Assignment 1 – Jedi Trainer
CAP6121
Due: 2/10/12 11:59pm

"…help me Obi-Wan Kenobi, you're my only hope…"

In order to help train young Jedi, we require a set of training tools to help them with their lightsaber skills. In this first assignment, you will build a Jedi Training simulator similar to the one shown in the figure. The goals for this first assignment will be to get familiar with Unity 3D, Microsoft Kinect, and optionally stereoscopic viewing.

Minimum Requirements

The main goal of the Jedi Trainer is to help young Jedi with their lightsaber skills. To do this, your application must have two modes. First, it must contain a training droid, like the one shown in the figure, that moves around randomly (or pseudo randomly) and shoots lasers at you at varying times. The user's job is to deflect these lasers with the lightsaber so he/she does not get hit. Second, the simulator will have attack droids that come after you. The user's job in this case is to fend off these droids by using the lightsaber or the force. Note that in this game you will not have to travel in the environment, all attack droids will come to you. The game can optionally work in 3D stereo and you can utilize it to assist in gameplay. How can 3D stereo improve the player's overall experience?

When using the force, you should at a minimum be able to

1. Shoot lightening out of your hands
2. Grab objects to throw them at enemies
3. Send a wave of energy that can knock down an enemy
4. Heal yourself

The Virtual World

The world you create for the Jedi Trainer is completely up to you and your imagination. The models you use for the training droid, the attack droids and the lightsaber are completely up to you. The only requirement that I have is that you try to incorporate sounds in the game and try to add special effects for the lightsaber. You can also make the scoring for the game anyway you wish.

Strategy

There are two ways you could create your lightsaber. With the Kinect, you get skeleton tracking so we know the position of your two hands. When you bring your two hands together the two points you get can create a vector which can be used to track the lightsaber. This vector would give you the position and orientation of the lightsaber when you move. You can either made a one-sided lightsaber (see Figure on the left) or a two sided one like the one used by Darth Maul (see Figure on the right). In fact, it might be easier to create a lightsaber of this variety since your hands would not need to be too close together.

As for your force powers, I recommend using heuristics to determine when certain parts of the body are in certain positions relative to each other. You could also use simple machine learning techniques like template matching as well (e.g., collect some training samples, then calculate the Euclidean distance between a current pose and the average of the training poses, the smallest distance wins).

Note that the data that the Kinect gives you might be noisy, so you may want to filter it. I would suggest you use the technique found in

LaViola, J. "Double Exponential Smoothing: An Alternative to Kalman Filter-Based Predictive Tracking", In the Proceedings of Immersive Projection Technology and Virtual Environments 2003, ACM Press, 199-206, May 2003.

Deliverables

You must submit a zip file containing your source. Also include a README file describing what works and what does not in your application, any known bugs, and any problems you encountered. To submit, you can email me your zip file. Please not that both team members must submit an individual README describing what parts of the assignment you worked on and what parts your partner worked on.

Grading (based loosely based on the following):
60% correct functionality
30% creativity
10% documentation