Motor Skills Tester

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Outline

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Problem Statement

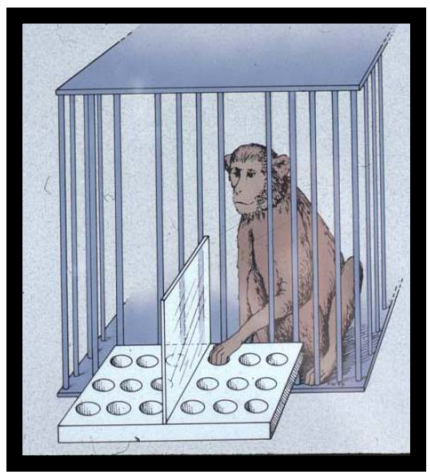
- Design an apparatus to test the fine motor skills of rhesus monkeys that minimizes the cognitive portion of problem solving; should be easy to clean, durable, adjustable for human testing, and attach to cage securely.

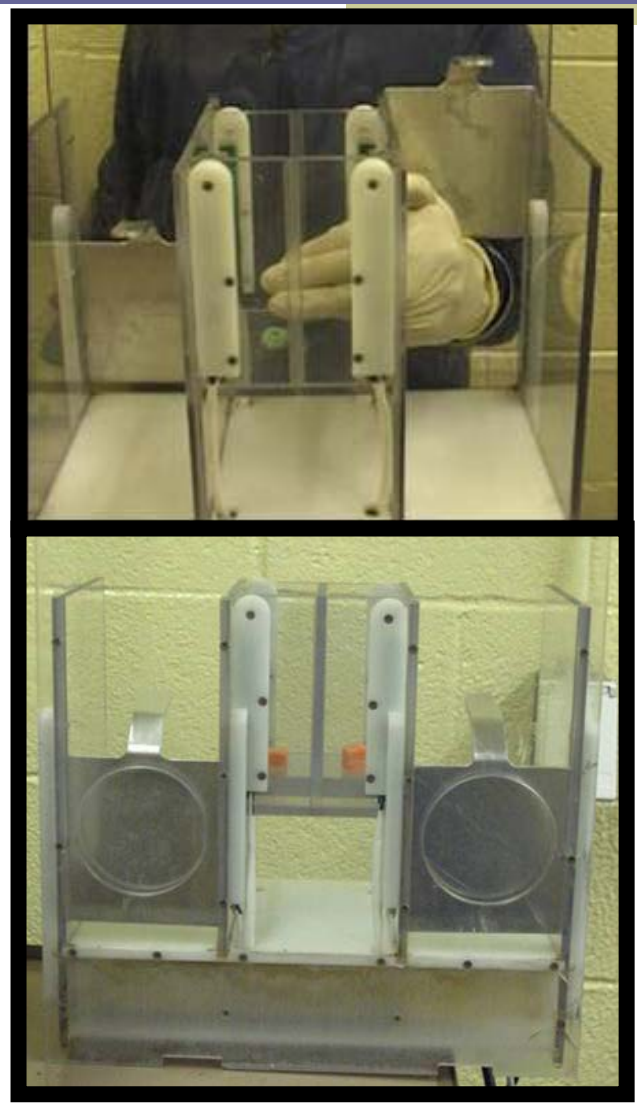
Design Requirements

- Easy to clean
- Less cognitive
- Adaptable to humans
- Durable
- Well-attached to cage
- Better photodiode system

Current Products

- mMAP
  - Monkey movement analysis panel
  - Cost: $2800
- Detached Design
  - Not attached to the cage



