

# Experimental Development of the

# Mobile Vestibular Platform

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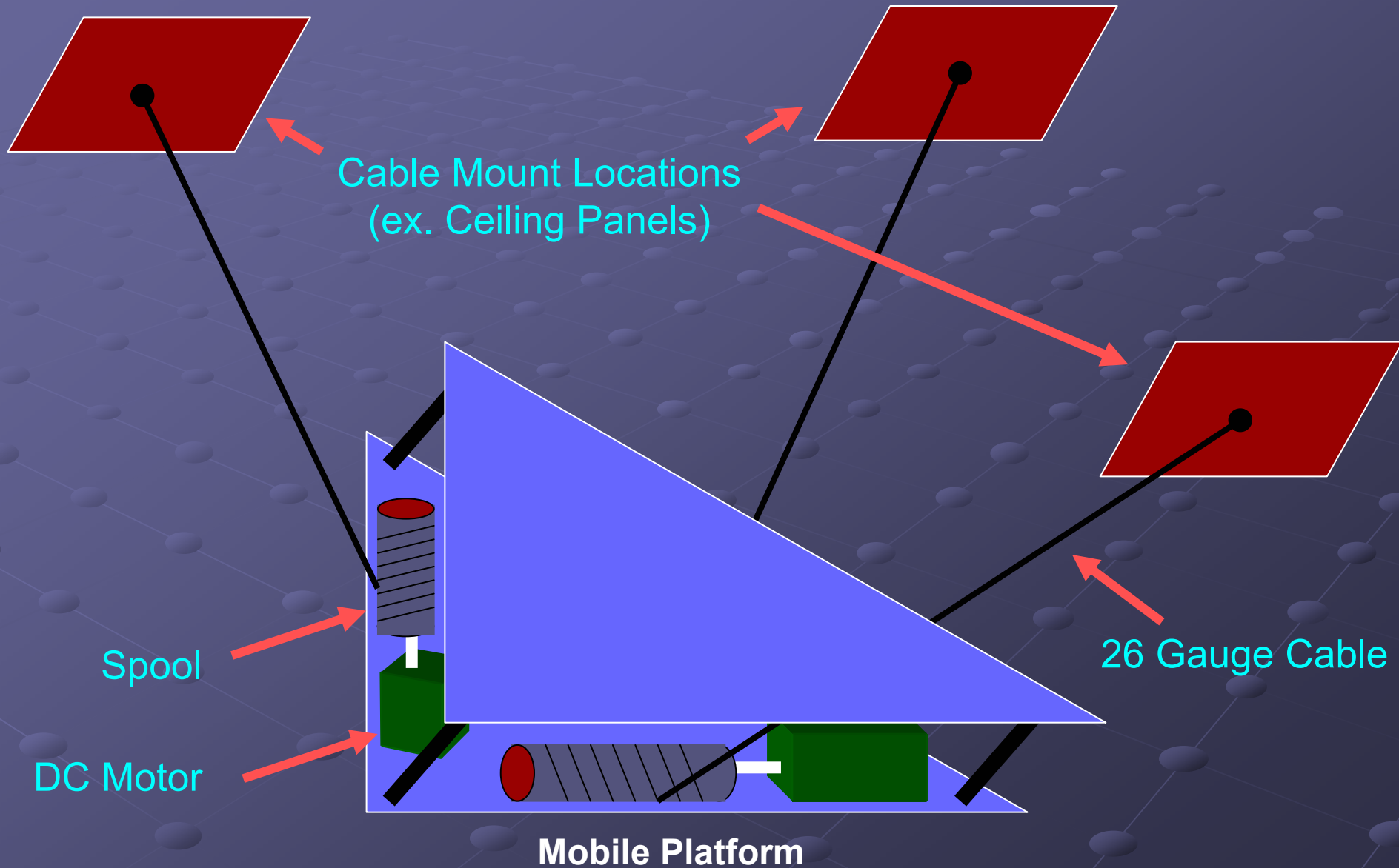
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# Parallel Cable Robotics

- Modular design: actuators, cables, end-effector
- Movement through parallel operation of actuators
- Precise mobility within a predetermined 3-D space (feasible workspace)
- Versatility in accommodating a variety of tasks

