Team Instrumentation Final Presentation

REIS
RENEWABLE ENERGY & ISLAND SUSTAINABILITY
University of Hawai'i at Manoa

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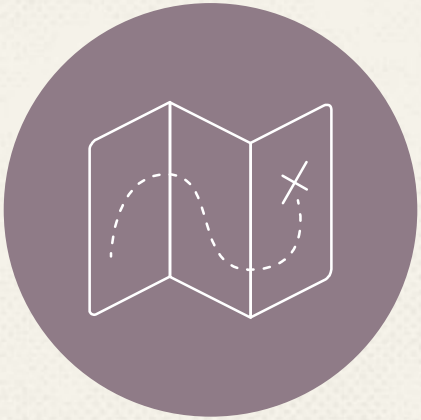
Project Background and Motivation

- In 2012, UH Manoa paid $35 million for their electricity bill.
- Even with energy efficient measure implementation, UH Manoa paid $34.3 million, which is only 2% decrease
- SCEL is in the process of creating a wireless environmental sensor network to collect data
  - To forecast solar irradiation patterns
  - Determine optimal places to install renewable energy sources throughout the UHM campus

Goals of Our Project

- Help students in SCEL to analyze and debug the modules they are creating (weather boxes)
- Create a minimum viable product that logs the device under testing (DUT) voltage and current in real time and export the data as a .csv file



How we accomplished our goal

Specifications of our project, method of approach, major problems and solutions, bill of materials

Device Specifications

- Collect current and voltage readings from a device under testing (DUT)
- Transmit data to a computer in real time
- Display data in a graph format after collection
- Export data as a .csv file
- DUT must have a maximum voltage of 10 V and 3.2 A

