

Thesis Report 12 : 18 May - 25 May

Goals

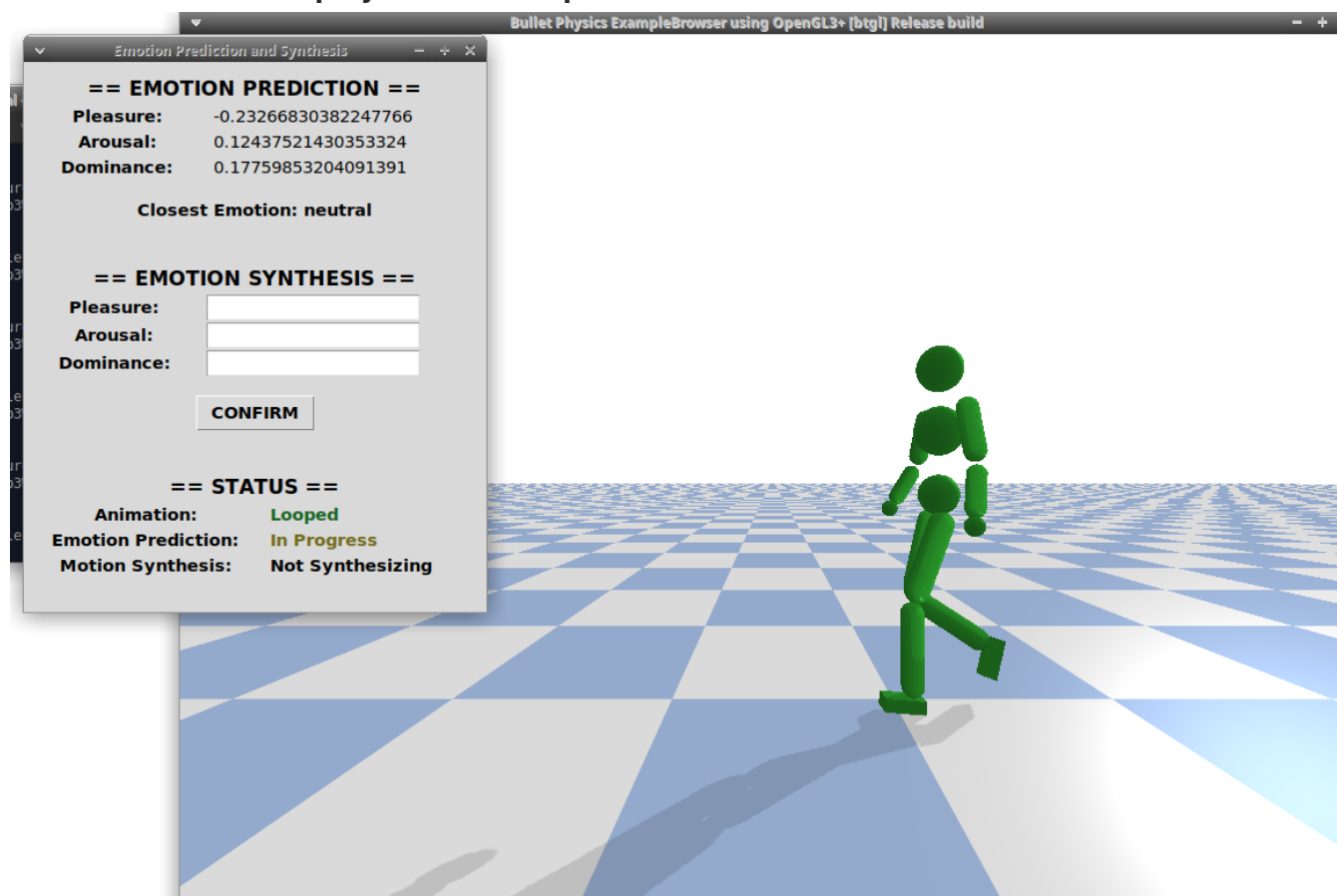
- Create GUI ☒
- Implement Inverse Kinematics ☒
- Finalize project loop ☐
- Find a good conference to attempt to publish on ☐

