

WiiHab Team



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Clients

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UW–Madison
**Tactile Communication and
Neurorehabilitation
Laboratory**

Overview

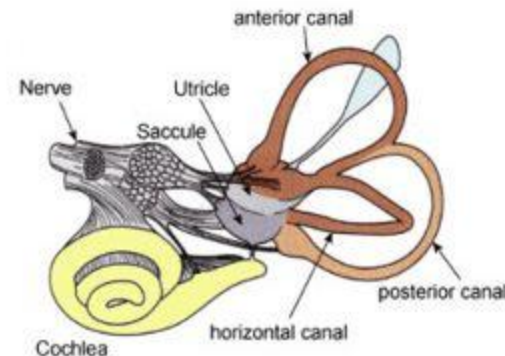
- ▶ Background
 - Balance Impairment
 - Current Rehabilitations
- ▶ Motivation
- ▶ Design Alternatives
 - Clinical Grade Force Plate
 - Wii Balance Board
 - Rolyan BEEP Board
- ▶ Design Matrix
- ▶ Final Design
- ▶ Future Work

Balance Impairment

- ▶ Caused by stroke, brain/spinal cord injuries, and degenerative diseases
- ▶ Effects daily lifestyle
- ▶ Balance exercises proven beneficial
 - Daily repetition of certain movements



Depiction of a stroke.



The vestibular system in the ear helps with balance perception.

Current Methods of Rehab



NeuroCom



Force Plates



Wii Balance Board

Motivations

- ▶ Travel to large healthcare facilities
- ▶ No instant feedback of center of position
- ▶ High cost/
unattainable for average patient
- ▶ Not enjoyable



Force plates can cost \$4,000 – \$80,000.

Design Requirements

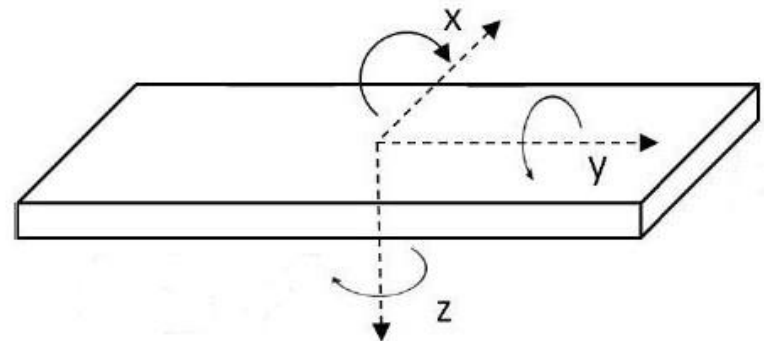
- Cost effective and easily accessible
- Accurate
- Instant audio and/or visual feedback
- Easy and enjoyable to operate
- Portable – available in participants' homes
- Withstand daily use for up to five years

Design Alternatives

- ▶ Clinical Grade Force Plate
- ▶ Nintendo Wii Balance Board
- ▶ Rolyan BEEP Board

Clinical Grade Force Plate

- ▶ “Golden Standard”
- ▶ Four transducers – one in each corner
- ▶ Measures three axial forces and corresponding moments
- ▶ Cost: \$4,000–\$80,000
- ▶ Requires Amplifier and Computer with Software



Nintendo Wii Balance Board



- ▶ Released in 2007 as accessory for Wii Console
- ▶ Extensive research recently done to use as clinical tool
- ▶ Four transducers in each pedestal
- ▶ Communicates via Bluetooth
- ▶ Cost: \$99.99
- ▶ Require computer with Bluetooth connection and programming software

Rolyan BEEP Balance Board

(Balance Enhancement Exercise Program)

- ▶ Balance Rehabilitation Device
- ▶ Modeled after first class lever
- ▶ Audible signal when not balanced
- ▶ No precise center of pressure data
- ▶ Cost: \$185.00
- ▶ Gives physical feedback

