

## Agenda for OpenWorm meeting

April 28th, 2014

**Attending:** Stephen Larson, Padraig Gleeson, Jim Hokanson, Matteo Cantarelli, Giovanni Idili, Michael Currie, Andrey Palyanov, Tom Portegys, Rayner Lucas, Matt Olson, Johannes Rieke, Mark Watts

- **Updates**

- Welcome Johannes and Mark!
- New hangout strategy
- Kickstarter is Launched
- [Reddit AMA](#)
- Tom / Padraig cross over
- Jim / Michael / Matteo cross over
- Waffle.io
- Release 6
  - [Neuromechanical modeling with Sibernetic](#)
    - Sibernetic receives muscle activations from 302 neurons (?)
    - Sibernetic sends sensory signals to 302 neurons (Andrey, Margarita)
    - [Sibernetic outputs to format that can be run through the movement validation pipeline](#) (?)
    - Improve Sibernetic performance (Chris, Mike)
  - [Geppetto simulation engine](#)
    - Worm body model from Sibernetic integrated into Geppetto (Sergey, Matteo)
    - Running network of 302 single compartment neurons in Geppetto (Matteo)
  - [Movement validation](#)
    - Output from worm body can be compared to WormBehavior database (Jim, Michael)
    - Motif analysis (Balazs)
  - [Optimization engine](#)
    - Fitness function (behavior classifier) for worm movement created from WormBehavior database (Jim, Michael)
  - [Data collection and representation](#)
    - Build data to model pipeline via PyOpenWorm (Stephen, Padraig)
      - Add ion channels to nervous system model (Stephen, Vahid)
      - Add synapses to nervous system model (Stephen)
      - Add references to nervous system model (Stephen)
    - [NeuroML model updates](#) -- upgrade to top level?

- Full scale model (Padraig)
  - Simplified model - point neurons (Padraig)
- [Community outreach](#) (outside of issues)
  - Perspectives article (Balazs, Jim, Stephen)
  - SPH paper (Andrey, Sergey, Mike, Stephen)
  - Outreach to biologists (Stephen, Padraig, Giovanni)
  - Fundraise (Giovanni, Matteo, Stephen, Padraig, Balazs)
- **Topics**
  - **Padraig**
    - A bit more work on c302 - <https://github.com/openworm/CElegansNeuroML/tree/master/CElegans/pythonScripts/c302>
      - Set of python scripts for making LEMS / NeuroML2
      - Could also be used for the replay project.....
      - Still working on getting stable
    - Working on API for OSB: [https://github.com/OpenSourceBrain/OSB\\_API](https://github.com/OpenSourceBrain/OSB_API)
    - Paper on libNeuroML/PyLEMS in Frontiers, mentioning OpenWorm - out soon
  - **Matteo:**
    - Geppetto 0.1.2 released
      - Live deployment available [here](#)
      - <https://github.com/openworm/org.geppetto/releases>
      - Replay branch merged into development
      - Added simulator to read the recordings generated from [Python project](#)
      - Improved error handling (exceptions and errors on the backend will surface)
      - Tutorial added
      - Popup widget added
    - Waffle.io synced across all Geppetto repositories <https://waffle.io/openworm/org.geppetto>
    - Adding TSL (formerly SSL) support to allow for secure connection
    - Setting up development instance for testing purposes
    - Will work with Johannes
  - **Sergey**
    - Sergey working on membranes porting most tests now passing
    - Exporting of membrane model to Collada now working
  - **Matt**
    - Started working on plot2d widget which uses an alternative library
  - **Giovanni:**
    - **Kickstarter**
      - Launched (Launch event)
      - Social media PR