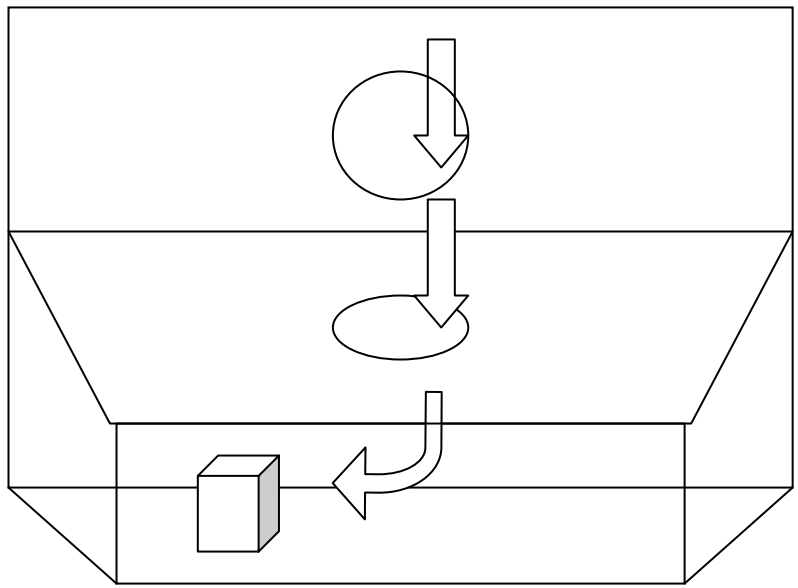


Motivation

- Current product has multiple problems
  - Diodes become dirty, signals fail
  - Apparatus is difficult to clean
  - Task challenges cognitive instead of motor skills

Hinged Box Design

- Reward set to alternate sides of hole to test each arm
- Small wells to standardize reward placement

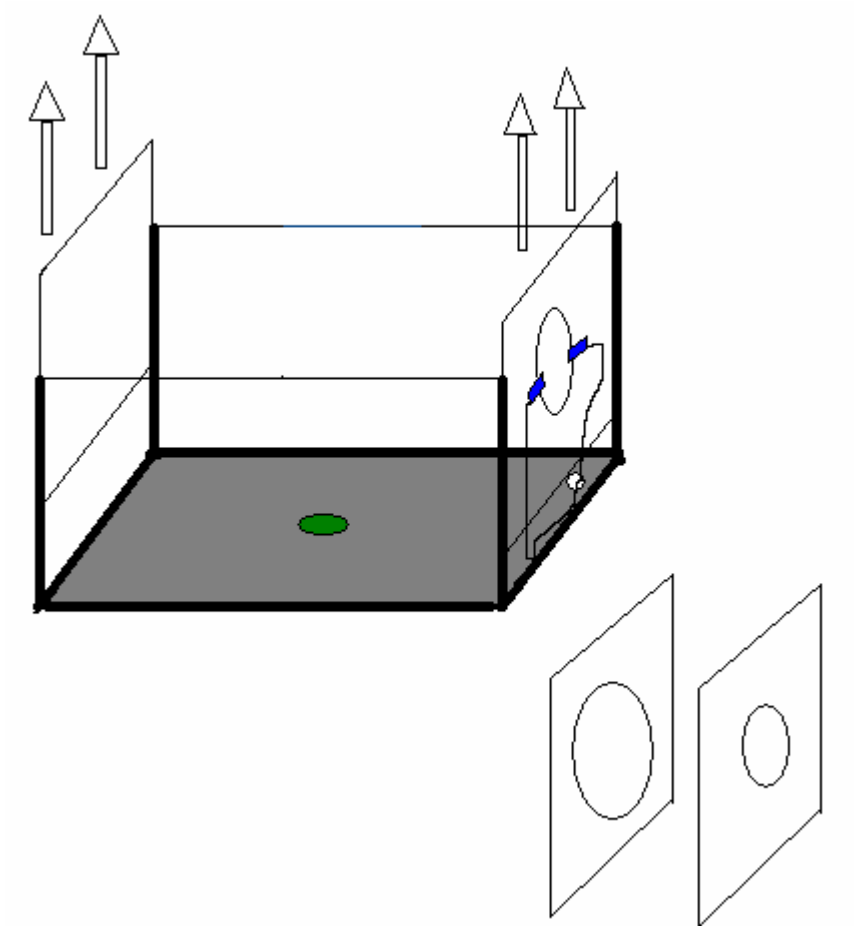


Hinged Box Design: Pros & Cons

- Pros
  - Easy to clean
  - Quick to reset
  - Little cognitive challenge
- Cons
  - May be difficult to physically reach reward
  - May not be adaptable for human testing

