Before running our program, please make sure to do the following:

1. Ensure you have Python installed by running the following command in your terminal:

```
python
```

If this command shows that you do not have Python installed, please do so by following the instructions from the following link:

https://developer.nvidia.com/cuda-toolkit

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2. Ensure you have proper dependencies by installing NumPy, Matplotlib, and Imageio with the following commands

```
pip install numpy
pip install matplotlib
pip install imageio
```

---

3. Determine if you have a NVIDIA CUDA GPU by running the following command in your terminal:

```
nvidia-smi
```

If you know that you do not have a Nvidia GPU, or the above command shows that you do not have a CUDA compatible GPU, then you will not be able to run this program.

If running the above command shows that you DO have a Nvidia CUDA GPU, then continue to section 4.

---

4. RUN WITH GPU

4.1 Check if you have CUDA toolkit installed by running the following command in your terminal:

```
nvcc -version
```

If you do have a CUDA toolkit installed, please move to step 4.2. If you do NOT have a CUDA toolkit installed, please do so by following the instructions from this link:

https://developer.nvidia.com/cuda-toolkit

4.2 Install CuPy:

If your CUDA toolkit is v11.2 ~ 11.8, install CuPy by running the following command:

```
pip install cupy-cuda11x
```

If your CUDA toolkit is v12.x, install CuPy by running the following command:

```
pip install cupy-cuda12x
```

4.3 Download the file “goatHerdingCupy.py” from the GitHub link provided:

https://github.com/emersonpummill/softwareProject2

4.4 Open the file and set the “gridSize” and “numGoats” variables. Please ensure that numGoats does not exceed $(gridSize/2)^2$, or else the program will run infinitely. Also note that an image will be generated (and deleted at the end of the program) for each iteration, so do not test with a large grid size (9 or above) unless you have ample storage for images!

4.5 Navigate to the location of this program in your terminal and enter the command:

```
python goatHerdingCupy.py
```

Wait a few minutes to see results, and please do not open the movement file or the images while it is processing!

The results will be generated in the same location as the program. They will be titled “animation.gif” and “movement.csv” for the movement gif and coordinates logs, respectively.