

Neural-Enhanced Universal Ride At Low-cost (N.E.U.R.A.L.)



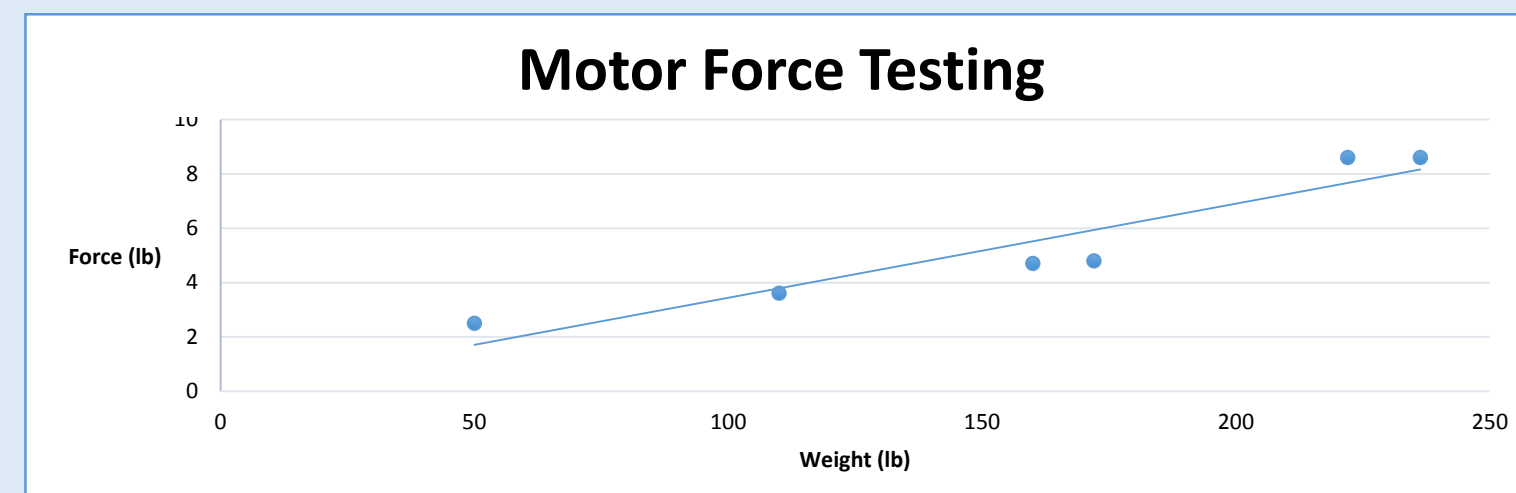
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Goal Statement

- To design a low-cost brain-controlled (EEG) wheelchair which will provide mobility to people who have experienced spinal cord injuries, were born unable to move, or have been permanently paralyzed

Measurements



Reliability Testing

Number of Signals	Success (Mean)	Total Reliability
1 (Left)	8.25 of 10	82.5%
2 (Left, Right)	6.50 of 10	65.0%
3 (Left, Right, Front)	1.75 of 10	17.5%

