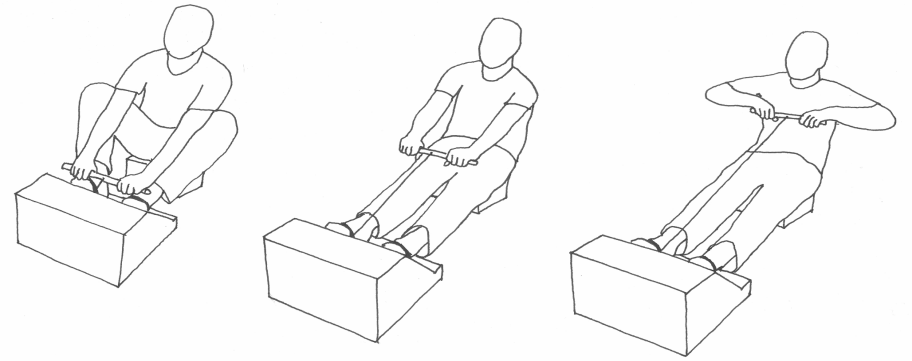

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KEY CONSIDERATION FOR MOCKUP DESIGN

- design of customer interface w/ product
- ergonomic considerations
    - safety concerns
    - maximum power output
- power flow and generation
    - testing on existing rowing machines
- construction of a more accurate physical mockup of *Kinkajuice*

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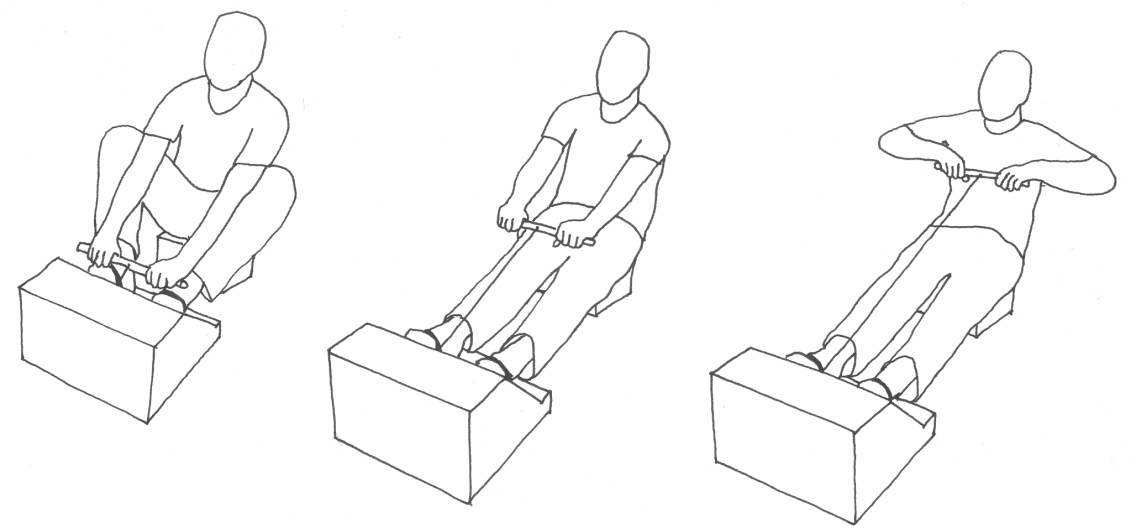
CUSTOMER INTERFACE:

- creation of user's manual
  - use in correlation with Kinkajou
- encourage proper techniques & usage patterns to increase life of product and keep users healthy
  - common injury – tendonitis in lower arms due to overuse
    - Encourage rotation of users



