



Michigan Tech

UN5390: Scientific Computing I

Fall 2016

Project Status Report ($1\% \times 5$ weeks)

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Using fourth order Runge-Kutta adaptive time step method to simulate the celestial free return trajectory followed by a spacecraft in the earth-moon gravitational field

Week #10

1. Did you meet with your advisor(s) to discuss research this week?

Yes. I did meet Dr.Gowtham from 11 to 11:10 AM ,November 2.

2. What did you do this week (past Saturday through this Friday)?

Discussed about the potential project ideas with Dr.Gowtham. Chose the “Apollo 16 on HPC” as my term project. Studied about the gravity slingshot technique. Working on the workflow as expected in the project Description.

3. What are you planning on doing next week (this Saturday through next Friday)?

To work on the project workflow and getting the equations set up and tested starting from Newton’s law of Gravitation.

4. What were (are) the difficulties/obstacles you faced (facing)?

The main difficulty is coming up with a good workflow and setting up the equations as of now.

5. What is the approximate percentage progress?

5%

Week #11

1. Did you meet with your advisor(s) to discuss research this week?

Yes. I did meet with Dr.Gowtham at 10:10 AM Wed, Nov 9 and 7:30 AM Thur, Nov 10 and was briefed and handed information on setting up the HPC cluster and have been in touch with Dr.Gowtham via email about the same.

2. What did you do this week (past Saturday through this Friday)?

Worked on setting up the HPC cluster using the detailed description from Dr.Gowtham and also learnt how to run MATLAB remotely on parallel processors in-class discussions, Scientific computing 1, Thur, Nov 10 that will be used to complete the project.

3. What are you planning on doing next week (this Saturday through next Friday)?

Will try to implement the algorithm on MATLAB and to implement the algorithm parallelly and set up workflow for running it on the cluster.

4. What were (are) the difficulties/obstacles you faced (facing)?

Installing the nodes of the cluster took about a day although successful and some nodes gave trouble booting from the network but were resolved and installed.

5. What is the approximate percentage progress?

25%.

Week #12

1. Did you meet with your advisor(s) to discuss research this week?

No. Dr.Gowtham is not available on campus until next week.

2. What did you do this week (past Saturday through this Friday)?

Worked on the equations that pave way to implement the code on MATLAB. Studied Range-Kutta(RK4) technique to solve the problem.

3. What are you planning on doing next week (this Saturday through next Friday)?

Making sure the equations are feasible to code onto MATLAB. Implement code on MATLAB locally and remotely.

4. What were (are) the difficulties/obstacles you faced (facing)?

Thorough understanding of the RK4 technique and how the project can be implemented using it.

5. What is the approximate percentage progress?

35%

Week #13

1. Did you meet with your advisor(s) to discuss research this week?

Yes. I did meet Dr.Gowtham on Nov 30, from 9:00 to 9:30 AM and Dr.Gowtham installed MATLAB on the cluster which is being used to run the Project.

2. What did you do this week (past Saturday through this Friday)?

Worked rigourously on solving the problem on a 2D plane and coded it on MATLAB. The MATLAB code was run on the Cluster and the matrix generated for different velocities.

3. What are you planning on doing next week (this Saturday through next Friday)?

Get the results from the simulation and report the work to Dr.Gowtham.

4. What were (are) the difficulties/obstacles you faced (facing)?

`qsub` is starting with at Error state `Eqw`. however, this shouldn't pose a problem as MATLAB was successfully run on the cluster using 4 `workers` successfully and produced results. We will resolve the issue when we meet Dr.Gowtham next week.

5. What is the approximate percentage progress?

80%

Week #14

1. Did you meet with your advisor(s) to discuss research this week?

Yes. I did meet Dr.Gowtham on 6, 7, Dec, 2016.

2. What did you do this week (past Saturday through this Friday)?

Worked on code `apollo_mission.m` and ran it on the cluster and produced the results in 367.158 secs.

3. What are you planning on doing next week (this Saturday through next Friday)?

The project is done and the data is stored in `Positions_and_velocities.dat` and the visualisation is in the file `Apollo_mission.avi`.

4. What were (are) the difficulties/obstacles you faced (facing)?

The main difficulty was running the jobs on all the nodes and `qsub` starting in `Eqw` due to the misplacement of the user directories which was resolved when we met Dr.Gowtham.

5. What is the approximate percentage progress?

100%.