GATOR Games

Games and Assistive Technologies for Rehabilitation

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About Us

- Computer engineering seniors at Colorado State University
- We are working with Dr. Pasricha and Dr. Matt Malcolm.
- Dr. Pasricha specializes in embedded system design and under his supervision we have been working to create a system for Dr. Matt Malcolm and his graduate students in the occupational therapy department.

Responsibilities
Database management, Programming, and Funding Documentation: Chris Hesser
Lead Programmer, Server management: Corey LeFevre
Team leader, Programming, and 401 Documentation: Michael Rowack
Our Motivation

• Annually, strokes affect over 700,000 individuals.
• 40% of the victims who survive stroke, experience moderate to severe impairments.
• Globally 17 million people have Cerebral Palsy.
• Nearly 50% of those with CP have impaired upper limb function.
• Upper limb impairment results in a diminished quality of life.
  o Those who suffer are challenged by everyday tasks like cooking, cleaning, using their phone or computer, etc…
We Want to Help

• **Our goal:** Help the people who are suffering with these health issues.

• We will accomplish this by:
  - Providing an effective rehabilitation system
  - Providing an enjoyable system that can help people who otherwise would give up on their physical rehabilitation.
  - Offers many patients the opportunity to improve their quality of life.
Collaboration

- GraduatePrograms.com ranks CSU's Occupational Therapy program as the best in the nation.

Together we want to provide a fully functional system with games and hardware to make the physical rehabilitation process less tedious and more enjoyable.
Continual Integration of new hardware into the system over the last 4 years.

- Web cameras
- Tablets and Android Devices
- Microsoft Kinect
- Leap Motion Controller
Software

- Python Anywhere & Web2Py
- HTML5 & JavaScript
- Torque 3D

- Open Source libraries
  - Kiwi JS
  - Create JS
  - Graphics, Animation, and Sounds
GATOR Games

- Therapeutically enhanced games
- Integrates movements used in therapy
- Tools to monitor progress

The games motivate a patient to undergo rehabilitation better than the existing techniques used by therapists using repetitive and supervised activities.
GATOR Games

Score: 4
Number of Rockets: 2

Time: 48
Goals of New Games

- This year we wanted to create games that were more effective
  - Better graphics
  - More features
  - Progression
- New rehabilitation movements

- First game to feature up and down movement
Progress

• Q: Does the score provide the user with a measure of their progress?
• A: No.
• In order to fix this problem we added a progress report system
  o statistics
  o New measure
Areas to Improve

• Leap Motion is not meant to be inverted
  o Requires a perfectly set environment for smooth gameplay
  o Nimble controller is an alternative

• More gestures into the system

• Therapist automation

• Large scale studies with patients
  o Currently studies are taking place on a very small scale w/ OT
Help More Patients

- Many victims of SCI and TBI have little to no upper limb mobility we want to help these people.
- Expand system to benefit these patients.
- This can be done by integrating a new piece of hardware.
EMOTIV

- Translates brain activity to electrical signals
- Inputs from 14 EEG channels
- Headset output can be interpreted by API on patients’ home computer
Integration

- Extending Emotiv Features
  - We will design a custom software infrastructure to translate the patients thought into a smart home environment

- Smart Home environment
  - Locks, Lights, Fans, TV, windows, blinds, etc...
  - Better quality of life
Phase 1 (complete)
- In our first phase our goal was to gain familiarity with the system and develop new features, tools, and games into the system.

Phase 2 (In progress)
- Our second phase was and is to support the beta testing of the GATOR system with the Occupational Therapy department here at CSU. While this is going on we are continuing game development.

Phase 3 (Planned)
- Our third phase will be starting development with the Emotiv headset. Our goal for this phase is to understand how to create our own controls based on the EEG input.

Phase 4 (Planned)
- Our last phase we hope to have a full smart home environment setup that can be controlled using the Emotiv headset. Meaning our API is complete and patients can potentially beginning testing with the headset.
# Budget

- **Funding received:** $2100
- **Spending:** $265
- **Available:** $1835
- **Needed:** $5665

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Thank You!

If you have more questions or want to help, feel free to contact us!

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