Marionette DAQ

Summary

The Marionette DAQ is a an open source industrial quality data acquisition device designed for the Portland State Aerospace Society. The underlying goal of the project is to provide a DAQ that is:

- **Completely Open Source** (hardware, firmware, and Interface software).
- Provides **more connectivity** than any other device currently on the market.
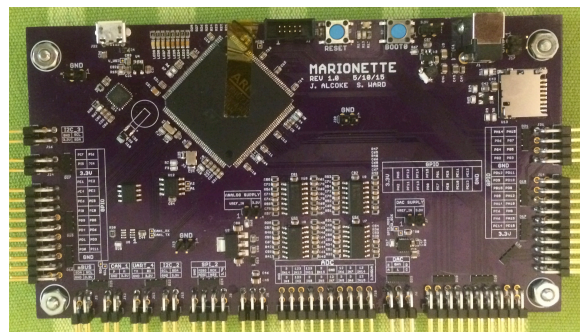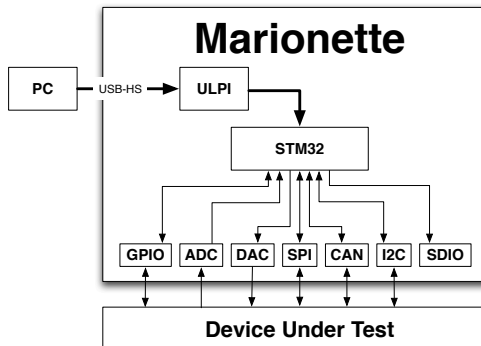- All for an **affordable** (to students) cost.

Problem Statement

Data acquisition (DAQ) systems are critical to any automation or sampling project that needs to be quickly prototyped. Most of the existing DAQ modules are hard to use, aren't cross platform, or have limited performance.

There is a demand to replace the complicated, poorly documented and system restricted devices to a simple, flexible, and easy to use DAQ.

Solution

- Off the shelf 32bit microcontroller with USB 2.0 High Speed.
- Easy to assemble, components can be placed by hand.
- A real time operating system (ChibiOS) with customized drivers and libraries
- Uses the Python scripting language for a fully customizable, cross-platform user interface.

Marionette block diagram: PC → USB-HS → ULPI → STM32 → GPIO, ADC, DAC, SPI, CAN, I2C, SDIO → Device Under Test

DAQ Comparison

Category	DI-149	USB201	LabJack U3-HV	Minilab1008	Marionette	USB202	LabJack U6	OpenDaq	USB1208 FS - Plus
Price	$59.00	$99.00	$114.00	$129.00	$130	$149.00	$299.00	$300	$399.00
USB - HS	N	N	N	N	Y	N	N	N	N
OS - Hardware	N	N	N	N	Y	N	N	N	N
OS - Firmware	N	Y	N	N	Y	Y	N	Y	N
OS - Driver	N	Y	N	N	Y	Y	N	N	N
OS - API	N	Y	Y	N	Y	Y	Y	Y	N
ADC Channels	8	8	16	8	15	8	14	8	8
ADC Bits	10	12	12	12	12	12	16	16	12
DAC Channels	0	0	2	2	5	2	2	1	2
DAC Bits	0	0	12	12	12	12	12	14	12
GPIO	4	8	16	24	60	8	20	6	16
SPI	0	0	1	0	1	0	1	0	0
I2C	0	0	1	0	2	0	1	0	0
CAN	0	0	0	0	1	0	0	0	0
SDIO	0	0	0	0	1	0	0	0	0

Results

- Created three Marionette-v1 custom boards for a cost of $130 ea
- Added CAN network peripheral
- Implemented USB 2.0 High Speed
- Enhanced existing DAC library to interact with an external DAC IC

Contributing Members

Capstone Team:
- Jeff Alcoke, ECE – Project HW Designer
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- Andrew Greenberg
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