AUDITORY & VISUAL STIMULI
GO KART FOR SHANE
LAWNMOWER FOR SHANE

Team 3
Steven Kapinos
Brian Lewis
Anthony Vessicchio

Clients:
Dr. John Enderle
Shane Davis
Overview – Auditory and Visual Stimuli

- Client
- Objective
- Specifications
- Components of Device
Has been researching rapid eye movements and their respective neuronal activities for the past thirty years

- Led to the belief that there is a way to determine whether or not a person has suffered mild traumatic brain injury or not based on their results from a visual/auditory stimuli eye movement test
In the U.S. alone, more than one million people suffer at least one concussion every year
If ignored or treated improperly, concussions can lead to very serious long term traumatic brain injuries and even death
In today’s society, many people are at risk for concussions
- Contact sports
- Military
Objective of Visual/Auditory Stimuli System

• Design a safe, efficient, and accurate device to test for mild brain trauma
• Device is able to record eye movements in response to visual and auditory stimuli
• Device can be used on any patient
  • Age
  • Weight
  • Height
Device needs to:

• Record eye movements using an EOG
• Have the option to activate auditory stimuli and visual stimuli simultaneously and separately
• Activate the stimuli sources in a manner that appears random to the patient
  • Makes for a more accurate test
• Display results in a user-friendly manner
Arched Black Board

• Main component of device
• Contains an 11x7 matrix of auditory and visual stimuli sources
• Mounted to wall
77 LED lights built in to buzzer
  - Evenly spaced out in 11x7 matrix
- Red
  - Contrasts black board and is able to better stand out
- Programmable through an Arduino microcontroller
Piezo Buzzer/LED

- 77 speakers behind LEDs
- Can also be activated using Arduino microcontroller
- Board will be modified for Piezo buzzer/LED implementation
• Speakers need to be protected
  • Allow for optimal performance
• White surface needs to be covered
  • Assures patient is able to focus on LEDs
• Very thin and does not obstruct sound
• Microcontroller that is able to activate both speaker and LED component
• Programmable using C language
• Able to activate the LEDs and speakers in a randomized fashion
• Will be used in combination with microplexors
  • Ability to control all of the LEDs and speakers
LabView Program

- EOG signals inputted into LabView Program
- Displays results in a user-friendly manner
  - Eye displacement
  - Eye velocity
  - Peak velocity
Overview - Vehicles for Shane Davis

- Client
- Background
- Objective
- Specifications
- Purchased Vehicles
- Major Components
- 21 year-old male diagnosed with Spastic Quadriplegia and Cerebral Palsy
  - Limited mobility in all four extremities
  - Most movement in left arm and hand
- Confined to an electric wheelchair
Cerebral Palsy is a neurological disorder that affects one’s motor controls.

- Spastic Quadriplegia is a type of CP that affects all four limbs of the patient and reduces his fine motor controls.

The objective is to modify both a lawnmower and a go-kart that allow Shane to operate the vehicles.

- A joystick, similar to the device on his wheelchair, will be used in place of the pedals and steering wheel.
Vehicle Specifications

Go Kart

Safety: Needs Roll Rage
Engine: 100cc to 150cc, Gas powered
Brakes: Cables/Disc Brakes
Needs to have Reverse function
Length from Seat to Pedal: 20’ to 36”
Height: At least 4 feet tall
Easy Access to wiring
Emergency Brake

Lawnmower

Lawnmower has been previously donated and meets all of the specifications for Shane
110cc Dune buggy

- Engine Type: 110cc single cylinder, 4-stroke
- Fully automatic transmission
- Emergency Brake
- Disc Brakes for Front and Rear
- 1.8 Gallon fuel tank
- Height: 47.2 inches
- Pedal to Seat: 21 inches
- Weight: 220 lbs
Troy-Bilt Lawnmower

- 17 horsepower engine with various speed settings as well as reverse
- 42-inch mowing deck
- Seat Width – 16.5 inches
- Ground to Chair Height – 20 inches
- Electrical ignition
For both vehicles, an Arduino Mega 2560 microcontroller will be used.

Board contains 14 pulse width modulation ports that will be able to vary the outputs from the joystick.

Programming is accomplished by connecting a USB cable to the board and using the company’s software to write the code.
8-Way Competition Joystick
- Contains 4 switches to allow microprocessor to know which outputs are active
- Spring Return-to-Center capabilities
- Ideal height for Shane is 3 to 5 inches
  - Joystick is 3.66 inches
## Budget

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<thead>
<tr>
<th>Auditory &amp; Visual Stimuli</th>
<th>Go-Kart</th>
<th>Lawnmower</th>
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<td>5 Piezo Buzzers</td>
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Shane Davis & his family
Dr. John Enderle
Ellington Agway Power Equipment
Xui Zhai
Joe Calderon
Questions?