

WEIGHT DISTRIBUTION MONITORING SYSTEM

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Abstract

Ms. Carol Rohl is a hemiplegic woman who suffered a thalamic bleed in 2004. Our team has been approached to assist in her rehabilitation. Currently, she does not know when her stance is balanced due to a lack of sensory feedback on the left side of her body. She would like a portable weight distribution monitoring system that she can use to train herself to recognize an even weight distribution.

Background

Strokes and Hemiplegia

- 3.5 million stroke survivors in U.S., 600,000 new cases each year
- \$30 billion in healthcare costs
- Brain tissue damage reduces neural traffic, impairment of motor neuron activation
- Causes loss of motor, sensory functions in hemiplegic area

Balance Improvement

- Rehabilitation exercises to increase weight hemiplegic limb supports
- Force platforms used, but only clinically

Client Specifications/ Design Requirements

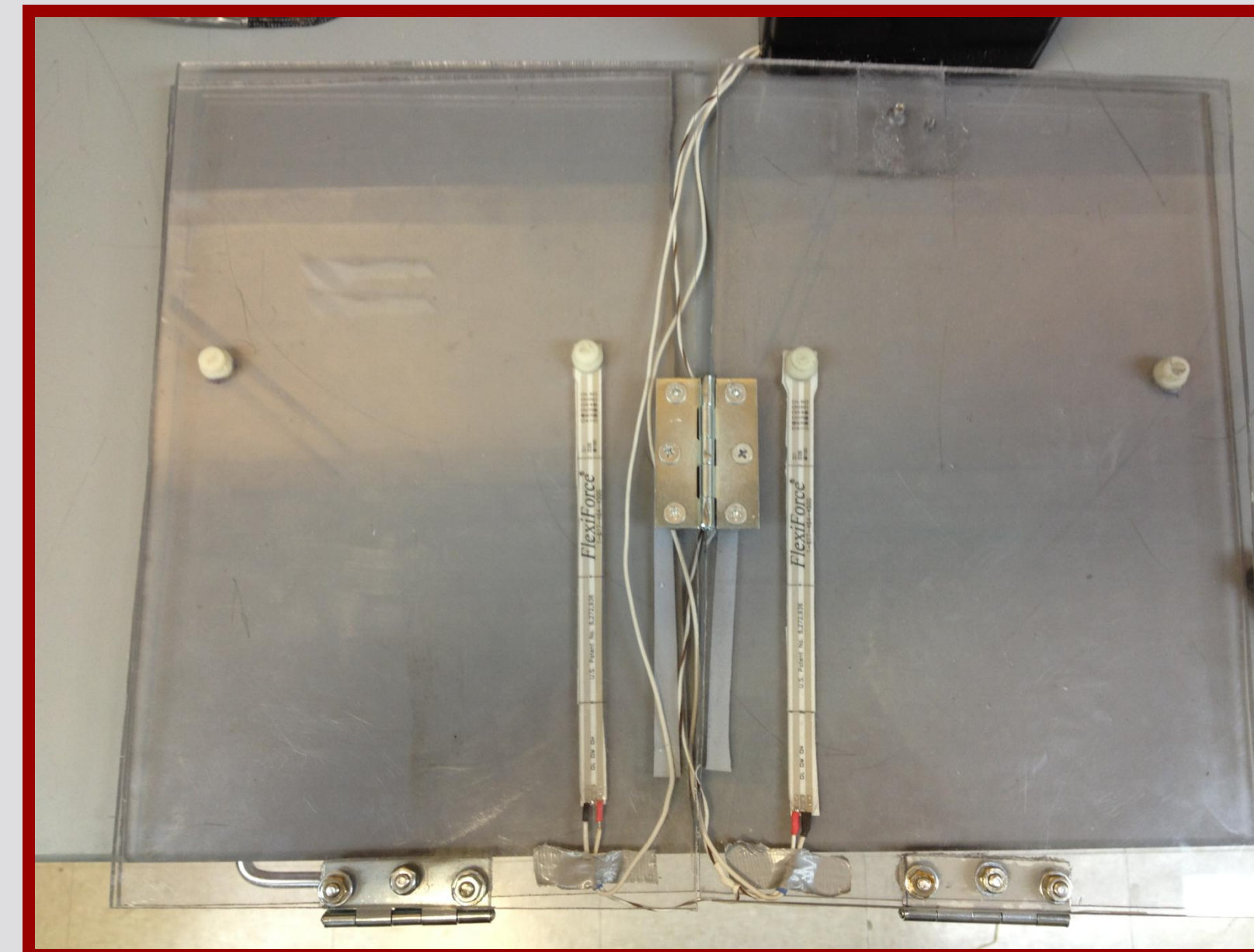
- Portable with compact storage
- Eye level visual feedback with simple user interface
- Accommodate shoulder width stance
- Withstand frequent use
- Around notebook size with unfolded height less than 1 in.
- Lightweight
- Pick up and carry device with one hand

