Milestone Progress Evaluation

Project Title: Autonomous Multi-Cycle Farming in Space

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

Christopher Millsap <cmillsap2013@my.fit.edu>
Giampiero Corsbie <gcorsbie2018@my.fit.edu>

From BIO [coordinator: Drew Palmer, apalmer@fit.edu]:

David Masaitis <dmasaitis2016@my.fit.edu>

From MEE [coordinator: Elisabeth Kames <ekames2011@my.fit.edu>]:

Dominic Allard, dallard2016@my.fit.edu
Courtney Cline, ccline2018@my.fit.edu
Joseph Luya, jluya2016@my.fit.edu
Bryce Johnson, bjohnson2016@my.fit.edu,
Philip Bernhard, pbernhard2015@my.fit.edu,
Timothy Frazier, tfrazier2016@my.fit.edu,
Joshua Calhoun, calhounj2008@my.fit.edu,
Kali Jenson- AEE student, kjenson2015@my.fit.edu,
Chris Mateo- ECE student, cmateo2016@my.fit.edu

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 1

Task	Giampiero	Christopher	To do
1. Choosing microcontroller	Responsible - 50%	Responsible - 50%	none
2. Decide on development OS	Informed[1]	Responsible[2]	Based on sensors and actuators
3. Install and configure VS	Responsible	Responsible	demo
4. Compare and select collaboration tools	Responsible	Informed	none
5. Provide demos of tools	Responsible - 50%	Responsible - 50%	Not done as of 9/29/19
6. Create requirements document	Responsible - 50%	Responsible - 50%	none
7. Create design document	Responsible - 50%	Responsible - 50%	none
8. Create test plan	Responsible - 50%	Responsible - 50%	More defined
9. Define change management process	Responsible - 25%	Responsible - 75%	Verify with MEE

[1] Project member is informed but not yet proficient in said task
[2] Project member is proficient and responsible for said task

10. WBS	Responsible - 50%	Responsible - 50%	none

Discussion

Task 1 - Choosing a microcontroller:

Both CSE team members were responsible for this task equally. We found that identifying microcontroller specs for the project to be easy but narrowing down a microcontroller to be more difficult. We decided between Arduino, Raspberry Pi 3 or 4 models, Raspberry Pi 0, Beaglebone, and Rabbit before ultimately deciding on using BeagleBone Black/Blue for the project. The idea behind this choice was that this board offers much more support for a robot which is essentially what the AMCFD is. We hope to create two tracks for development one with the inexpensive linux based BeagleBone and one with a custom spun board that is entirely optimized for the AMCFD.

Task 2 - Decide on development OS:

Deciding on a development os was trivial as we can identify the needed os at microcontroller choice. So far we have decided on developing in Linux since that is what the board runs on. There will be times when Windows may be needed, it all depends on the tools required for sensor and actuator development.

Task 3 - Install and configure VS:

VS is installed and configured with a .NET application for demo. No difficulties present in this task.

Task 4 - Compare and select collaboration tools:

Beginning in the SDLC we went over many collaboration tool ideas. While we discussed using Smartsheet and others the final set contains GitHub, Slack, GoogleDrive, and texting. The biggest issue present here is communication with the vast multidisciplinary team where some students do not communicate opinions or schedules effectively even when directions are spelled out. The tools, however, have been chosen and are effective for the CSE members.

Task 5 - Provide demos of tools:

Tools are ready for presentation at anytime.

Task 6 - Create requirements document:

Creating the requirements document was not a small task. We met with our client several times and met between ourselves on numerous occasions. Deciding on the structure of the software was the most

difficult problem so far, but designing the syntax of the configuration file may be more of a challenge in the future. We feel we have adequately defined the requirements necessary at this stage in the SDLC.

Task 7 - Create design document:

The design document will cover the various modules that monitor and control the system, along with detail that describes how the actuators and sensors interact with each other. Defining the lighting array in terms of actuators was difficult on opinions but it makes sense as to the nature of the lighting system in relation to actuator behavior. Configuring and running the AMCFD needed to be represented in a diagram as to work out the control flow for the defined subsystems with the client.

Task 8 - Create test plan:

Professional recommendation, in the software development domain, dictates that defining tests early on in the SDLC is necessary for developing a good quality product. We did this by specifying an approach along with, pass/fail criteria, environment, deliverables, and simulation structure for testing our software. The only difficulties present in this task was researching to verify our plan met professional standards. NASA complies with many of the same metrics as the private sector.

Task 9 - Define change management process:

The change management process on our project will be handled on Github and client/customer reviews. We inherit all hardware change processes through MEE. After testing and passing the software can enter a baseline state.