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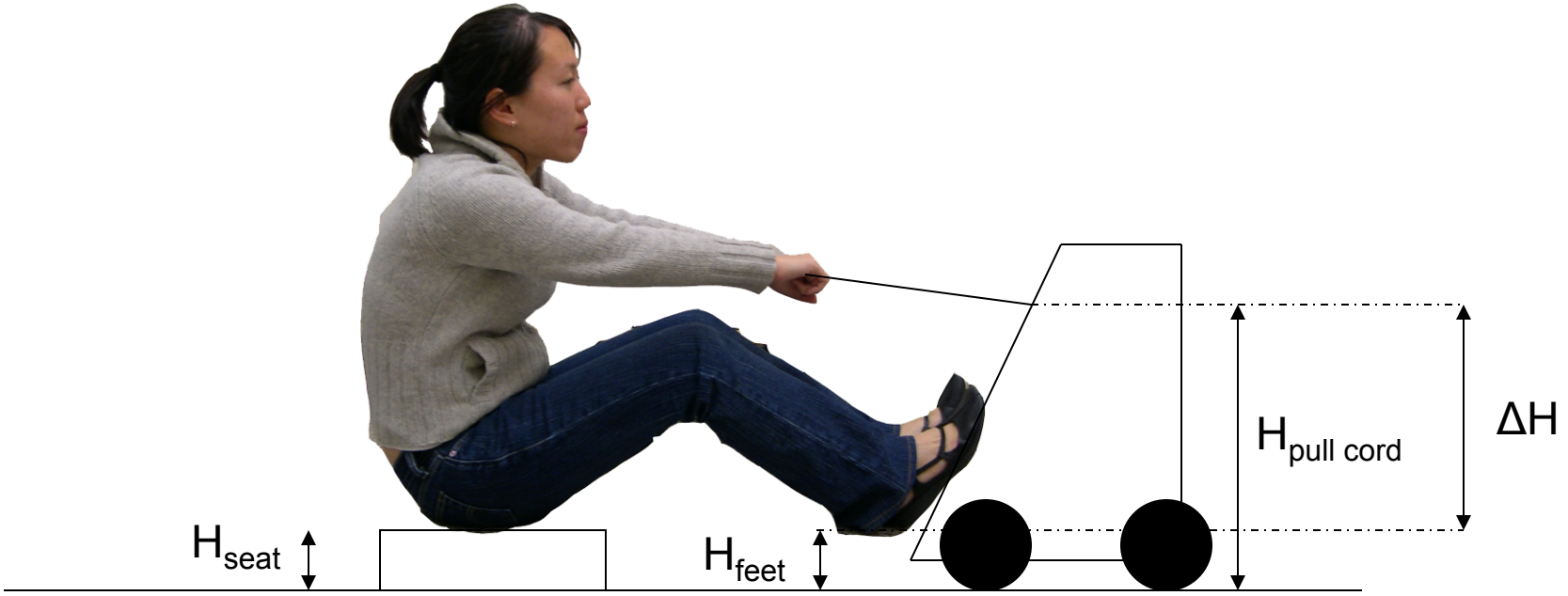
ERGONOMIC CONSIDERATIONS:

- dropping $H_{pullcord}$ severely reduces power output
- reducing $H_{seat} – H_{feet}$ does not cause significant decrease in power output
  - reduces comfort
    - important to consider for long-term consumer health