Solution to Multi-signal Unreliability: Created hybrid system with EEG and EMG



Figure 1: Low-Cost Motorized Wheelchair

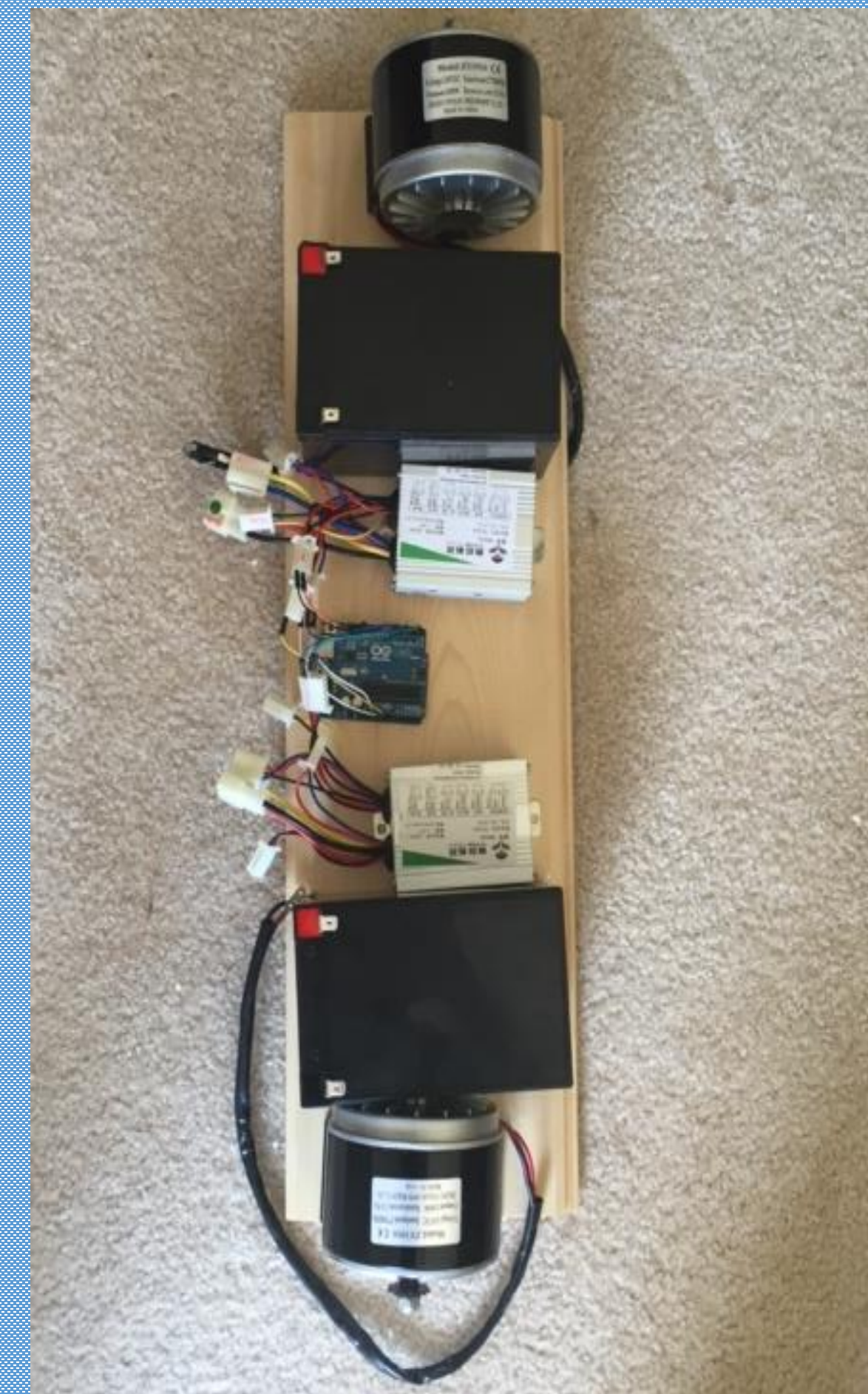


Figure 2: High V Controller
24V 250W motors
12V 12Ah batteries

Approach

- Low-Cost Materials.**
 - EEG headset \$400.00
 - Drivetrain \$120.00
 - Wheelchair \$ 77.91
 - Batteries (12V 12Ah) \$48.00
 - Motors + Controller \$80.00
 - Total **\$725.92**
- Average cost of Electric Wheelchair:
 - \$2,000-15,000**
- Accessible by the general public.

