

Detecting Cognitive Decline Using Smart Home Technology

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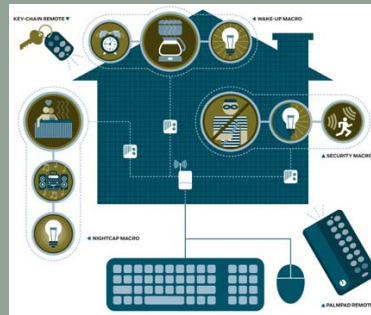
Problem Statement

Cognitive decline can be difficult to recognize in outpatient care settings and changes in ambulatory ability may be easier for health professionals to recognize.

Hypothesis

Older adults with cognitive impairment will have altered gait and slower walking speed with timed up and go (TUG) testing than older adults without cognitive impairment. Outpatient centers could use gait analysis to inform diagnosis and this may be more acceptable to older adults than overt cognitive testing.

Smart Home Technology



Technology

- Seat Pressure Sensor
- iPhone
- Accelerometer
- Infrared Ceiling Sensors
- High Resolution Camera
- Machine Learning

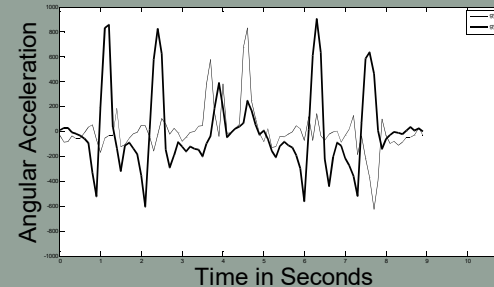
Analysis Methods

- Data Mining With Retrospective Analysis
- Machine Learning
- Time Domain Waveform
- Peak Detection

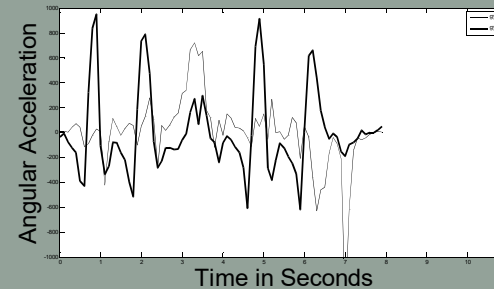
TUG Test

Get up from chair walk 10 ft, turn around walk 10 ft back, turn around & sit down

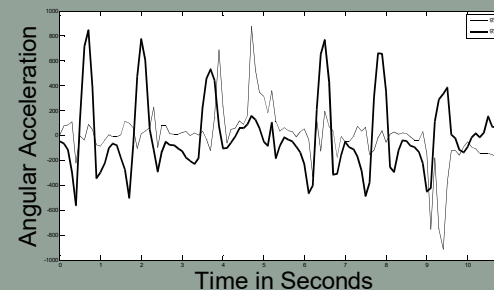
Participant #29 TUG 1 (no load)



Participant #29 TUG 2 (no load)



Participant #29 TUG 3 (cognitive load)



Captured Walking Cadence

	Total Trial Time	Time Between Peaks	Median Time Between Peaks
Participant #2 79 Female			
TUG Trial 1	9	1.66	1.3
TUG Trial 2	10	1.58	1.3
TUG Trial 3	9	1.60	1.3
Participant #29 80 Female			
TUG Trial 1	9	2.13	1.3
TUG Trial 2	8	1.77	1.3
TUG Trial 3	12	1.78	1.5
Participant #330 18 Female			
TUG Trial 1	13	1.67	1.1
TUG Trial 2	10	1.43	1.0
TUG Trial 3	12	1.85	1.45

Implications

Interventions to improve screening and the ability to identify decline early and accurately are critically needed to improve patient safety and outcomes. They may also be more acceptable to older adults than overt cognitive testing.