# Virtual Image



# Viable Present/Future Applications

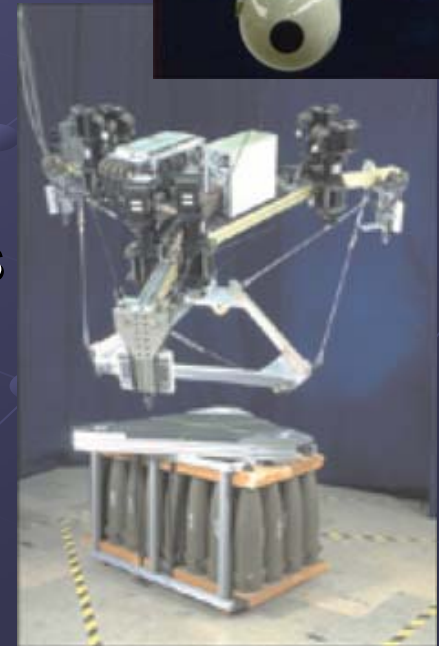
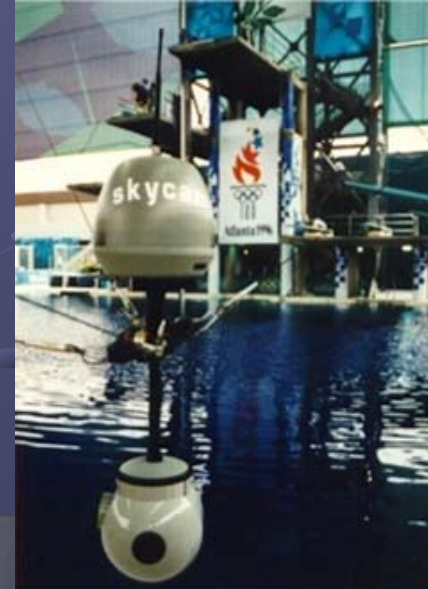
- Short distance transport of hazardous materials



- Environmental monitoring of uninhabitable, remote, or hostile locations
- Safe mine detection over small predetermined regions
- External surveillance of space craft or stations

# Contemporary Models

- Skycam: Video camera mounted robot
  - High speed mobility
  - Broadcast quality video use
  - Easily installed on pre-existing structures
- RoboCrane: Industrial quality robot
  - Designed by NIST
  - Manipulating of heavy and fragile loads
  - Precision in performing tasks

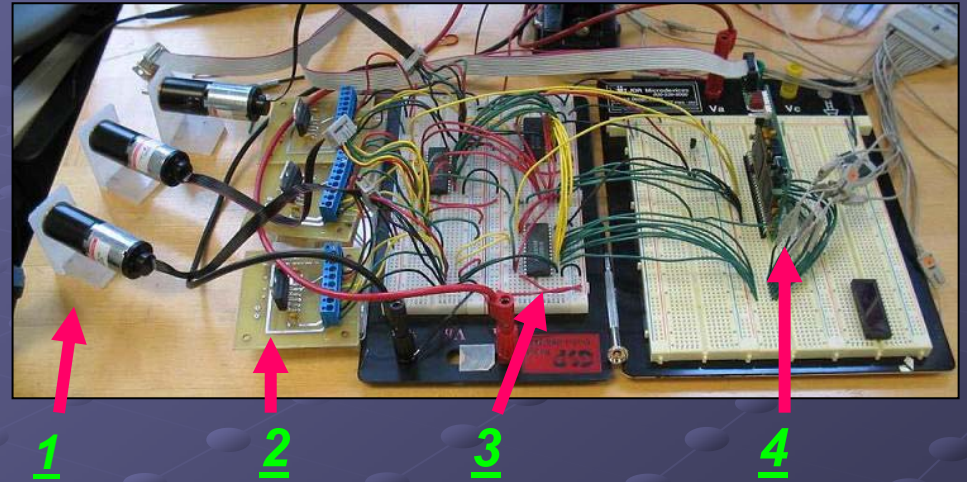
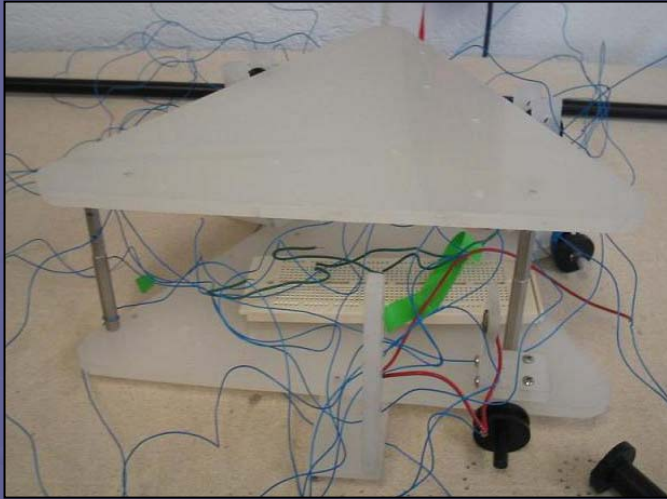