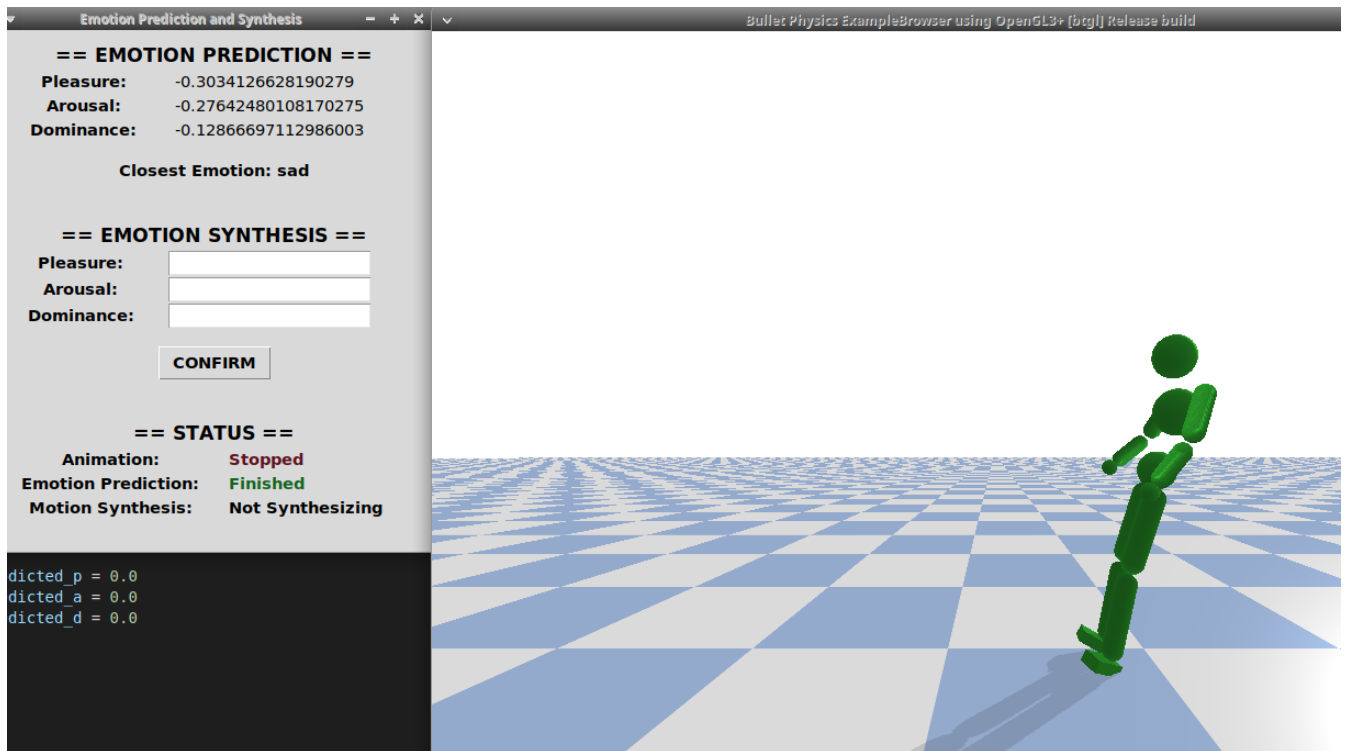
Last Week Leftovers:

None

Done

- Created a GUI to display the current predicted emotional coordinates





- **Implemented Inverse Kinematics to get the joint rotations given the new synthesized positions for the hands, head and so on**
 - Came across a bunch of issues
 - Basically, PyBullet (the engine we're using) already has a `CalculateInverseKinematics` function, however, the documentation is not explicit and I spent a lot of time trying to figure out how it worked and it was that it returned
 - Then, for some reason, the computed rotations weren't being calculated correctly - I would try to have it so an arm would be raised, and the returning rotations would change nothing
 - Realized the reason for this is because DeepMimic (SpacetimeBounds) uses a Humanoid.urdf composed of **spherical joints** which are incompatible with the `CalculateInverseKinematics`
 - Spent several days trying to make `CalculateInverseKinematics` work
 - Tried using other InverseKinematics solvers, but none were compatible with our body
 - Luckily, I found out that someone had created a copy of our Humanoid Body using **revolute joints** - <https://github.com/xbpeng/DeepMimic/issues/151>
 - Using this body I could actually have the `CalculateInverseKinematics` function working
 - There were other problems - Our Humanoid is in the XYZ coordinate system (Y meaning "up") and this one was on the XZY axis (Z meaning "up"), so I had to rotate the entire body's base
 - **So now what we do is, we first pass our current rotations from our deepmimic model to this IK compatible one** to make it so both display the same motion. Then we use Inverse Kinematics to compute the changes in rotations necessary for our desired

positions, using our IK compatible body. Then we pass these rotations back to our main body and apply them

- This works, but there are still some small issues which I've got to figure out when getting the rotations back from the IK body to the main one

- **Researched some Conferences:**

- Looked at a bunch of conferences (such as ACM SIGGRAPH/Eurographics Symposium on Computer Animation and IEEE/ACM International Symposium on Mixed and Augmented Reality but none seemed to be accepting submissions. All deadlines were between january and the end of march/start of may

Left Undone

- Still need to integrate InverseKinematics solver with the rest of the project (get new positions from motion synthesis, and pass them to the solver)
- Still need to find a conference

Problems

Notes

Thoughts

Struggled a lot this week. Quite a lot. I thought that, after having our coefficients and our motion synthesis working, integrating it would be a breeze. However, I hit a major roadblock with the Inverse Kinematics. From thursday to tuesday I worked on nothing else and kept facing new problems each day. First I couldn't work around the sphere joints, then I couldn't apply the DOF array returned by the `calculateInverseKinematics` function, then I couldn't pass the position from our base model to the IK-compatible one, and then I couldn't pass the computed rotations back from the IK-compatible model to our base.

I managed to figure out those issues and do have a working inverse kinematics now, which is nice. But I was seriously stressed throughout the week. I realized that without this portion of the project, there wouldn't be much of a project at all, so when stuff wasn't working I got a bit nervous. I started thinking of alternatives, looking at other IK solvers, thinking of implementing my own, generating rotations directly from our coefficients rather than positions, even thinking about foregoing our motion learning system so that I could re implement our mocap visualization in Unity and just using that instead. But with enough dedication and some new grey hairs I managed to work through our problems. Although this did delay me quite substantially and made it so I couldn't really produce much more work this week.

I also looked at some conferences on <http://portal.core.edu.au/conf-ranks/?search=&by=all&source=CORE2021&sort=arank&page=1> but I couldn't find any that had a publishing date past may unfortunately.

Work Hours

- Worked everyday except Saturday from about 11am to 8pm