Results

- Mapped **facial expressions** to directional commands
- Mapped **EEG brain states** to commands using Emotiv **Machine Learning Algorithms.**
- Completed a **small scale prototype.**
- Assembled and **motorized a low cost wheelchair.**



Figure 3: Emotiv EEG EPOC Headset

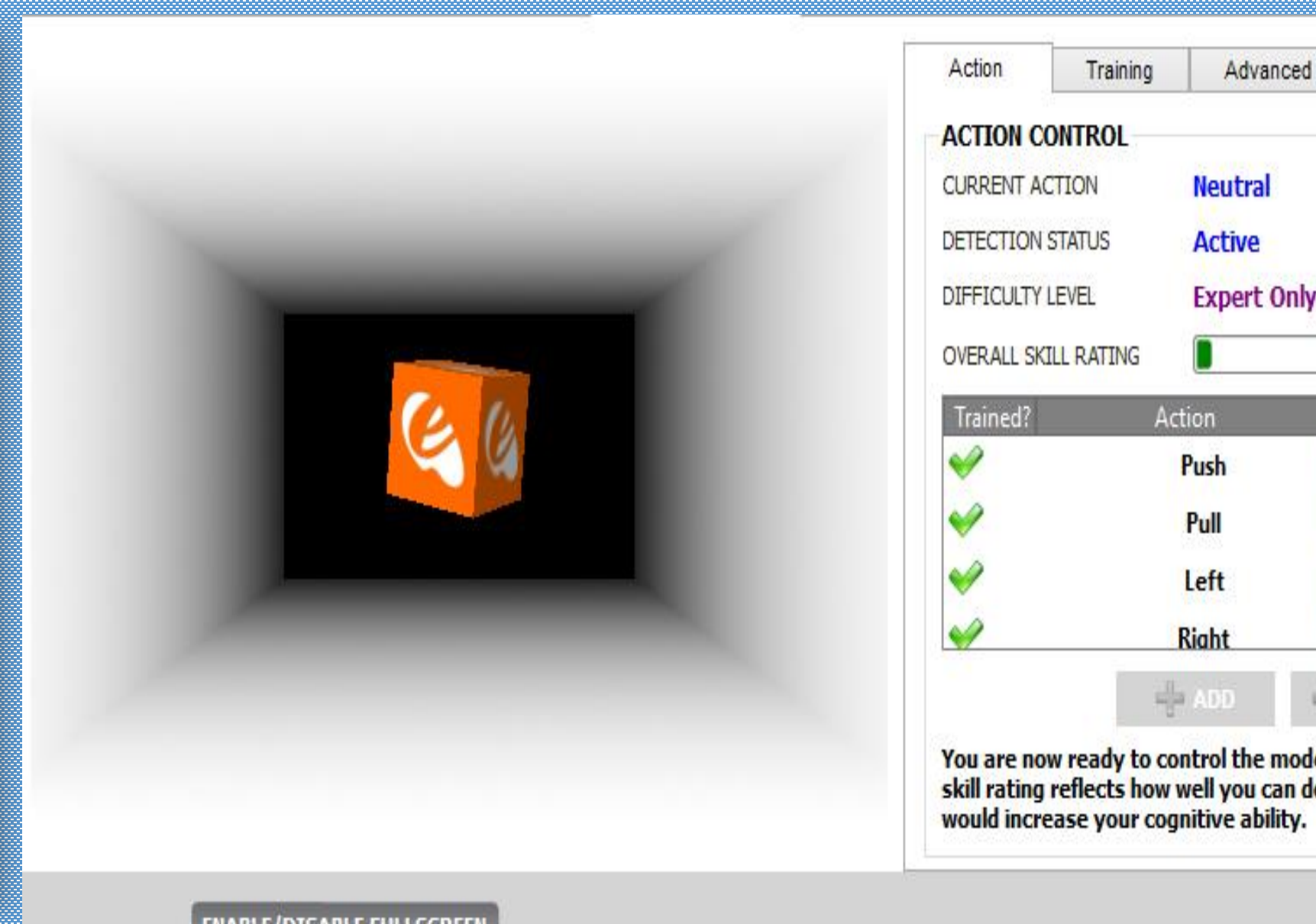


Figure 4: Cognitive Control Training

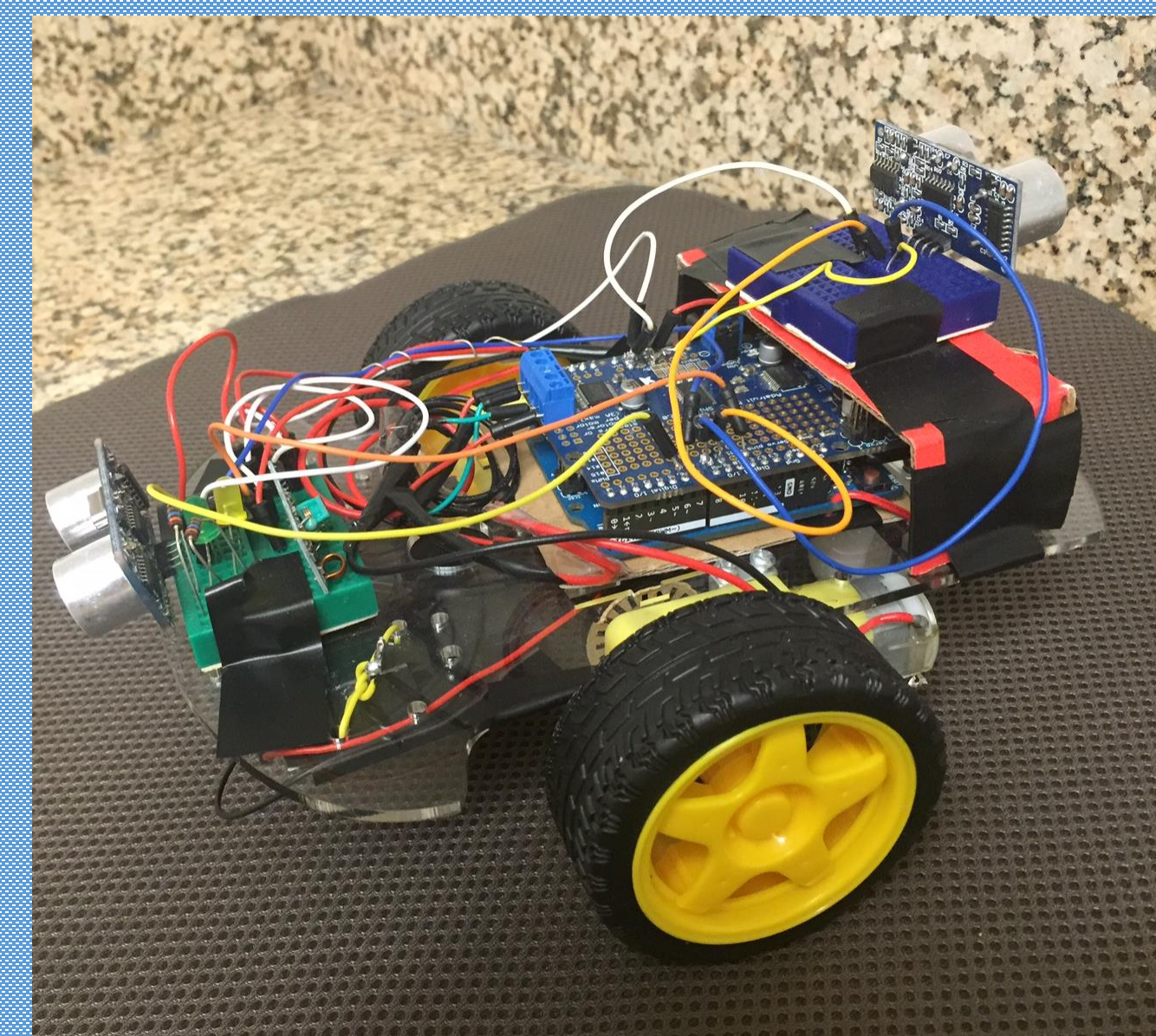


Figure 5: Small Scale Car Prototype

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