# Cable Robot Design Layout

- Overall Qualities:
  - Light-weight
  - Low cost
  - Sensor-oriented functionality
- Mechanical Aspects:
  - Suspension by three 26 gauge cables
  - Actuators controlling operation of cable spools on platform
  - Two-tiered platform (end-effector) structure



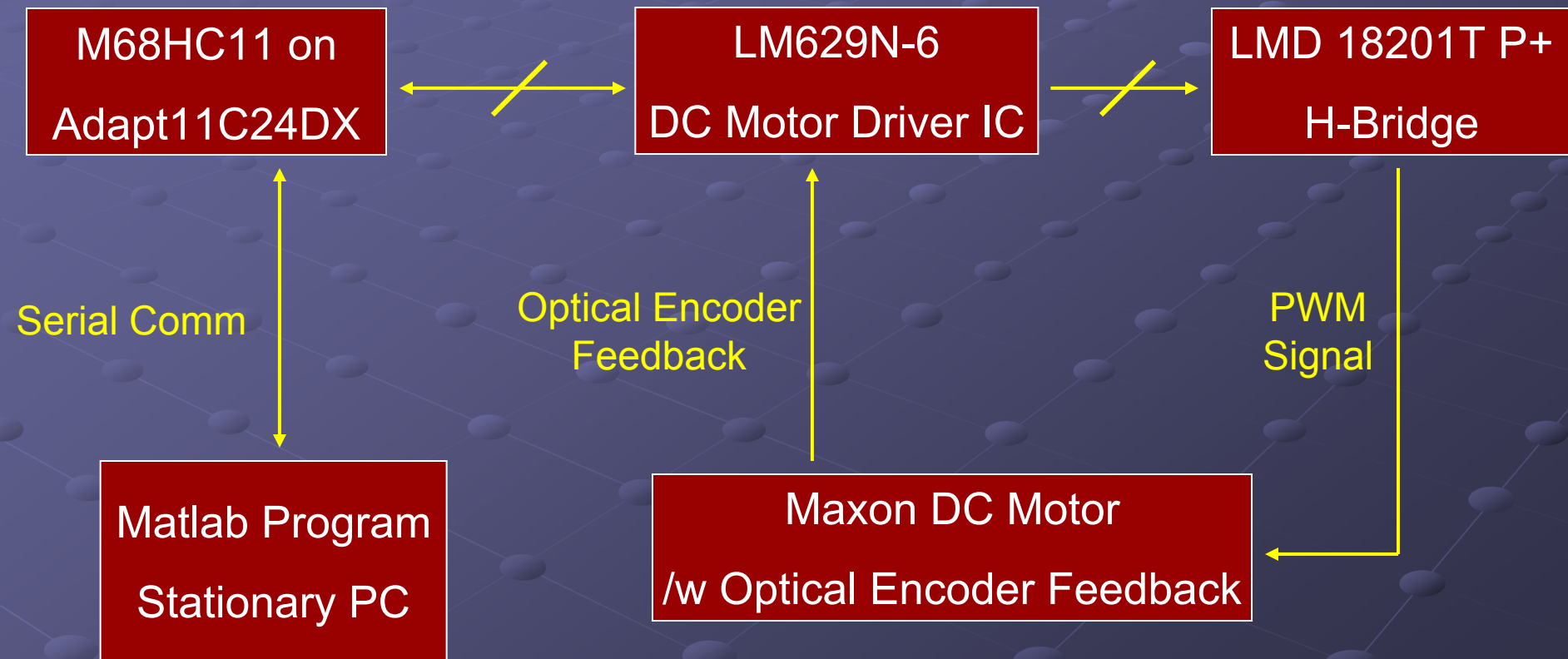
# In the Beginning ...