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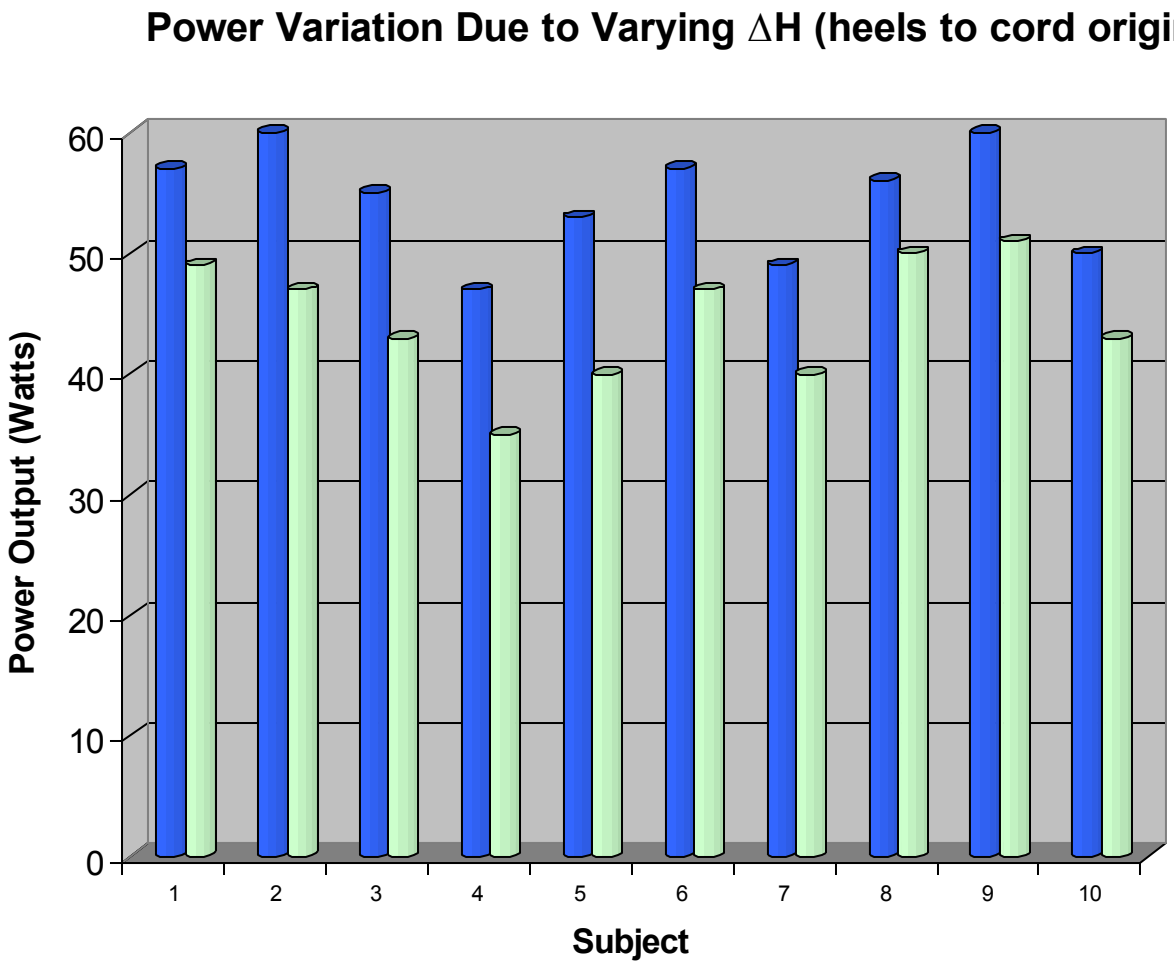
ERGONOMIC CONSIDERATIONS:



$Power_{goal}$ = 60 W

18 minute charge

10:1 use:charge ratio

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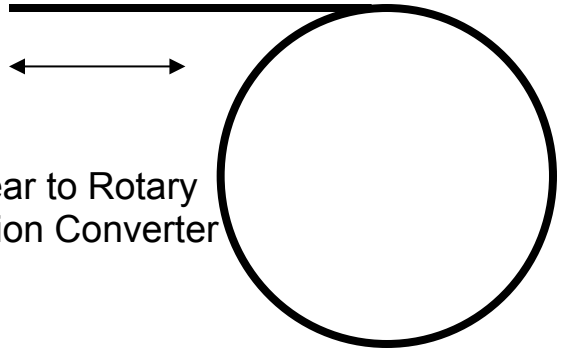
POWER FLOW AND GENERATION:

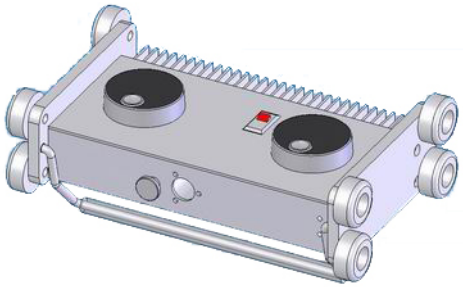


Linear to Rotary
Motion Converter

¼ HP Motor

Boost
Converter

12 V DC
2 A·h
Lead-Acid Battery



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POWER FLOW AND GENERATION:

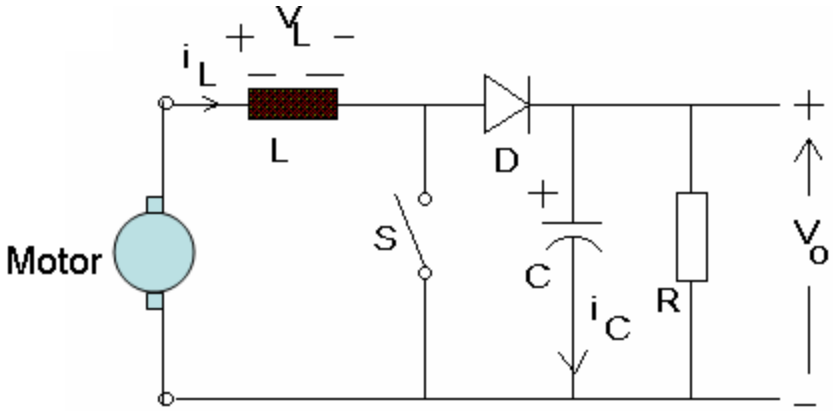
$$T = K_m i$$

$$V = K_e \omega$$

Motor Constants depend on coil geometry and magnets.

By regulating current, we can control input force. If voltage is controlled we can regulate the speed of the user's motion