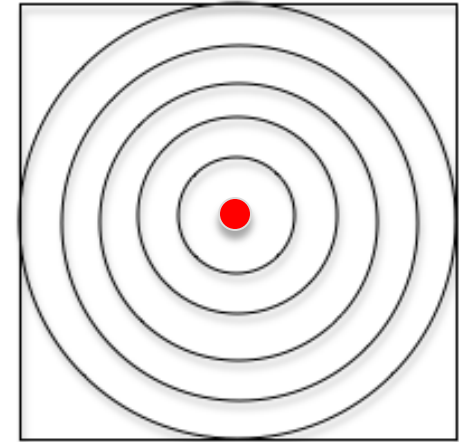


Design Matrix

Category	Weight	Clinical Grade Force Plate	Wii Balance Board	Rolyan BEEP Board
Price	0.25	1	10	9
Accuracy	0.2	10	8.5	1
Mobility	0.2	2	9	10
Scientific Literature	0.15	10	10	2
Accessibility	0.1	3.5	10	8
Stability/ Ergonomics	0.1	9	8	7
	Total (Max 10)	5.4	9.3	6.25

Final Design

- Nintendo Wii Balance Board
- MatLab programming
- Real-time visual representation of patient's balance



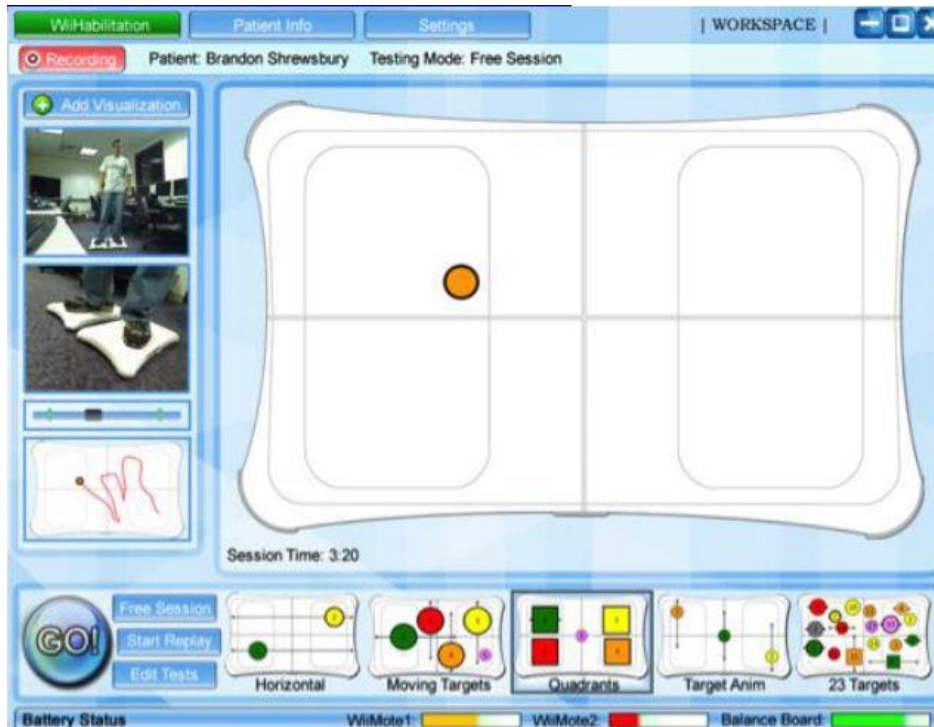
Visual Display of CoP on computer.



Via Bluetooth



Future Work



An example of a possible interface.

- ▶ Connect the Wii Balance Board to the computer
- ▶ Program audio/visual feedback with MatLab
- ▶ Create friendly interface for users

Special Thanks:

Clients: Dr. Kurt Kaczmarek, Kathy Rust, & Mitch Tyler

Advisor: Dr. Thomas Yen

Aaron Striegel – Department of Computer Science & Engineering of University of Notre Dame

Questions?

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