Task 10 - WBS:

Each of the above tasks had smaller subtasks that needed to be defined so that we could adequately assign work. This was done through a WBS and this file can be found on our Google Drive and may be added to the project site if requested by the client/sponsor.

Team Discussion

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

- Christopher Millsap <cmillsap2013@my.fit.edu>:
    - Has provided project management experience from work to this project and led meetings with entire interdisciplinary team. Has met all action items and tasks from milestone 1.
- Giampiero Corsbie <gcorsbie2018@my.fit.edu>:
    - Provided exceptional quality of work to project and always met action items and tasks from milestone 1.

----From BIO [coordinator: Drew Palmer, apalmer@fit.edu]:

- David Masaitis <dmasaitis2016@my.fit.edu>:
    - Subject matter expert on biology and provided invaluable resources from NASA and beaglebone board.

----From MEE [coordinator: Elisabeth Kames <ekames2011@my.fit.edu>]:

- Dominic Allard, dallard2016@my.fit.edu
    - Provided MEE experience and ideas.
- Courtney Cline, ccline2018@my.fit.edu
    - Has provided project management experience from work to this project and led meetings with entire interdisciplinary team. Has met all action items and provided ample research journals pertaining to project.
- Joseph Luya, jluya2016@my.fit.edu
    - Has not been present.
- Bryce Johnson, bjohnson2016@my.fit.edu,
- Philip Bernhard, pbernhard2015@my.fit.edu,
- Timothy Frazier, tfrazier2016@my.fit.edu,
    - Met action items from interdisciplinary meetings
- Joshua Calhoun, calhounj2008@my.fit.edu,
    - Provided scribe abilities via meeting minutes and MEE design ideas
- Kali Jenson- AEE student, kjenson2015@my.fit.edu,
    - MEE designs/drawings and ideas
- Chris Mateo- ECE student, cmateo2016@my.fit.edu
    - Met action items from interdisciplinary meetings

Plans for Next Milestone

Task	Giampiero	Christopher
Create state diagram and design for the system	Responsible - 50%	Responsible - 50%
Implement inheritable high-level interfaces/classes for sensor communication	Responsible - 50%	Responsible - 50%
Create simulated farm for testing	Responsible - 50% Test	Responsible - 50% Test/Demo
Create baselining requirements and process	Responsible - 25%	Responsible - 75%

Task 1 - Create state diagram and design for the system:

Currently we have an SSD but we will want to be more detailed further into the SDLC. The flushed out state diagram will help us in testing and verification along with filters for requirements traceability. (May not need)

Task 2 - Implement inheritable high-level interfaces/classes for sensor communication:

Per our discussions with our faculty sponsor/client we want to be able to have abstract classes to run various sensors with little adjustment. These classes should represent the basic functionality of the devices they interface to.

Task 3 - Create simulated farm for testing:

The simulation will show behaviour of the system over time as expected along with displaying our exception handling. This will be further developed for showcase.

Task 4 - Create baselining requirements and process:

As we get closer to release we need to have clear requirements regarding what is considered a baseline of our software including the verified tests it passed. This will not be as important during the senior design phase but will be necessary if the project gets adopted by NASA.

Task 5 - Config file simulation

Added this task 9/30/19 to create a configuration file for at least one phase in system and run in simulation

Date(s) of meeting(s) with Client during the current milestone 1:

Every two weeks starting 9/13/19

Project Logs			
Action	Date	Time spent in hours	Comments
Met with Dr Chan about plan. Got plan approved	9/9/19	0.5	Updated: Timers vs scheduling, gas detection, growth detection and light, hardware priority, milestone 3 needing 1 actuator and 1 sensor with simulated data for

			simulated cycles. Borrow from senior design center
Met with Dr Chan about plan	9/13/19	1.5	Notes on DM and how the system should be structured
Met with Dr Chan about design and SRD	9/27/19	1.5	Changes: @ 1.1.3.4.1 change react/observe to observe/react Change scheduler to task manager and decision maker to driver For design diagram set on/off edges to link sensor to task manager instead of driver Send event to driver Add config file syntax

"See Faculty Sponsor Feedback below"

Faculty Sponsor feedback on each task for the current Milestone:

- Task 1 - Choosing a microcontroller:

- Task 2 - Decide on development OS:

- Task 3 - Install and configure VS:

- Task 4 - Compare and select collaboration tools:

- Task 5 - Provide demos of tools:

  Demo technical tools for building the system. Not collaboration items.

- Task 6 - Create requirements document:

  Consistent vocab.

- Task 7 - Create design document:

  Consider potentially still using XML as discussed.

- Task 8 - Create test plan:

- Task 9 - Define change management process:

- Task 10 - WBS:

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: _____