Week 1 Report

Sam Frederick

Tuesday

- Created, revised, and completed thesis contract and proposal (throughout week)
- Set up GitHub account
  - Followed "Hello World" tutorial https://guides.github.com/activities/hello-world/
    - Created a repository
    - Learned about, created a branch 'readme-edits'
    - Made edits to a README file
    - Submitted a pull request to merge 'readme-edits' with 'master' branch, merged branches

Tuesday

- "GitHub Crash Course for Beginners"
  https://www.youtube.com/watch?v=SWYqp7iY_Tc&frags=pl%2Cwn
  - Basic Commands
    - `git init`
    - `git add`
    - `git status`
    - `git commit`
    - `git push`
    - `git pull`
    - `git clone`

Wednesday

- Created local repository on 'research-computer-1' to test functionality of git, commands for pushing to remote repository on GitHub.
  - Created repository 'research-computer-1-repository-test'
  - Created text.txt, practiced edits and commits.
  - Created new branch 'mybranch' with new file 'moretext.txt'.
  - Merged 'mybranch' with 'master'
  - Used remote commands, pushed 'master' to GitHub.
  - Added README.md locally then added, committed, pushed to remote repository.
    - Required to log in each time I pushed something to GitHub, would like to do just once.

Wednesday

- Installed PLUTO on 'rc1'
  - User variable `$PLUTO_DIR` placed in .bashrc
  - Followed tutorial shock-tube problem to verify the installation was working properly.
    - Installed Gnuplot as temporary tool for visualization.
  - Also ran through Orszag-Tang example
    - Common MHD computation test, difficult for numerical schemes without divergence cleaning to perform (preservation of the $\nabla \cdot B = 0$ condition).
      - https://nrg.iag.uni-stuttgart.de/research/magnetohydrodynamics/orszag-tang-vortex

Thursday / Friday

- ○ Installed VisIt on 'rc1'
  - ■ Difficulties with launching GUI, realized user must be in 'visit' directory and enter bin/visit into command line to launch program.
  - ■ Created a permanent path for visit directory `$VISIT_DIR` in .bashrc
  - ■ <mark>Updates to bashrc to GitHub?</mark>
  - ■ Alias created to combine terminal commands for cd to $VISIT_DIR and entering bin/visit. Typing 'visit' will perform these commands to launch the software.
- ○ Alias also created for launching PLUTO Python config UI:
  - ■ `>> python $PLUTO_DIR/setup.py` reduced to `>> plutosetup`
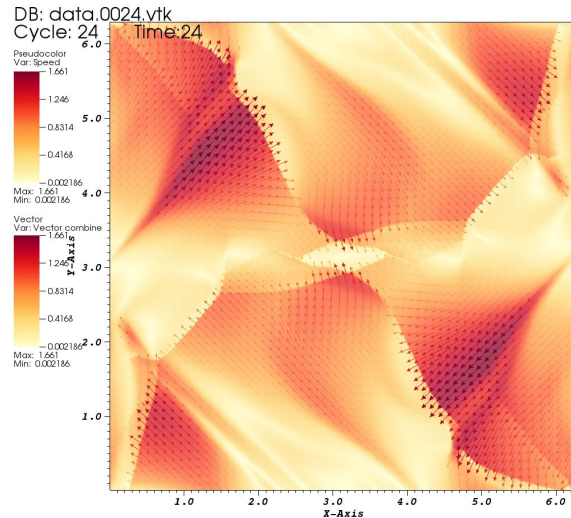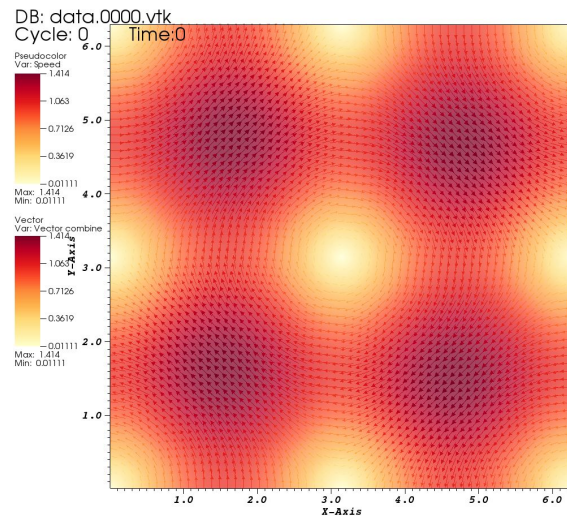 - ■ https://www.digitalocean.com/community/tutorials/an-introduction-to-useful-bash-aliases-and-functions