Simple Box Design

- Removable side panels
- Alternate side panels for right and left side testing and human and monkey use.
- Food placed in middle of box on bottom

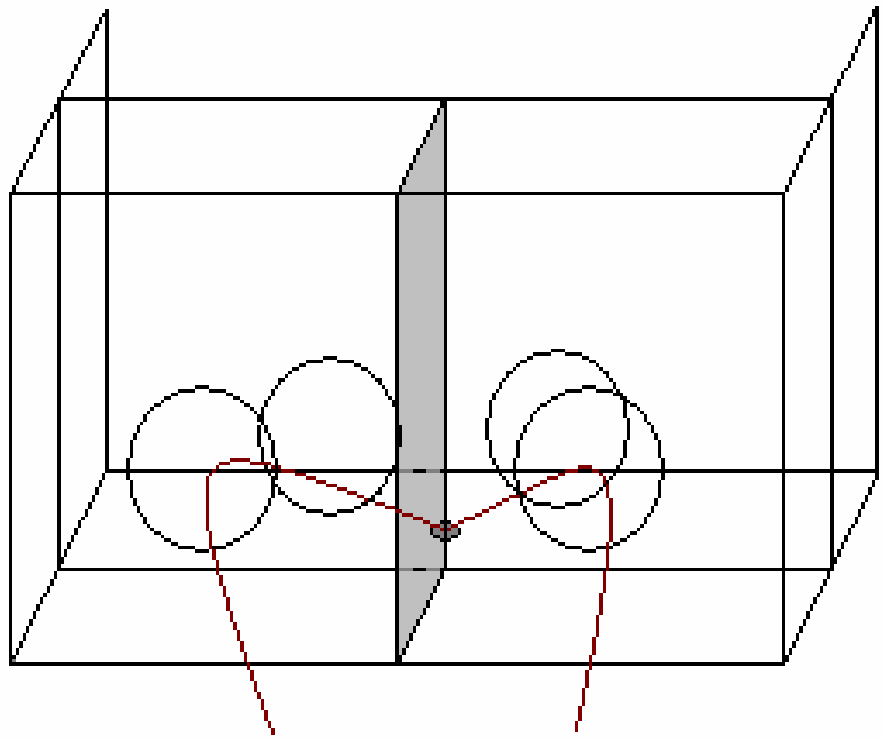


Simple Box Design: Pros & Cons

- Pros
  - Easy cleaning
  - Less cognitive
  - More versatile
    - Human/monkey
    - Left/right
- Cons
  - Food slides around
  - Removable panels difficult to secure
  - Edges sharp

Staggered Box Design

- Direct path to food
- Slight indentation for food
- Open top for easy cleaning



Staggered Box Design: Pros & Cons

- Pros
  - Less cognitive
  - Simple design
  - Easy to clean
- Cons
  - May not force monkey to use specific arm
  - May not be adaptable for human testing

Design Matrix

Design Alternatives	Cognitive Simplicity (1-10)	Ergonomics (1-10)	Adaptability for human testing (1-5)	Total Points (3-25)
Hinged Box	10	5	1	16
Simple Box	8	9	5	22
Staggered Box	9	9	1	19

Future Work

- This Semester
  - Finalize design
  - Order materials
  - Construct prototype
- Next Semester
  - Circuit components
  - Computer testing software
  - Primate testing

References

- Marina Emborg, M.D. Ph.D.
- Dopaminergic Therapy Improves Upper Limb Motor Performance in Aged Rhesus Monkeys (Richard Grondin)
- Grondin, R. and Wang, A. monkey Movement Analysis Panel (mMAP) Lexington, KY. 2000.

Any Questions?