

EFFICIENT GYRO-ROLLER BASED REHABILITATION PROGRAM FOR STROKE PATIENTS

Tulakan Ruangrong

AIMLAB - Biomedical Engineering - Mahidol University

TABLE OF CONTENTS

1. Introduction
2. Previous Works
3. Present Works

INTRODUCTION

STROKE

- Around *20,000 deaths* in Thailand every year.
- Major cause of paralytic.

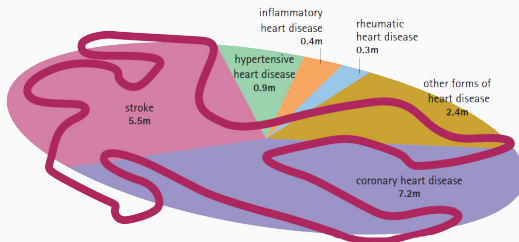


Figure 1: Global deaths from Cardiovascular disease

REHABILITATION

- Neural plasticity
- Most of commercial devices are very expensive
- Strict and repetitive process
- Easy to be motiveless and bored

COMBINATION BETWEEN VIRTUAL REALITY AND REHABILITATION TECHNIQUES

REHABILITATION

- Neural plasticity
- Most of commercial devices are very expensive
- Strict and repetitive process
- Easy to be motiveless and bored

COMBINATION BETWEEN VIRTUAL REALITY AND REHABILITATION TECHNIQUES

REHABILITATION

- Neural plasticity
- Most of commercial devices are very expensive
- Strict and repetitive process
- Easy to be motiveless and bored

COMBINATION BETWEEN VIRTUAL REALITY AND REHABILITATION TECHNIQUES

REHABILITATION

- Neural plasticity
- Most of commercial devices are very expensive
- Strict and repetitive process
- Easy to be motiveless and bored

COMBINATION BETWEEN VIRTUAL REALITY AND REHABILITATION TECHNIQUES

REHABILITATION

- Neural plasticity
- Most of commercial devices are very expensive
- Strict and repetitive process
- Easy to be motiveless and bored

COMBINATION BETWEEN VIRTUAL REALITY AND REHABILITATION TECHNIQUES

GYRO-ROLLER



Figure 2: Gyro-Roller System



Figure 3: With patients

Difference between 2nd and 3rd version

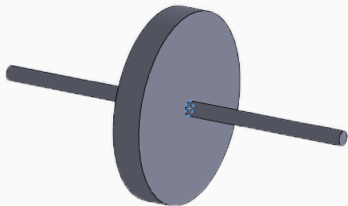


Figure 4: Version 2 wheel

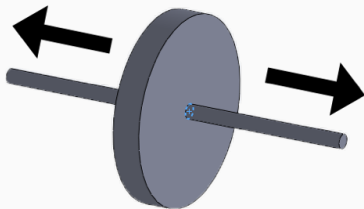
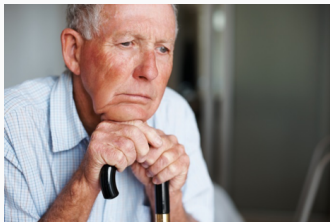


Figure 5: Version 3 wheel

THESIS OBJECTIVES

- Game Design
- Virtual Reality based Gyro-Roller system
- Clinical Trial



- Develop 3 different games with active & passive modes including several levels and log file.
- Find out how effective of the Gyro-Roller version 3 over version 2.
- Collect the data of 20 subjects for at least 2 months.

- Develop 3 different games with active & passive modes including several levels and log file.
- Find out how effective of the Gyro-Roller version 3 over version 2.
- Collect the data of 20 subjects for at least 2 months.

- Develop 3 different games with active & passive modes including several levels and log file.
- Find out how effective of the Gyro-Roller version 3 over version 2.
- Collect the data of 20 subjects for at least 2 months.

PREVIOUS WORKS

Mechanic

- ~~Fix pulley belt tension~~
- ~~Fix handle bar alignment~~
- ~~Wiring servomotor → tuning goal position~~

Software

- ~~Write new Arduino sketch to control DC motor~~

Game pages – integrated

- Login
- Registration
- Game Selector
- Calibration – with motor connected
- EMG collection game
- Space shooting game – being integrated

This project is tracked using *git* with  Bitbucket

PRESENT WORKS

Literature Review

- Cognitive rehabilitation
- Serious game for rehabilitation

Game Development

- Add mode to control mass movement
- Design and create cognitive based games

EMG Analysis

- Figure difference between mass to the left-right
- Apply information to the game

Mechanic

- Sent device back to fix problems

	Betker et al. [25]	Ma et Bechkoum [26]	Conconi et al. [27]	Caglio et al. [28]	Cameirão et al.[29]	Burke et al. [20]	Ryan et al. [31]	System RehaCom [33]
Application Area	Motor	Motor	Cognitive	Cognitive	Motor and Cognitive	Motor	Motor	Cognitive
Interaction Technology	Body Weight Movement	Motion Tracking + HMD	Speech + Touch+ Motion Tracking + Biosensors	Keyboard	Motion Tracking	Motion Tracking	WiiMote Wii Balance	Special Keyboard + Joystick
Game Interface	2D	3D	3D	3D	3D	2D	2D	2D
No. Players	Single	Single	Single	Single	Single	Single	Single/Multi	Single
Competitive/Collaborative	None	None	None	None	None	None	None	None
Game Genre	Memory + Simulation	Simulation	Strategy	Simulation	--	Simulation	Maze	Assorted
Adaptability	Yes	Yes	Yes	No	Yes	Yes	--	Yes
Progress Monitoring	Yes	Yes	Yes	No	Yes	Yes	--	Yes
Performance Feedback	Yes	Yes	Yes	--	Yes	Yes	--	Yes
Portability	Home	Clinic	Clinic	Clinic	Clinic/Home	Home	--	Clinic

Figure 6: Classification and comparison of rehabilitation serious games

Add mode to control mass movement

- Able to move automatically
- But not able to control movement speed for now

What to do

- Add ability to control speed into library
- Write some of the basic games that are cognitive related (EMG results would be applied afterward)

What to do

- Design proper experiment to investigate difference during wheel movement
- Wait for the Gyro-Roller to come back from factory

Problem

- Can't contact manufacturer

What to do

- Keep contacting
- Order cover parts (acrylic dome)

END