## Components:

- 3 - LM629N-6 Precision Motor Controller IC
- 2 - LMD 18201T P+ H-Bridge DC Motor Driver IC
- 4 - Technological Arts Adapt11C24DX Microcontroller board with Motorola M68HC11 Microcontroller with 32K EEPROM
- 1 - Maxon DC Motor with Optical Quad. Amplitude Encoder Feedback

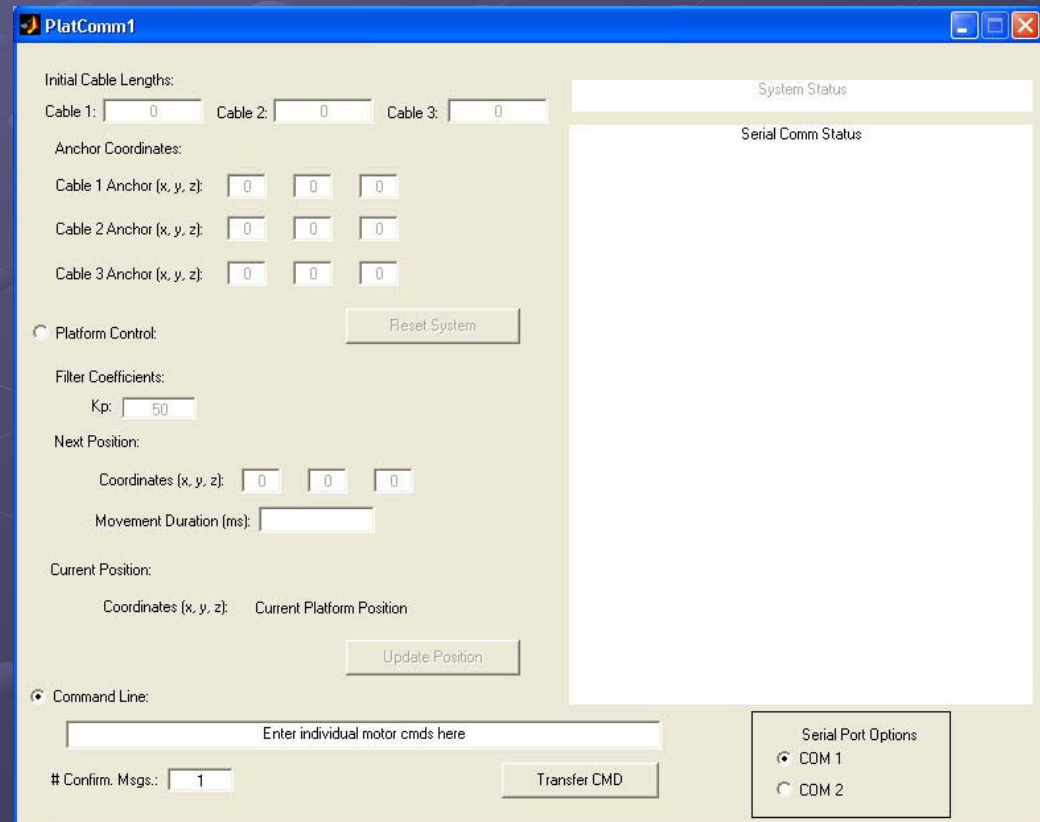
# System Module Flowchart





# Matlab Control Center

- Serial communication with microcontroller board on mobile platform
- Remote terminal control of platform operation
- Simplification of microcontroller operation
- User-friendly GUI

