Thesis Report 1 : 16 February - 23 February

Goals

- Perform a Spacetime Bounds training from start to end ✅
- Learn more about Spacetime Bounds functioning ✅
- Learn more about Spacetime Bounds training commands (resume trainings and stuff) ✅
- Install stuff on remote server ❌
- Download and try out Dance Emotion data ✅

Last Week Leftovers:

None

Done

- Created a file explaining the core functioning of Spacetime Bounds run_model and train_model
- Learned how to properly start/stop/resume Spacetime Bounds training
- Accessed remote server
- Performed a training. Stopped it midway. Resumed it, and saw the results
- Downloaded stuff into remote server (Git project and some of the requirements)
- Downloaded some mocaps from the Dance Emotion Data:
  - Labels are strings (sad, happy, etc)
  - Format (bvh) can't be directly imported into DeepMimic/Spacetime bounds!!!
- Found more emotional mocap : https://www.nature.com/articles/s41597-020-00635-7 ; https://motion.hacettepe.edu.tr/?c=locomotion#
- CMU mocap data also can't be directly used with DeepMimic/Spacetime bounds
- ‼️Found a library that helps convert BVH files into a format that can be used with DeepMimic!
- ‼️ **Created scripts/settings files to convert both CMU and DanceEmotion bvh data into usable mocap data!**
- ‼️ **Created a script that allows me to extract the body's link data (e.g hands positions, velocities and orientations) on a model being controlled by a policy**
- ‼️ **Started figuring out how to extract LMA features from model running**
  - Can be done in two ways (Leaning more towards the first):

a. Run_Model has a handy --record tag that outputs a DeepMimic mocap file each time the animation loops (although in reality what I probably need/want is the Link data to convert into LMA features, but the rest of the idea is the same). So what I can do, is wait for the animation to reach a looping point. Use that file to get all the necessary data to create the LMA features, and use that. WIth this, model training will be done using the Deepmimic mocap data

   - **PROS**:
     - Really easy to extract data ;
     - Allows me to look at entire animation before doing changes, which can lead to a more consistent motion ;
     - I can get a list of changes to be applied to each Keyframe (i.e every 5 or so frames) and apply them effective-immediately (i.e since I'm looking at the entire animation data I get a list of keyframe changes for the entire animations and just apply them sequentially at their corresponding timings) ;
     - Allows me to transition back to the baseline movement for X frames before transitioning into a new emotion, possibly leading to a better emotion-emotion transition
   - **CONS**:
     - I need to let the animation perform 1 initial loop to get the base animation data ; Emotion detection only happens after the first initial loop ;
     - Optimized work for looping animations (but to be honest, we're focusing on walking/running animations so this should be fine) ;
     - Overall seems real nice for short, looping animations but for something like a long dance motion, its not as good

b. I can get frame by frame data of the skeleton performing the model. So I can simply write a script that, at each X frames, gets the current frame data and either write that to a file (to then train our models) or just use it to perform motion synthesis / emotion analysis

   - **PROS**:
     - No need to let the animation perform an initial baseline loop before allowing the editing ;
     - Emotion Analysis can be performed without having to wait until the loop point
   - **CONS**:
     - I'll be looking at the current motion (i.e after changes may have been applied) rather than the base motion, which may start adding artifacts with each new change (since we're never resetting back to the middle)

    - Transitions between emotions may be harsh because we lose the baseline frame to go back to in-between transitions
    - Motion synthesis needs to get new "current motion" each time (rather than always working with the baseline)

Left Undone

- Didn't install stuff on server
- Didn't run a full training on the server

Problems

- **[SOLVED]** Found out that Dance Emotion Mocap data and CMU Mocap data can be downloaded in the BVH format. Whilst this is usually fine (since this is a standard format for mocap data), one thing I failed to realize during Projeto de Tese, is the fact that **DeepMimic (and Spacetime Bounds by extent) use their own special format**. At no point during the papers was this mentioned, in fact they can be stated as using CMU data. However, what they did was manually convert the BVH files into their own simplified files (which contain JUST frame data, i.e no skeleton data of some joints and their rotations in a very specific format)
    - **[SOLUTION]** This was solved by using a library that allows me to create scripts and settings files to convert BVH data into the usable format (using inverse kinematics). It works decently well but the outcome motion does have some artifacts due to skeleton proportion mismatches (should still be usable however), and the settings files need to be properly fitted (specifically the scale value).
- **[NOT SOLVED]** Couldn't install necessary dependencies to run the project on the remote server due to lack of privileges.
    - Ask coordinators if I can get sudo privileges on the server

Notes

Thoughts

I thought this was going to be a nice chill week of me trying out Spacetime bounds, and looking at the data with everything working correctly. However, more and more hurdles started showing up and rising my anxiety levels. For one I felt desperate when I realized there was a compatibility issue between the mocap datasets I had picked out to use. Then, I started doubting the whole project idea and had to lay down things in paper to remind myself that this should, indeed, be possible. Nevertheless, the mocap data issue should be more or less fixed so now its time to move on.

Work Hours

This week I worked everyday from about 1pm-6pm