Task Assignments

Cristina Felicitas

- Hardware
- PCB design and fabrication
- Testing prototypes

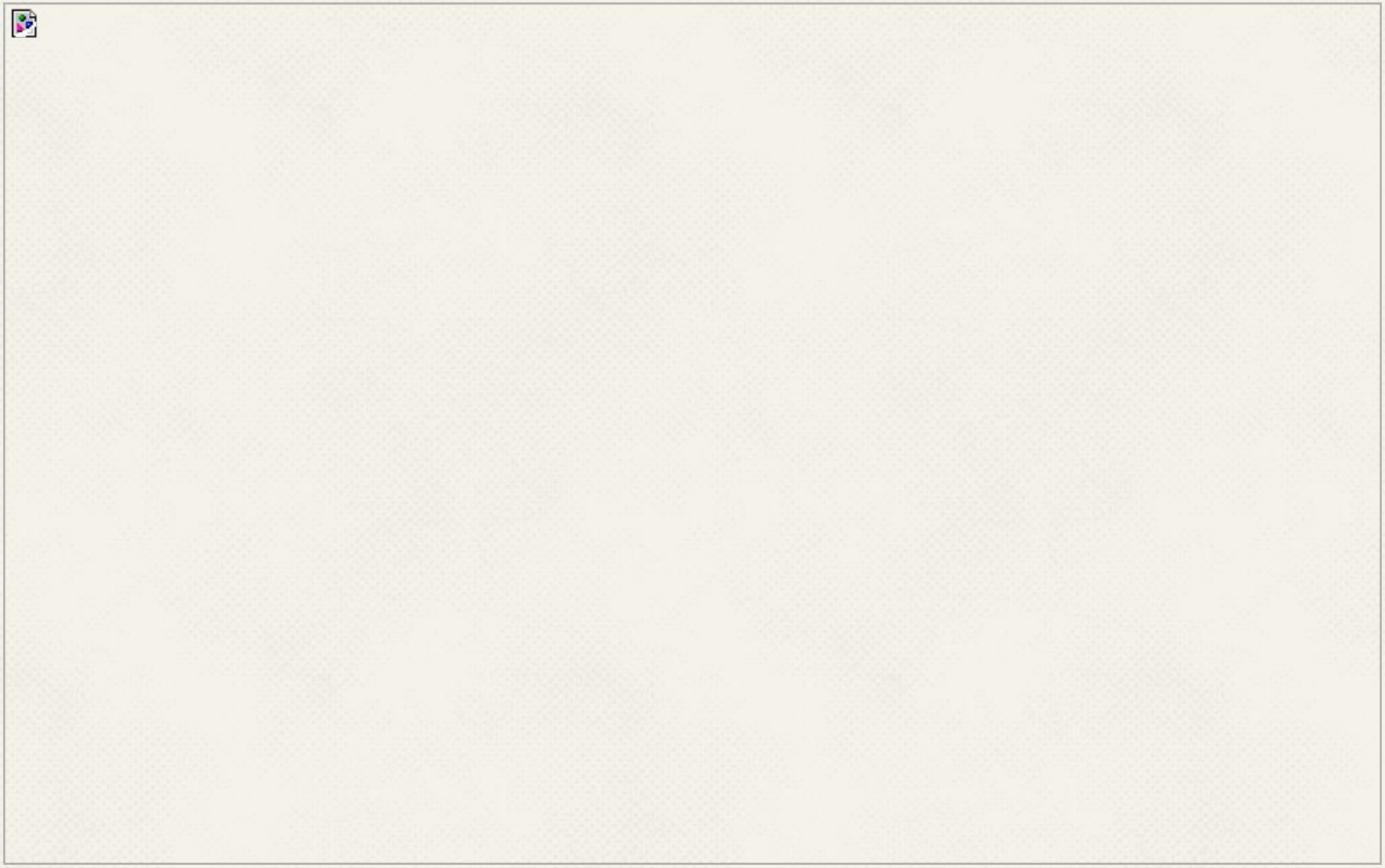
Timothy Byers

- Firmware
- Integration

Allie Kim

- Software
- Graphical User Interface