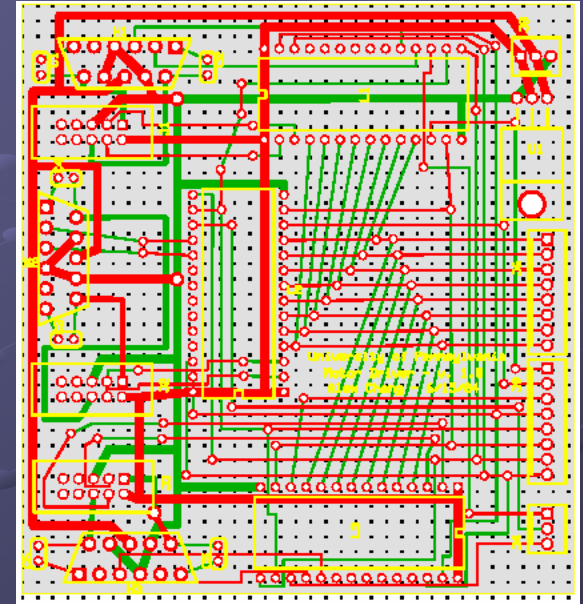


# Moving Toward Lighter Weight

## *Printed Circuit Board Design*

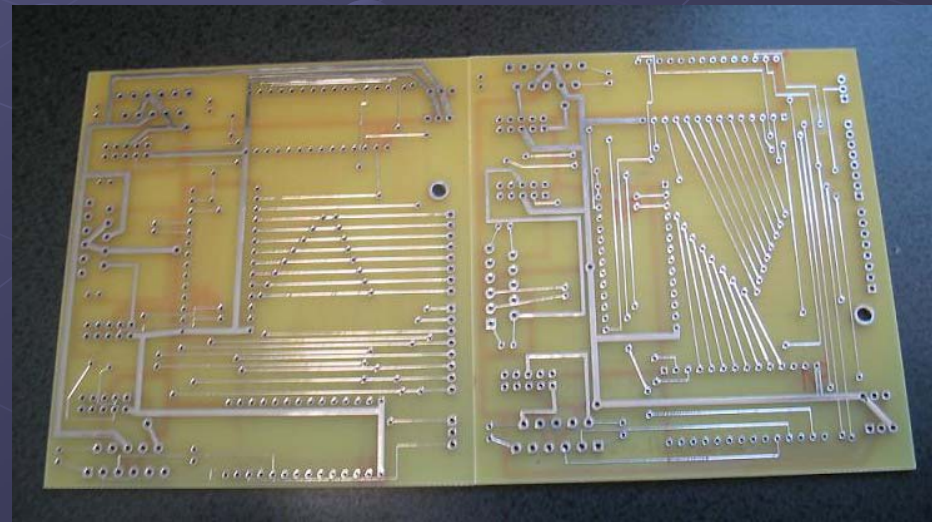
### Advantages:

- Compact arrangement: 3.6' x 3.9'
- Reduction in 'loose' wires during operation
- Very light weight and reproducible