Acknowledgements

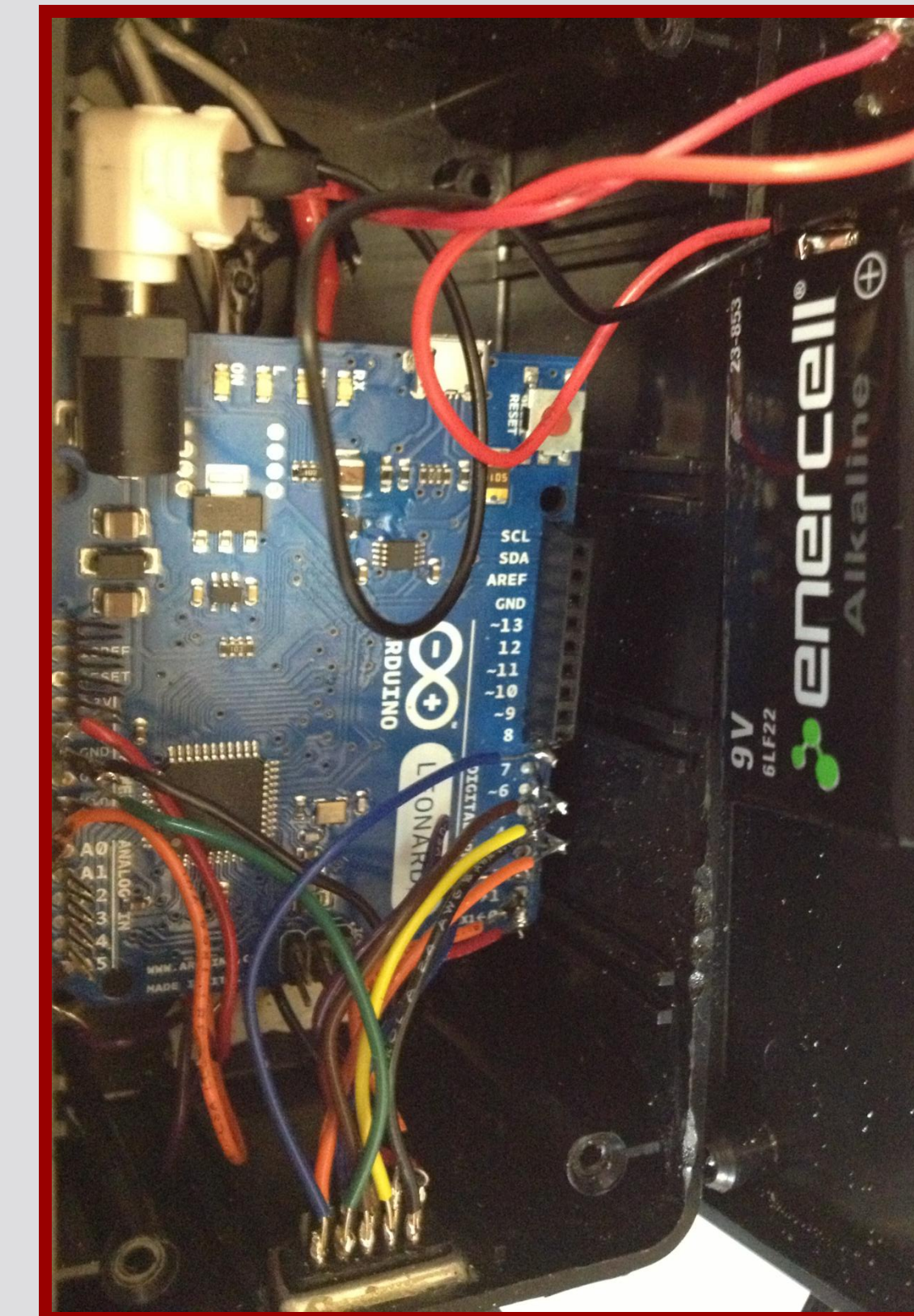
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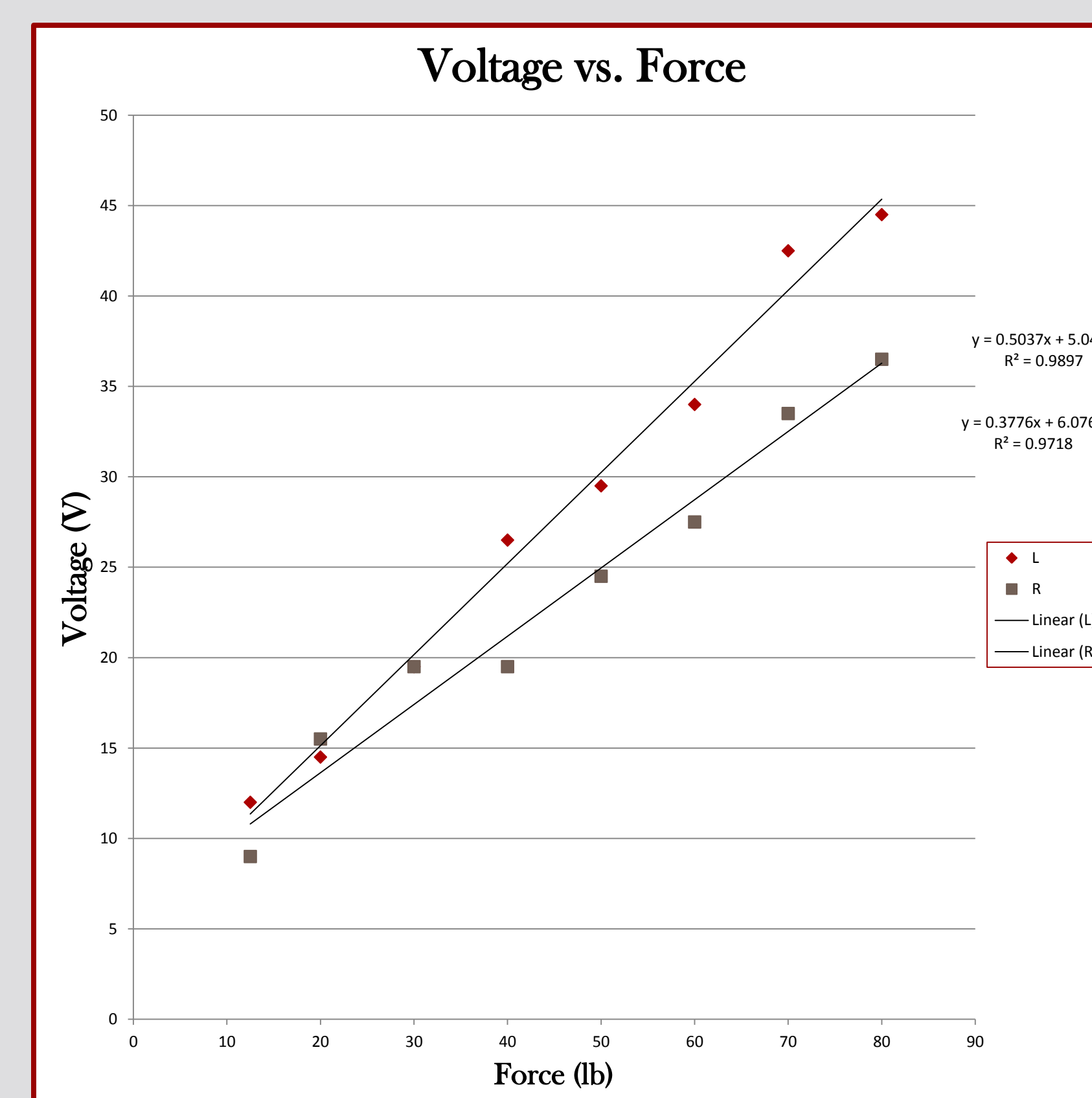
Final Design



- Hinged platform folds in half
- FSRs between sheets of polycarbonate
- Arduino microcontroller calculates voltage difference
- Row of LEDs to show degree of imbalance



Testing



- Range of weights from 12.5 to 100 lb.
- Linear fit of voltage-force plots for both FSRs
- Apply to code for normalizing forces
- Subject testing for distribution boundaries

Budget

Arduino Microprocessor	\$24.95
FlexiForce FSR (2)	\$76.05
Project Enclosures (2)	\$8.98
Assorted LEDs	\$8.38
Polycarbonate Sheet	\$0
Hardware, Circuit Components	\$31

- No set budget, but completed prototype for less than \$150

Results

1" high, 17 1/4" wide, 13 7/8" long
Weighs less than 6 lb.
LED feedback box at eye level
Successfully satisfied client's requirements

Future Work

- Refine force sensing system to minimize importance of foot placement
- Expand calibration range
- Accommodate variety of stances
- In-depth feedback option
- Bluetooth connectivity

References

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