- Integration

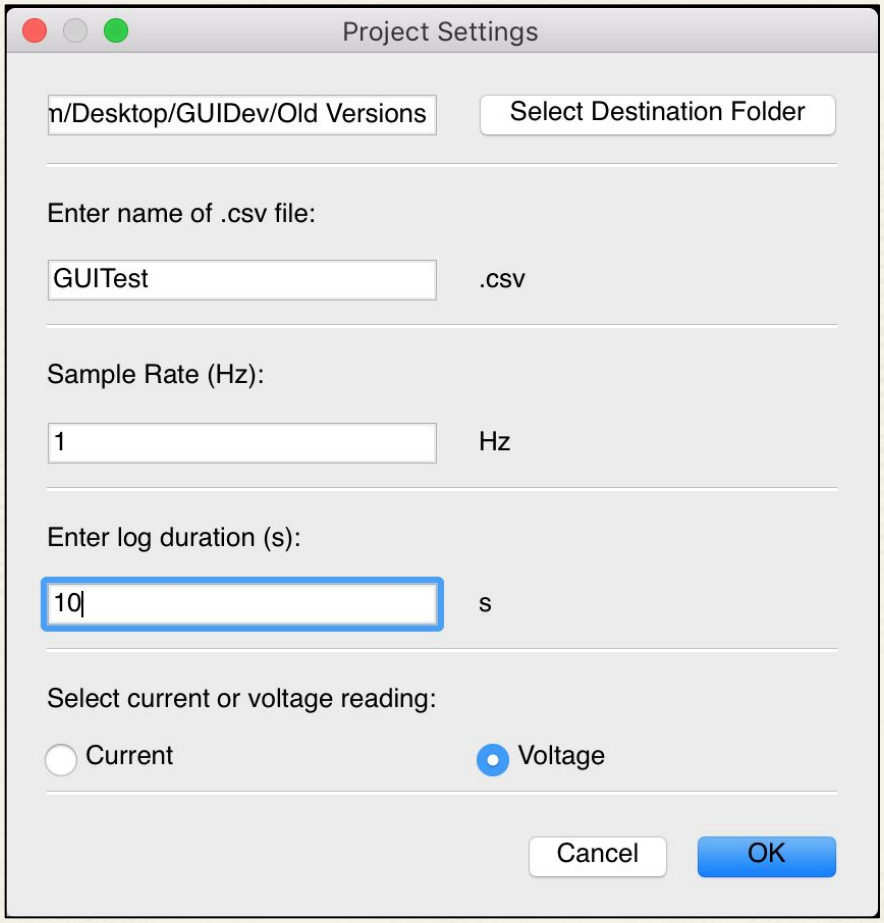
Block Diagram

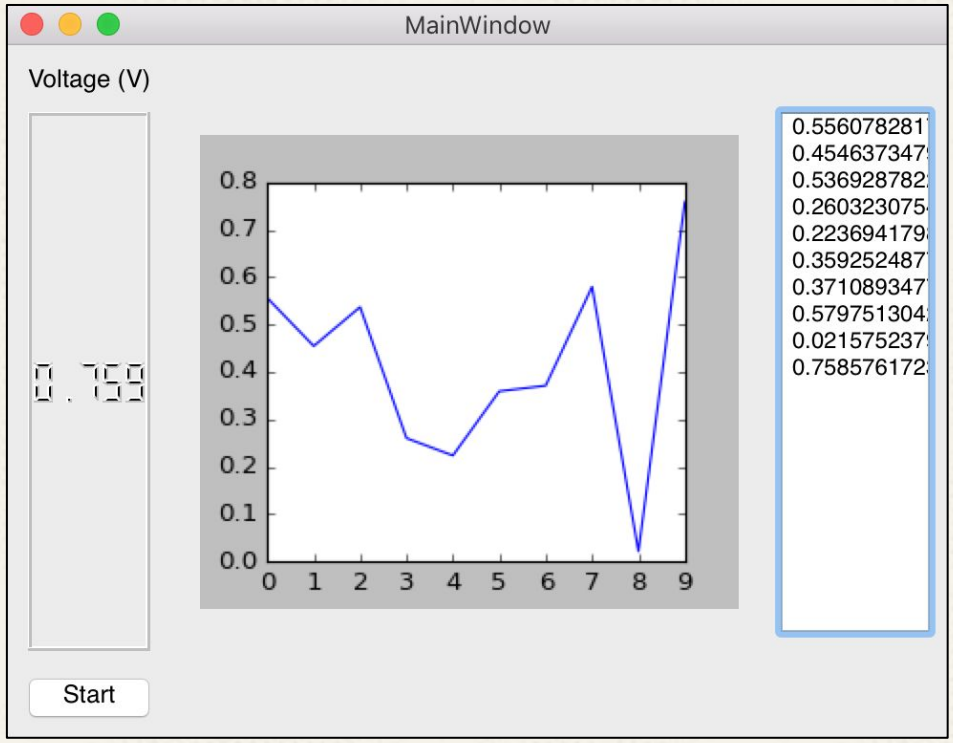


Software

- Python-based GUI
- Libraries used:
  - PyQt/Designer
  - Matplotlib
  - PySerial