Regulation of Voltage/Current is handled by Boost Converter



Boost Converter Schematic

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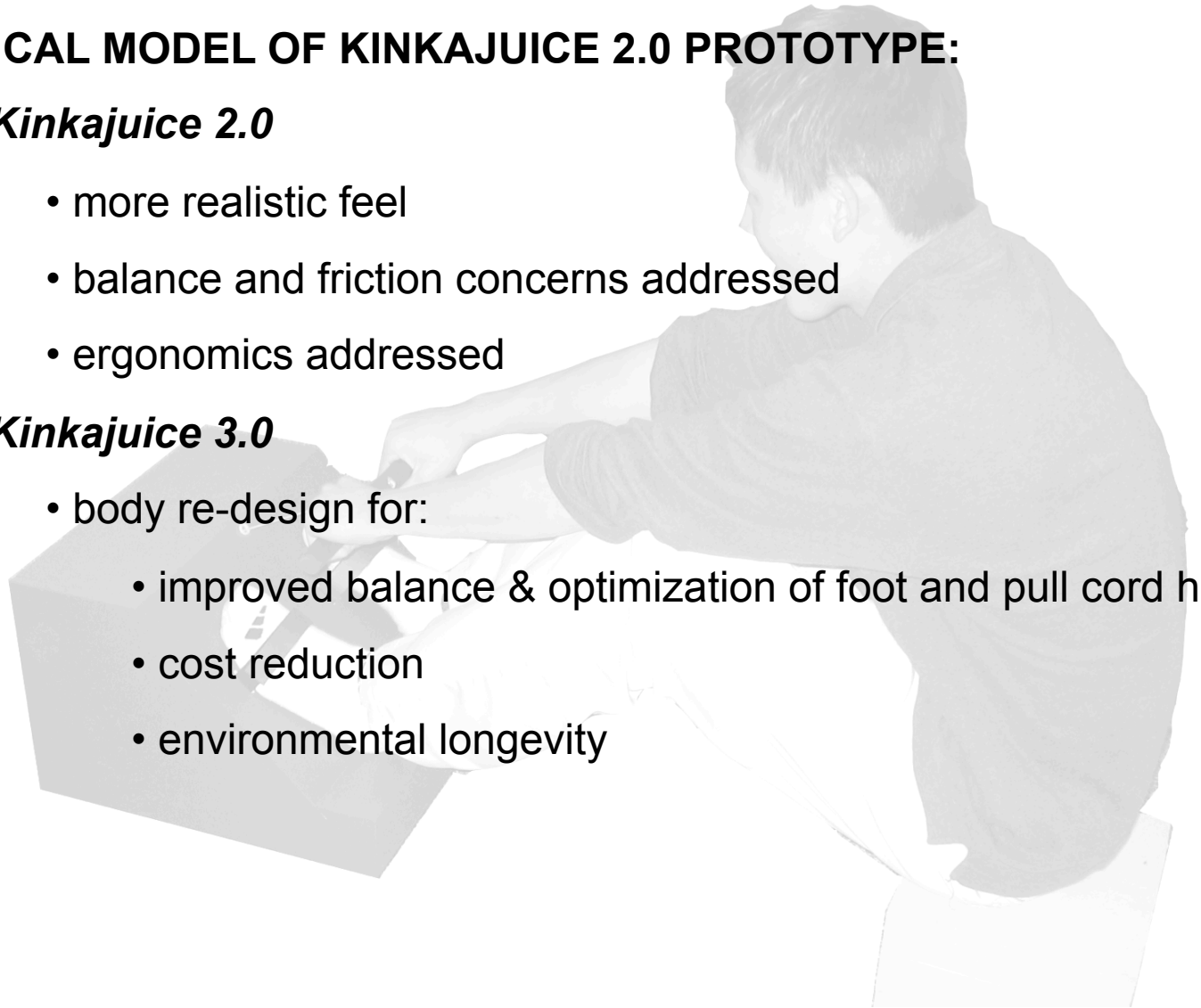
PHYSICAL MODEL OF KINKAJUICE 2.0 PROTOTYPE:

- ***Kinkajuice 2.0***
  - more realistic feel
  - balance and friction concerns addressed
  - ergonomics addressed
- ***Kinkajuice 3.0***
  - body re-design for:
    - improved balance & optimization of foot and pull cord height
    - cost reduction
    - environmental longevity



