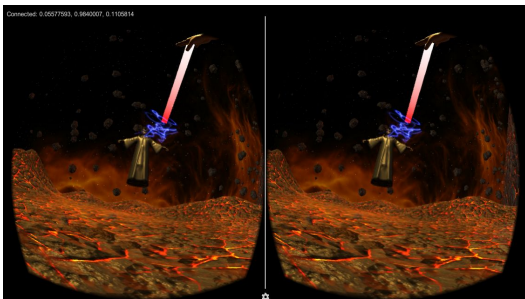# Myo the Force Be With You

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Game Control

Sync
Wave Right
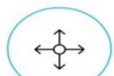
Select
Push
Spread

Deselect
Pull
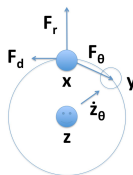*Wave Left*

Move Direction
Direction - Up/Down

Methods

Arm Model

- Arm orientation computed using Myo armband quaternion
- Used typical arm/hand dimensions
- Used typical shoulder position as the center of rotation

Force Model

Variable	Description
z	Arm position
$\dot{z}_\theta$	Arm direction
x	Object position
y	Desired object position
F_r	Radial force
F_θ	"Angular" force
F_d	Damping force

Force Diagram

$$\mathbf{F} = \mathbf{F_r} + \mathbf{F_\theta} + \mathbf{F_d}$$
$$\mathbf{y} = \|\mathbf{x} - \mathbf{z}\|\,\hat{\mathbf{z}}_\theta + \mathbf{z}$$
$$\mathbf{F_r} = \pm\alpha\,\frac{\mathbf{x} - \mathbf{z}}{\|\mathbf{x} - \mathbf{z}\|}$$
$$\mathbf{F_\theta} = \beta\,\frac{\mathbf{y} - \mathbf{x}}{\|\mathbf{y} - \mathbf{x}\|}$$
$$\mathbf{F_d} = -\gamma\dot{\mathbf{x}}$$

Physics Equations
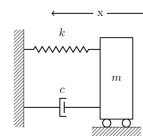
Spring-Mass-Damper Model

Push & Pull Gestures

Linear Acceleration on Z-axis
- Remove gravity using quaternion
$$a = (\mathbf{Q} * \mathbf{a_s} - \mathbf{g}) \cdot \hat{\mathbf{z}}_\theta$$

- Peak-detection algorithm

Pull and Push Acceleration Data
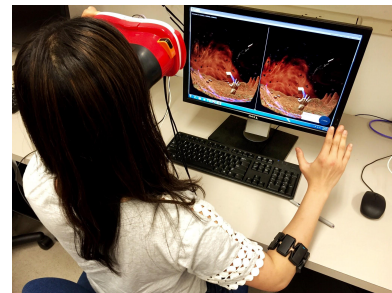
Future Work

- Position Tracking
- More EMG Integration
- EEG (Brain Signals)

References

- stanford.edu/class/ee267/
- myo.com
- unity3d.com
- en.wikipedia.org/wiki/Damping

Acknowledgements