

Milestone VI Progress Evaluation



Project Title: Autonomous Multi-Cycle Farming in Space

From CSE [coordinator and project sponsor: Philip Chan, pkc@cs.fit.edu]:

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Clients:

Some potential clients: NASA, SpaceX, Blue Origin, Virgin Galactic.

Current client: Dr. Philip Chan Associate Professor, Computer Engineering and Sciences at Florida Institute of Technology, coordinator and project sponsor.

Progress Matrix

Task Matrix for Milestone 5

#	Task	Progress	Chris	Piero	Todo:
1	Finished Application	90%	90%	10%	Dynamic GUI form
2	Config library	80%	50%	50%	Selection to editor by user
3	Finished reports	50%	20%	80%	Display them
4	User Manual	40%	10%	90%	Introduction, Astronaut, & Developer Sections
5	Poster	100%	100%	0%	Final edits
6	Another hardware demo	50%	100%	0%	Put hw back together

Discussion on Lessons Learned

Task 1

First lesson learned is not to be overly ambitious with project requirements. Put more work into evaluating all the needs and specifics of a given feature before committing to a timeline. Parsing in a YAML file and building a form dynamically is a very difficult project. Taking that form and adding to it to then give that back to the controller is even more difficult. There is probably a

reason why it is not done this way that often. We do not think the GUI makes it much easier to configure as previously thought. The application as a whole works well specifically on manual control, the reports are not finished but should be by the presentation. The manual control is done, the reports need work but that is actually easy to do, the dynamic GUI is still a problem and we may need to just keep it as an input box to edit YAML directly.

Task 2

Being able to configure the growth chamber for multiple crop types is invaluable. The design of this feature is simple, a config file is selected in the config library section then it is loaded into the editor which can then save the file to the directory, too the device or both. Of all the features this one is actually easy to implement. Since the farming chamber was being designed to handle many different seed types this feature needed to be implemented to maintain scalability with the chamber. A set of icons can be used to identify the crop type and there are eighty options to choose from. The user station will allow users to select other images as long as they can be constrained to a specific size for the list of crops.

Task 3

We decided on chart.js to generate reports due to its look and feel. We created database fields that are populated with data on the farming chamber microcontroller and accessed by the application when the user prompts it to do so. The reports will show:

- Cycle Set
- System uptime
- Total Phase uptime
- Actuator phase uptime
- Sensor phase uptime
- Sensor readings

As shown on the beaglebone:

```
amcfdb=# select * from device_metrics;
id | metric_id | uptime | name
-----+-----+-----+-----
1 | 1 | 10.0044 | Light
2 | 1 | 0 | WaterPump
3 | 1 | 1.34812 | HeightSensor
4 | 1 | 16.5502 | MoistureSensor
5 | 2 | 0.00141835 | Light
6 | 2 | 1.01188 | WaterPump
7 | 2 | 0 | HeightSensor
8 | 2 | 0 | MoistureSensor
(8 rows)
```

```
amcfdb=# select * from phase_metrics;
id | cycle_set | phase | phase_runtime | config_name
-----+-----+-----+-----+-----
1 | 0 | 0 | 30.0033 | test_config
2 | 0 | 1 | 1.01267 | test_config
(2 rows)
```

Chart.js is very intuitive and gives the user a lot for a minimal amount of code. We will certainly look at this software again for future projects.

Task 4

The user manual will focus on installing, using, and maintaining the software. It is divided into four primary sections. The first section is for astronauts, the end users, and it focuses on connecting to the growth chamber, manual control, using the configuration editor, and reading metric reports. The second section is for botanists, who will create the initial design of the configuration. This section provides a breakdown of all elements of the configuration file, along with its syntax and semantics. The third section is for computer administrators and provides step-by-step directions on how to set up the growth chamber software along with the user station application. Finally, the fourth section is for developers and contains a description of the functional design of the growth chamber software, along with API documentation. Example configurations and an example of the internal python representation of the configuration file is also provided.

Task 5

There was a lot of confusion on who owned the poster since MEE and CSE operated independently of one another. We tried to work with MEE who designed the poster but our main contact changed their number so we were unable to communicate over text and emails were not being answered. MEE finally sent us their draft and we combined and edited as needed. The poster shows what we have now including a new mechanical design diagram and specific details about the two software properties of the farming system.

Task 6

The hardware demo will primarily be for class presentations due to time constraints in the virtual showcase and the lack of “beauty” the hardware currently has sitting on the floor in a project member's room.

Team Discussion

Notes are given based on interactions between CSE. They do not necessarily reflect the team member's entire contribution.

- Christopher Millsap <cmillsap2013@my.fit.edu>:
 - Primary on hardware interfaces
 - Primary on GUI application
 - Primary on abstract planning
 - Primary on YAML to C# parser
- Giampiero Corsbie <gcorsbie2018@my.fit.edu>:
 - Provided python expertise
 - Primary on internal database metrics
 - Primary on user manual design

- Provided linux expertise

Each member contributed fully. Communication was always immediate and thorough.

Giampiero and Christopher met several times over Spring Break to work on the Growth Chamber and Farming User Station requirements. Both team members managed to get the majority of the system operational before HSDC closed.

Date(s) of meeting(s) with Client during the current milestone 6:

Every two weeks starting 9/13/19

Project Logs			
Action	Date	Time spent in hours	Comments
	4/17/20		

"See Faculty Sponsor Feedback below"

Faculty Sponsor feedback on each task for the current Milestone:

- Fix up application
- Finalize showroom items
 - Finalize poster
 - Ebook page
 - Video
 - Simulation (talking over instead/and of words)
 - Software video integrated with hw
 - Show demo of application
 - user station
 - running of config file - important info only from script
 - different config file specs - for crop types to drive system autonomously
- Finish user manual
- Talk to MEE about adding section in ebook page for our stuff!

Task 1

Put in sliders for values to make constraints

Add segment in demo video that shows the config file format and the changes before and after.

Task 2

Okay. At least 2 config files!

Task 3

Made little progress on reports

Task 4

User manual

1. Astronaut need gui instructions
 - a. Load cf from library
 - b. Edit config file
 - c. Running manual control
 - d. Running reports
2. Add complete config file demo, see all the features
3. Add section in developer section for where program files and data files are
 - a. At the beginning of the section add where the source files can be downloaded?

4. Focus on the four users...

Task 5

Poster, suggest asking for more space for sections on posters. 1/5 20%.

Task 6

Video:

1. Simulation from mee
2. Simulation of hw and sw
 - a. Screen capture for user interface (user station)
 - b. Screen capture for output of important events from config file
3. Demo
 - a. Astronaut editing config file
 - b. Loading config file
4. Demo - lower level cf
 - a. Format of config file
 - b. Changes to the config file after editing

Faculty Sponsor Signature: _____ Date: _____

Faculty Sponsor Evaluation:

1. Faculty Sponsor: detach and return this page to Dr. Chan (HC 322)
2. Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

Christopher Millsap	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Giampiero Corsbie	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

Faculty Sponsor Signature: _____ Date: _____