Saturday


```
38    [Static Grid Output]
39
40    uservar      0
41    dbl         -1.0   -1    single_file
42    flt         -1.0   -1    single_file
43    vtk          0.1   -1    single_file
44    tab         -1.0   -1
45    ppm         -1.0   -1
46    png         -1.0   -1
47    log          1
48    analysis    -1.0   -1
```

- Read chapters 1-4 in PLUTO User Guide
- Updated 'rc1' to Ubuntu 18.04 (Nothing broke, yay!)
  - ==Second screen still flickers==
- Imported data from Orszag-Tang tutorial into VisIt.
  - .dbl filetype not recognized, changed to .vtk in pluto.ini (same format that Kuhn used).
    - Worked in pluto.ini file to understand how parameter settings affect output.
      - Re-ran simulation. Simulation time interval set to 4.0 seconds, .vtk filetype chosen, data exported to .vtk file every 0.1 seconds of the simulation, single_file type chosen which keeps all data parameters in the same file (easier to work with in VisIt).
      - Specifying output directory doesn't seem to be working, so `./pluto` just dumps the data into the `tests/MHD/Orszag_Tang` file
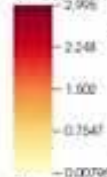
Saturday

- Created visualizations for density and pressure in VisIt making use of the 40 (4 seconds/0.1 seconds/export) data points, made nice animations. Had difficulty with exporting animations.
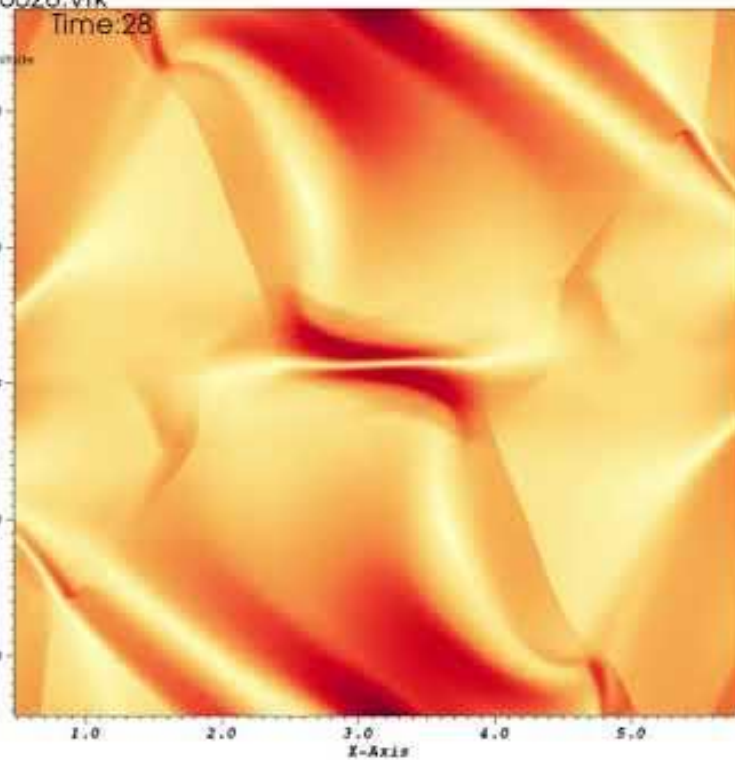
Saturday

- Set Atom as default editor.
- Edit 'visit' alias to add '`; cd -`' so that terminal will remain in prior working dir?
- Sound does not work for 'rc1'

https://www.space.com/30263-paul-sutter-on-why-magnetars-are-scary.html

Goals for Next Week

- Steps to Replicating Kuhn's Results
  - Start with creating new init.c (sets initial fluid configurations, see PLUTO user manual Chapter 5)
    - Set initial conditions for density, pressure
      - Start out with basic model (uniform density, uniform pressure)
      - Once basic models work, use n = 1 analytical solution for Lane-Emden equation to build more representative model.
      - Solving the Poisson equation for gravitational potential will also need to be included so that the model does not evaporate (Body Forces; User manual S. 5.4)
  - Learn how to code in C!

If these goals are achieved, modeling the magnetic field interior to the magnetar would be the next step in fully replicating Kuhn's computational model.