- Translations to [Italian](#) / [Russian](#) / [Spanish](#) / [Portuguese](#)
- Website updates / Kickstarter updates
- 21% funded in the first week (>\$25K)
- **Michael C.:**
  - Test (Turing) section suggestions, including new diagram, sent to Balazs last week. He used some but not all of my suggestions for the latest version of the paper.
  - With this done, continuing work on the movement validation repo this week
- **Jim:**
  - Loading features from disk (from MRC database) for comparison to computed features (from worm skeleton/contour over time)
- **Rayner:**
  - Has created a [quickstart bundle for NeuroConstruct](#)
- **Tom:**
  - Supercomputer time!
- **Balazs:**
  - (Update sent in writing to [Core Team Google Group](#))
  - Finished updating the perspective paper for what I really hope is the final version. This last round of updates was based on Michael's suggestions and feedback from Pdraig's colleagues.
    - Updated the DropBox documents, but the final PDF is also attached to this email. If you have the time please read it.
    - There is one minor tweak: Figure 2 will get a significant visual boost, but I could not finish it today. I am working on it in Inkscape that is a new software to me and find it incredibly annoying and difficult. I hope to finish the new figure tomorrow.
    - How to proceed? I propose is that unless anyone has major objection I will submit it on Thursday with the new Figure. Small changes and tweaks are welcomed till that. I have Wednesday afternoon free, so if anyone has any major concerns email me and we can set up a meeting.
  - The other item is that I will soon have the raw videos of the *C. elegans* behavioural database and start extract worm behavioural motifs.
    - Unfortunately cannot use the YouTube videos because they are annotated with the annoying coloured contours that make it difficult to run my code on it.
    - My motif extraction pipeline is running and started to write a paper about it, although there are many details to be figured out.
    - My PhD is on larval Drosophila, but in the paper I will contrast those beasts' behaviour with that of the worm to make it more interesting.

## From last time:

### ○ Andrey:

- Measuring internal pressure of Sibernetic and comparing to real worm and found our internal pressure is several orders of magnitude less. Trying to understand why and what to fix.  
<https://github.com/openworm/Smoothed-Particle-Hydrodynamics/issues/25>
- Working on [researching the muscle fiber properties and building it into the simulation](#)
- Implementing the leapfrog integration method to improve precision of Sibernetic
- [Best hardware configuration](#) for purchase?
- Time to describe current progress in a paper
- Team in Novosibirsk has grown -- [working on sensory system](#)
- Ways of making simpler worm body representation for faster calculations
- Describe all the physical parameters we use in simulation. Divide them into 2 groups - one will include such as gravity, distances, velocities, densities etc (which are the same as in real world and do not depend on simulation resolution) and another group, including parameters like viscosity, surface tension coefficient, elastic matter springs rigidity constant etc (which need to be tuned to keep simulation looking realistic when we change its resolution(particle size)). Plan to pay attention to handling of second group of parameters.
- Has been able to run the new Sibernetic code in Windows

### ○ Chris:

- Sibernetic performance issues
- Learning about SPH while doing it
- Submitted a pull request last night for integration
- 2 FPS -> 2.7 FPS improvement so far and there is more room for improvement
- Code is very sensitive to the platform it is run on
- Biggest gains will require major restructuring

### ○ Jim:

- Story so far
  - Received analyzed [videos of worms](#) from [Schafer lab at MRC](#)
  - Provides examples of what real worms do
  - Do similar analysis on simulated worms
  - Ultimately compare the two
- Efforts that have been taken
  - Porting analysis code that has been written for purposes of analysis on simulated worms
  - [Clean up Matlab codebase](#) -- validated that the code works.

- [Port functions necessary into Python](#)
- Obtained analysis of video data that have pulled out features about worms
- Analysis of single worms crawling on a 'lawn' -- not being perturbed
- Data and code (Matlab) have been provided by the Shafer lab
- Working with Michael Currie to translate key functions into Python
- Target is in a month to be able to compare simulated behavior to real worm behavior
- Ion Channels & Database work -- talking with Shreejoy Tripathy
- **Sergey:**
  - Last two week a I mostly work on Geppetto physic test and sync with Sibernet, as you know I finished with tests and it shows good result also I' finishing with preparation to synchronization. Also I've worked on generator a bit and some features for Sibernet.