sites using MODTRAN, we will be able to identify the optimum locations for the placement of daylight observing cameras. Archived weather and radiosonde data must be compiled into the proper MODTRAN input format for the desired simulations. By distributing the hundreds of MODTRAN simulations necessary to model a single day across the cores of multiple high-speed servers, we were able to perform simulations in just a few hours that might otherwise take over a week. Outputs from MODTRAN of atmospheric radiance and transmission can then be used to determine a site's suitability for the detection of a satellite against a bright sky. Future analysis of the data from each potential site will allow identification of the most favorable sites for the placement of daylight satellite viewing devices.

.

Charles Marley Rutkowski

Born on Maui and raised completely "off of the grid" in Huelo on the North Shore, Charles Marley Rutkowski has learned to mature and develop from the unique obstacles with which he has been presented. Growing up removed from modernity has presented him with distinct opportunities and challenges. Taking advantage of his background, Marley strives to equip himself with the knowledge and skills necessary to make an impact in the world. Marley is currently studying Electrical Engineering and Computer Science at the University of Portland in Oregon.



Akamai Workforce Initiative

University of Hawai‘i Institute for Astronomy (IfA)
University of California, Santa Cruz Institute for Scientist & Engineer Educators (ISEE)
UH Maui College

The AWI advances Akamai (smart, clever) students into the Hawai‘i technology workforce. AWI partners industry, observatories, educational institutions, and community to meet needs in astronomy, remote sensing, and other science and technology industries in Hawai‘i. The AWI includes internships, the Professional Development Program, the Teaching and Curriculum Collaborative, development and teaching of the UHMC engineering technology program, and outreach to high schools.

2012 Maui Akamai Internship

Akimeka, hν Photonics, Institute for Astronomy, Maui High Performance Computing Center, Pacific Defense Solutions, Pacific Disaster Center,
Pacific Joint Information Technology Center, Trex Enterprises

2012 Hawai‘i Akamai Internship

Canada-France-Hawaii Telescope, Gemini Observatory, Institute for Astronomy, Smithsonian Submillimeter Array, Subaru Telescope, W.M. Keck Observatory
Hawaii Natural Energy Laboratory of Hawaii Authority, Big Island Abalone Corporation

The AWI has received funding from:

The National Science Foundation (AST#0836053)
Air Force Office of Scientific Research (FA9550-10-1-044)
University of Hawaii
Air Force Research Laboratory
Kamehameha Schools
Thirty Meter Telescope Corporation
National Solar Observatory

For more information please contact:

Lisa Hunter, Director, Akamai Workforce Initiative
UH Institute for Astronomy and UCSC Institute for Science & Engineer Educators
(808) 573-9542, hunter@ifa.hawaii.edu

Lani LeBron, Program Coordinator, Akamai Workforce Initiative
(808) 573-9534, klebron@ifa.hawaii.edu

Akamai Workforce Initiative Headquarters

IfA Advanced Technology Research Center
34 Ohia Ku Street * Pukalani, HI * 96768

Lisa Hunter, Director, Akamai Workforce Initiative
808-573-9542 * hunter@ifa.hawaii.edu

Lani LeBron, Program Coordinator, Akamai Workforce Initiative
808-573-9534 * klebron@ifa.hawaii.edu

Samara Phillips, Program Assistant, Akamai Workforce Initiative
808-573-9533 * sphillips@maile.ifa.hawaii.edu

http://akamaihawaii.org