StepKinnction
A Fall Prevention Game Mindfully Designed for the Elderly

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Overview
Related Work
Design Considerations
The StepKinnnection Game
Conclusion
Ageing

- Aged Population Increases (Crisis)
  - 95k increase 2009-10
  - 120k increase 2013-14

- Changes in Mental and Physical Health

- Sedentary Lifestyle -> Health Problems
  - Obesity
  - Balance Disorder
  - Falls
Main Cause of Death and Injuries
- 1 in 3 seniors has a fall every year

Exercise can reduce falls by 40%
- Stepping last resort to avoid falls

But...

Exercise Programs are Boring
Commercial Games

- Fun -> Engagements
- Enhanced Interaction
- Tool for Training & Rehab
Issues

- However
  - Designed for Kids, not Seniors
  - Not alignment to Health Problems
  - Not Exploiting Potential to Measure Performance
Objective

- Investigate the feasibility of using interactive game technology as a means to exercise and reduce the risk of falling in the elderly
Literature Review

Focus on:

- Proven Strategies to Prevent Falls
- Game Design Guidelines
- Clinical Tests for Fall Risk Assessment
Game 1

Nintendo Wii Fit
Game 2

Gerling et al. 2010
Game 3

Uzor et al. 2014
Focal Point

- Appropriate Game Design
  - Special Age-Related Features & Natural Interaction
- Meaningful Tasks
  - Train Specific Motor & Cognitive Functions
- Assessment
  - Collection of Clinical Data during Gameplay
1. Appropriate Game Design

- Kinect
  - Natural Interaction
  - Focus on Exercise rather than Tech
- Simplistic Interface
  - High Contrast
  - Few choices
2. Meaningful Tasks

- Train 3 Abilities:
  - Stepping
    - Regain Base of Support
  - Stepping with Motor Inhibition
    - Avoid Obstacles
  - Rapid Stepping
    - Sudden changes in Environment
3. Assessment

- **Choice Step Reaction Time (CSRT)**
  - 6 Panels
  - 1 Panel lights up (Randomly)
  - Step and return (AQAP)

- **Clinical Measures**
  - Decision Time
  - Movement Time
  - Reaction Time = Decision + Movement

Lord et al. 2001
The StepKinnection Game
12 Weeks Study

It's Suitably Challenging

- Neutral: 10%
- Strongly Disagree: 0%
- Strongly Agree: 40%
- Agree: 50%

It's Playful

- Neutral: 10%
- Disagree: 0%
- Strongly Disagree: 0%
- Agree: 30%
- Strongly Agree: 60%
12 Weeks Study

Average Reaction Time - Inhibitory CSRT (secs)

Check Point

Error bars: 95% CI

Average Reaction Time Collected During Game Play (secs)

Check Point

Error bars: 95% CI
Summary

- Development of Kinect-based game for fall prevention for the Elderly
  - Special Age-Related Features
  - Train Specific Cognitive and Motor Functions related to the Problem of Falling
  - Collection of Clinical Measures during Gameplay
Future Work

- Future research should focus on:
  - Larger and Longer Studies
  - Explore Simpler Setup
  - Incorporate Intelligent Mechanism to Adapt Challenge
  - Personalisation
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