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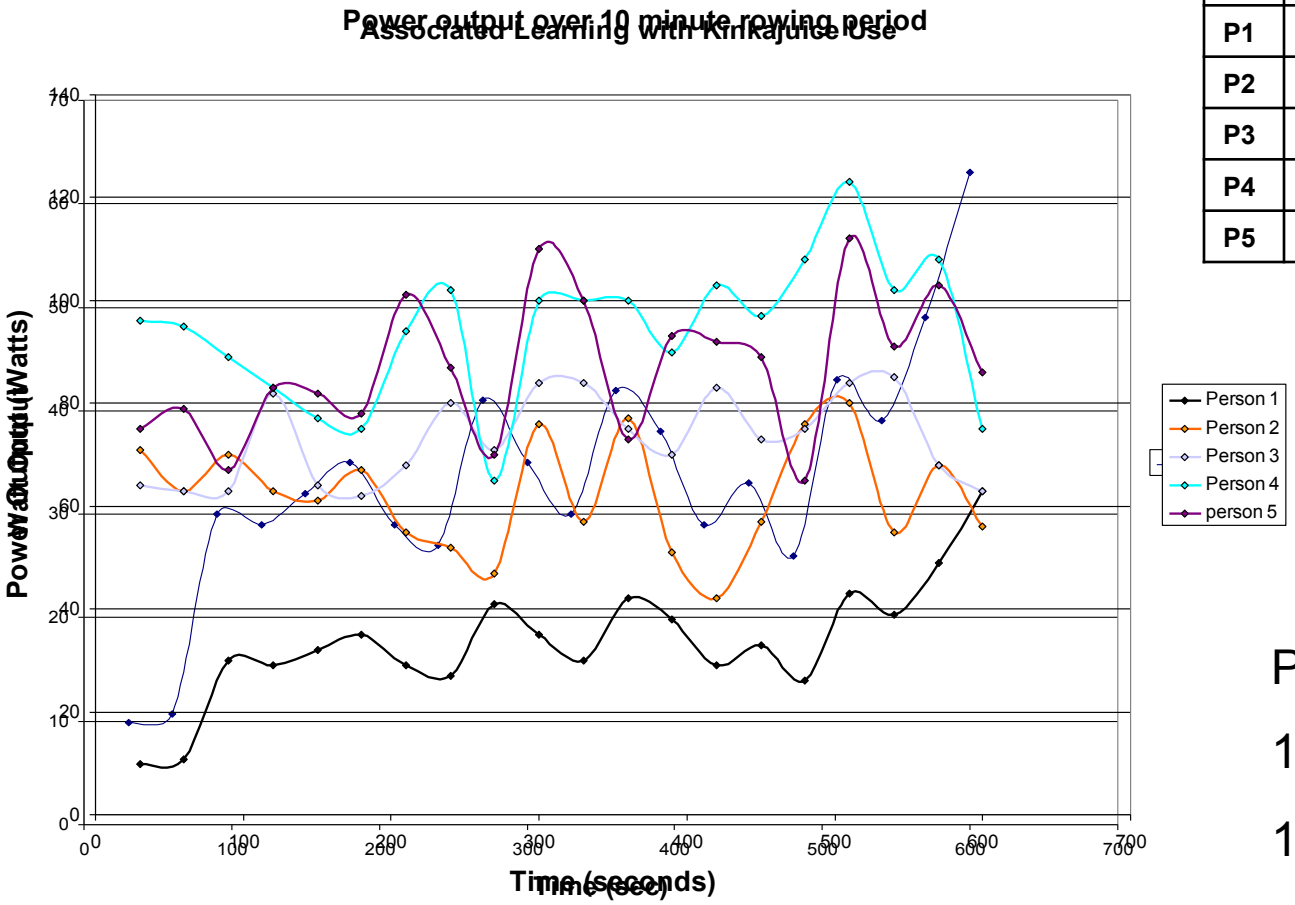
POWER FLOW AND GENERATION:



	Average Watts	Height	Sex
P1	33.53	5' 0"	F
P2	62.2	5' 10"	M
P3	73.05	5' 9"	M
P4	94.1	6' 3"	M
P5	86.8	5' 9"	M

$Power_{goal}$ = 60 W

18 minute charge

10:1 use:charge ratio

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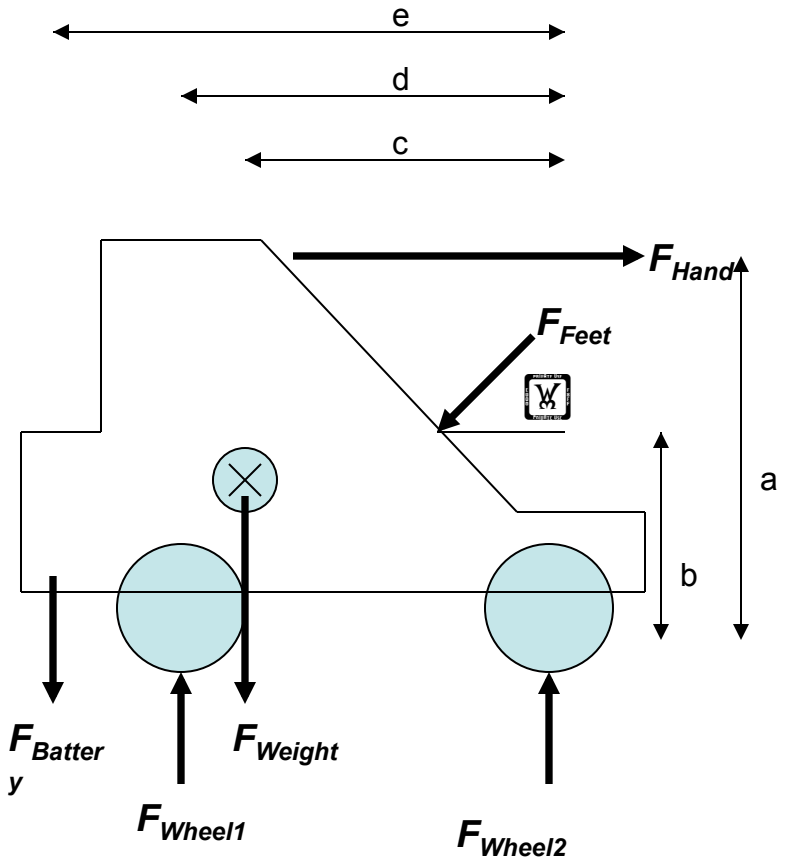
FORCE AND BALANCE CONSIDERATIONS:



How far from Center of Gravity should feet be placed to ensure stability?

$$\sum M_{Wheel2} = I\alpha$$

$$F_{Battery}e + F_{Weight}c - F_{Hand}a + \cos(\theta)F_{Feet}b = 0$$

$$b = \frac{-F_{Battery}e - F_{Weight}c + F_{Hand}a}{F_{Feet}\cos(\theta)}$$

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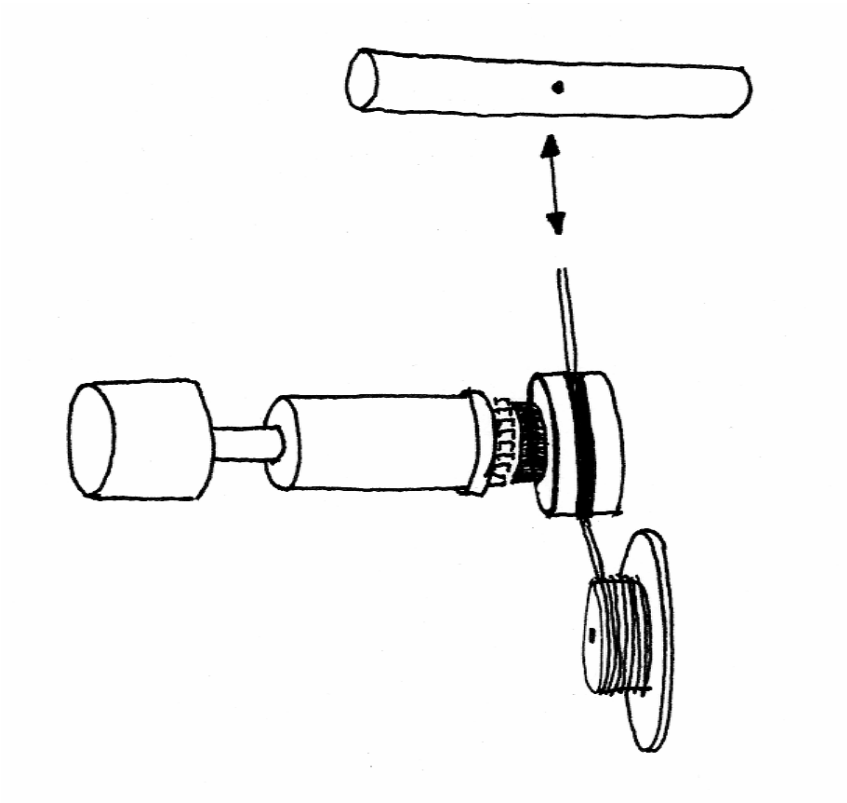
POWER GENERATION MECHANICAL ELEMENTS:



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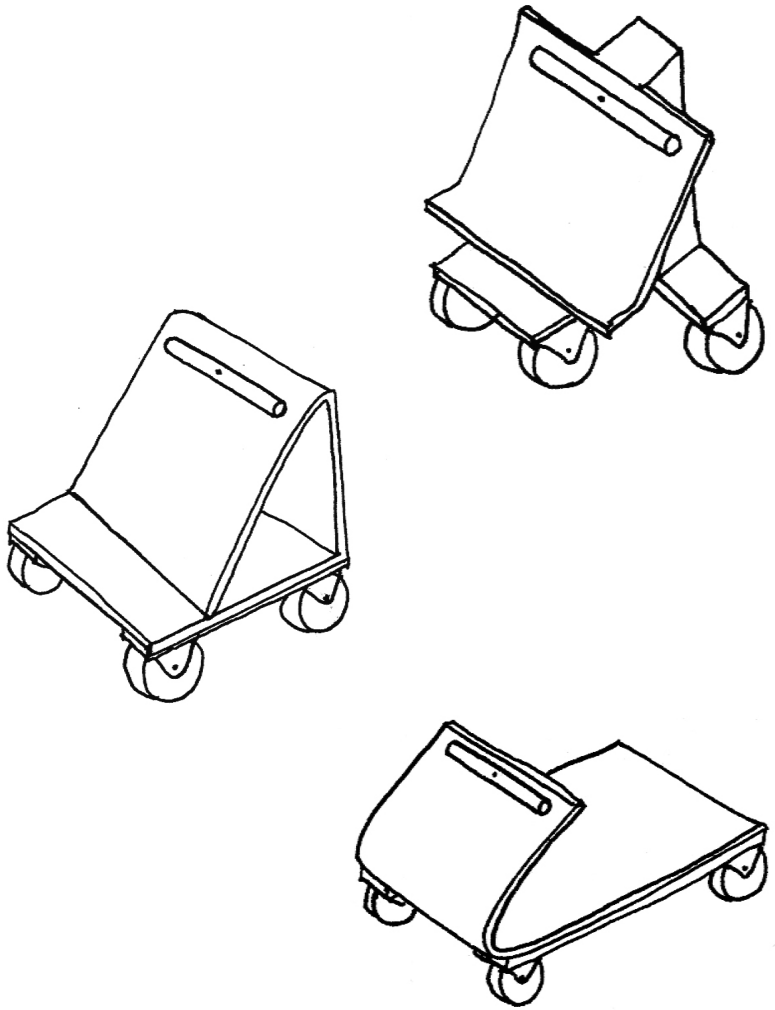
COST REDUCTION

CURRENT

- materials for prototype cost ~$100
- labor intensive construction

PROPOSED

- injection molding or thermoforming
- simplified housing
- sheet metal vs wood/fiber board



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CUSTOMER NEEDS:

- Variability of users (shape, strength (resistance), size)
  - *Large range of age groups in classes*
  - *Very robust individuals using products*
    - *if group is comfortable using it, then we're ok*
- Use on various terrain
  - Challenging – assume user can find an appropriate location
  - *Dirt roads prevalent – hard packed soil*
  - *Friction losses*
  - *Rails? -- $$$*
  - *Different tire cross section*
  - *Testing on:*
    - *Trails, common walking paths, Fresh Pond*
      - Ergonomics – comfort, user appeal
- Environmental Problems
  - *Dust, heat important to worry about*
    - *120 F baking for 1 week - test for Kinkajou*
  - *BUGS a consistent problem*
    - *Gaskets a possible solution*
- Low Cost -- $25/unit (*A+*)
  - *$50 = B*
  - *multiple smaller motors?*
- Simple human interface
  - Power connection
  - Various meters
  - *User cues IMPORTANT*
- Local repair possibilities
  - *Kinkajou must last 6 months (designed for 3 years –LED lifespan – 10,000 hrs)*

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