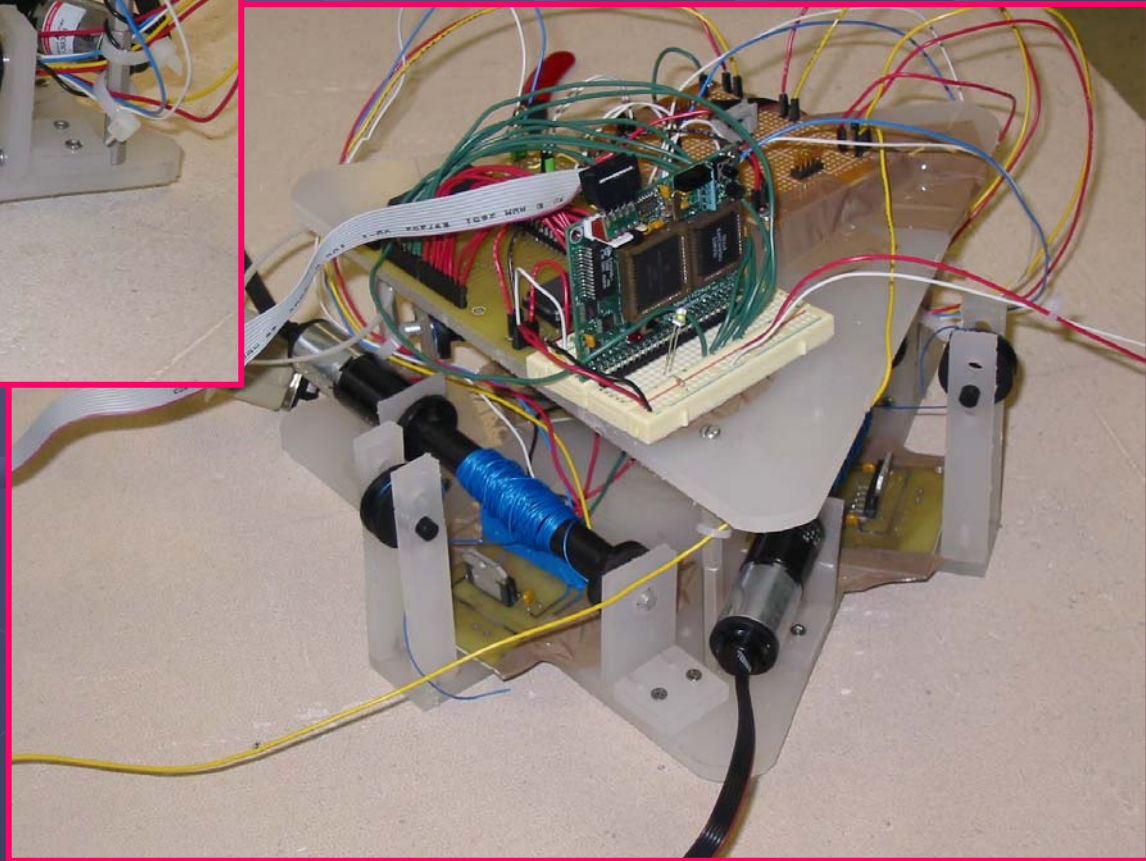
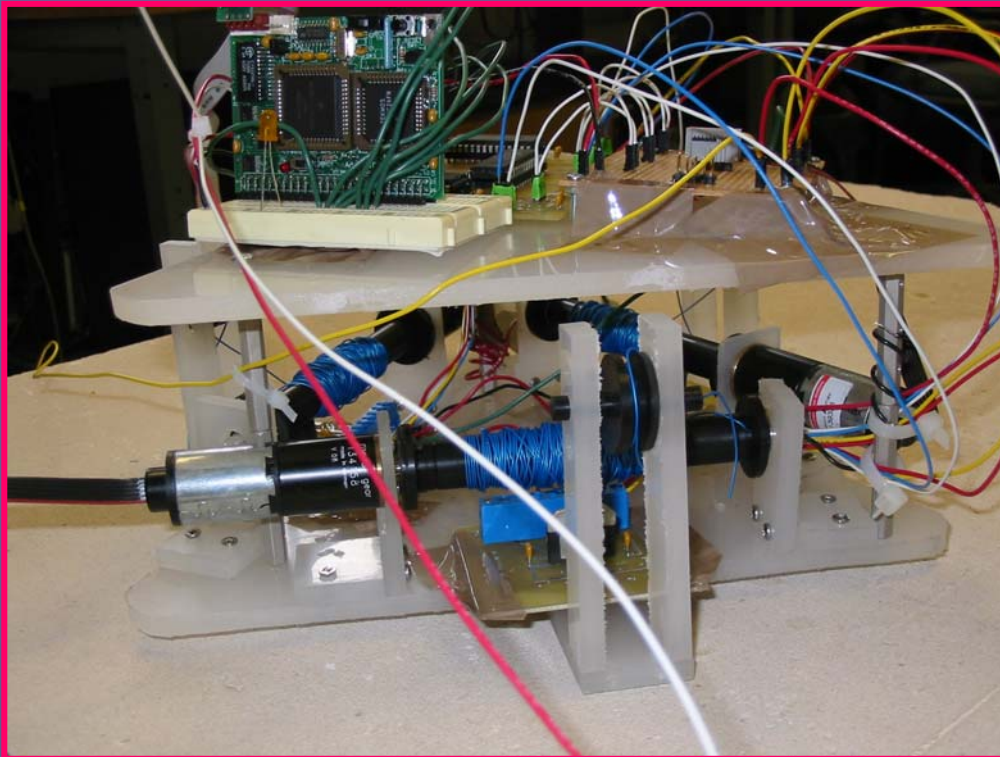


### Disadvantages:

- Electro-magnetic Interference
- Close proximity of lines
- Unintended loops and induction



# Completed Mobile Platform





# *Foreseeable Obstacles/Problems*

- Stretching of suspension cables under varying loads
- On board power supplies are easily exhaustible and produce excess load

# Future Work/Improvements

- IR remote control for manual adjustments
- Implementation of a range of sensory equipment
- More detailed analysis of capabilities of the mobile platform (ex. feasible workspace)
- Implementation of a network of mobile platforms