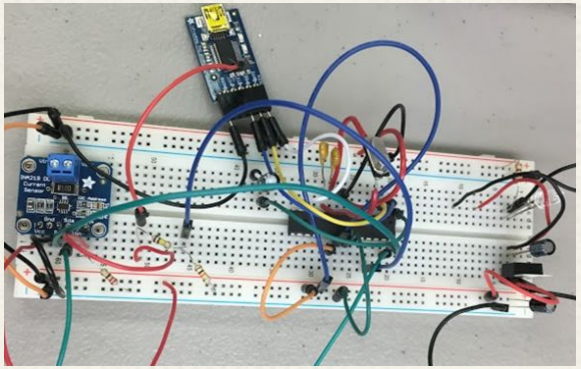
Screenshots





Methodology

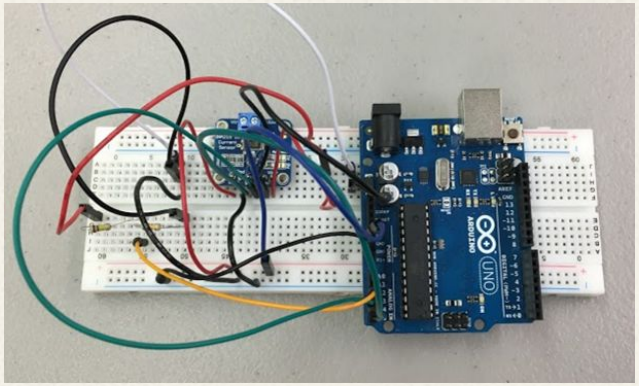
Rapid Prototyping:
the speedy creation of a product idea

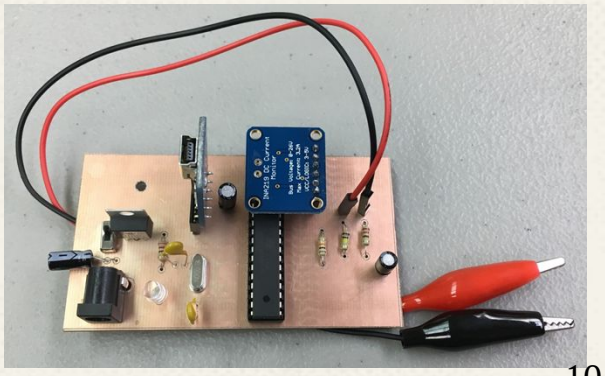


Arduino Circuit

Breadboard Version of Arduino Circuit

Printed Circuit Board





Problems and Solutions

Problems

1. INA219 didn’t provide the right voltage reading
2. Traces on PCB were printed on the top layer/Didn’t want to solder on the top of the board
3. Sending data from Arduino to GUI

Solutions

1. Created a voltage divider in circuit to get the voltage
2. Moved traces to bottom layer in Eagle
3. Simple function to read out from Arduino

Bill of Materials

Part Description	Part Name	Vendor	Product ID/#	Quantity	Unit Cost
Wall Outlet Connector	DC Barrel Power Jack/Connector	Sparkfun	119	1	$1.25
Voltage Regulator	Voltage Regulator - 5V	Sparkfun	107	1	$0.95
Wall Outlet	Wall Adapter Power Supply - 9V DC 650 mA	Sparkfun	298	1	$5.95
ON/OFF Switch	SPDT Slide Switch	Sparkfun	9609	1	$0.75
Socket for Microprocessor	DIP Sockets Solder Tail - 28 - Pin 0.3"	Sparkfun	7942	1	$0.95
Microprocessor	ATMega 328 P - Arduino Bootloader Programmed Chip	Adafruit	123	1	$5.95
USB Cable	USB Mini-B Cable - 6"	Sparkfun	13243	1	$1.95
FTDI	FTDI Friend + extras -v1.0	Adafruit	284	1	$14.75
Current Sensor	INA219 High Side DC Current Sensor Breakout	Adafruit	904	1	$9.95
Cables for Testing	Alligator Clip with Pigtail (4 Pack)	Sparkfun	1319	1	$2.95
Misc. Parts	Clock, capacitors, female headers, resistors, LEDs	Sparkfun	-	1	$5.00
				Total Cost	$50.40

Total Cost: $50.40

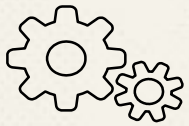
Final Status

- Read accurate values from DUT with 1% error
- Printed circuit board fabricated and working properly
- Communication from CVL to computer
- GUI working independently
- Will be debugging the product within the next week
- Will create a video to demonstrate working product

Remaining Tasks

- Debugging serial communications
- Debugging firmware
- Overall integration and testing

Future Improvements



- Wireless communication between CVL and computer
- Live plotting of data
- Gather and log other parameters from DUT
- Further customization of GUI settings
- Run basic analysis scripts on data sets
- Allow users to tag/comment data
- Power-saving features
- Reduce cost of device

THANKS!

Any questions or suggestions?

Acknowledgements

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- Faculty Advisor: Dr. Anthony Kuh
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