The Matrix

Kushaagra Goyal, Sanyam Mehra
{goyalk, sanyam}@stanford.edu

Motivation:

We wish to build a hand/arm tracking system and integrate it with an environment in Unity so that we can experience (somewhat) what being 'The One' feels like. Inspired from the 90's cult trilogy, The Matrix movies, we wish to create a virtual experience of a scene(s) that is(are) extremely popular.

Zen Mode

The Bullet Dodge

We aim to develop a program using IMUs to track head and hand/wrist orientation, flex sensors to track finger bends, and Unity to create the virtual avatar and the environment, to simulate a world where the user would be 'The One'. We are yet to decide between creating just an interactive environment, and gamifying it. We also have two options that we would want to try out for building our demo:

1. **POV experience** - the user would experience the world as Neo
2. **Avatar experience** - the user would be a separate entity and we would record the movements and gestures, then have a virtual avatar of Neo who would carry out the actions as recorded

We plan to decide between the two based, on richness of the immersive experience and relative complexity of implementation.

-*-*-*-*-*- -*-*-*-*-*- -*-*-*-*-*- -*-*-*-*-*-

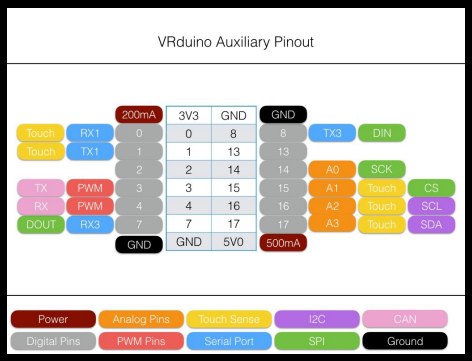
"Morpheus: Unfortunately, no one can be told what The Matrix is. You'll have to see it for yourself."

Approach:

Hardware required:

1.) Teensy board
2.) Flex sensors
3.) IMU's
4.) Connecting wires, breadboard , etc ..

We aim to integrate 2 IMU's and 2 flex sensors to a Teensy board. With 1 IMU we plan to track the head of the human and we will use the other to track orientation of hand. Flex sensors will be used to track the bending of fingers.



We would record data from the IMU's and flex sensors and import it into Unity. Once that's done, we plan to have pre-defined 'actions' that would then map to actions of the user/avatar in the virtual environment.

Milestones:

06/31 - Integrate flex sensors and IMU's with teensy; Get familiar with Untiy
06/03 - Finish importing data into Unity; Finalise between POV vs. Avatar based experience
06/06 - Complete scene development; Implement action recognition and mapping for the demo
06/09 - Finalise demo and poster

-*-*-*-*-*- -*-*-*-*-*- -*-*-*-*-*- -*-*-*-*-*-

"Morpheus: There is a difference between knowing the path and walking the path"

References:

LaValle, Steven M., et al. "Head tracking for the Oculus Rift." Robotics and Automation (ICRA), 2014 IEEE International Conference on. IEEE, 2014.

Marcus Georgi, Christoph Amma, and Tanja Schultz. “Recognizing hand and finger gestures with imu based motion and emg based muscle activity sensing.”, International Conference on Bio-inspired Systems and Signal Processing, 2015. BIOSIGNALS 2015.

Bowman, Doug A., and Larry F. Hodges. "An evaluation of techniques for grabbing and manipulating remote objects in immersive virtual environments." Proceedings of the 1997 symposium on Interactive 3D graphics. ACM, 1997.

Mine, Mark R., Frederick P. Brooks Jr, and Carlo H. Sequin. "Moving objects in space: exploiting proprioception in virtual environment interaction."Proceedings of the 24th annual conference on Computer graphics and interactive techniques. ACM Press/Addison-Wesley Publishing Co., 1997.

Mine, Mark. "Virtual environment interaction techniques." UNC Chapel Hill computer science technical report TR95-018 (1995): 507248-2.

https://docs.unity3d.com/ScriptReference/