

Modular Robotic Locomotion Systems



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Overview

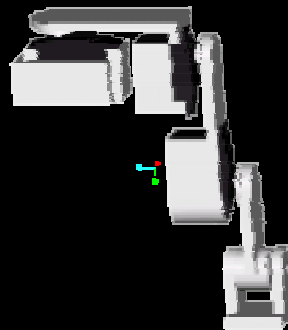
- Architecture

- Paper: “An Architecture for a Modular Robot”
- Logical
- Electrical



- Mechanical

- Leg Module
- Body



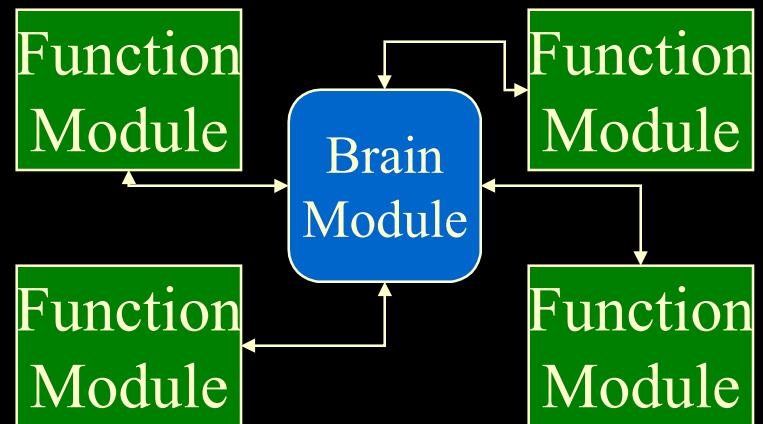
Modular?



- What is Modularity?
- Why be Modular?
 - Versatile
 - Cost
 - Robust
 - Prototyping and Testing

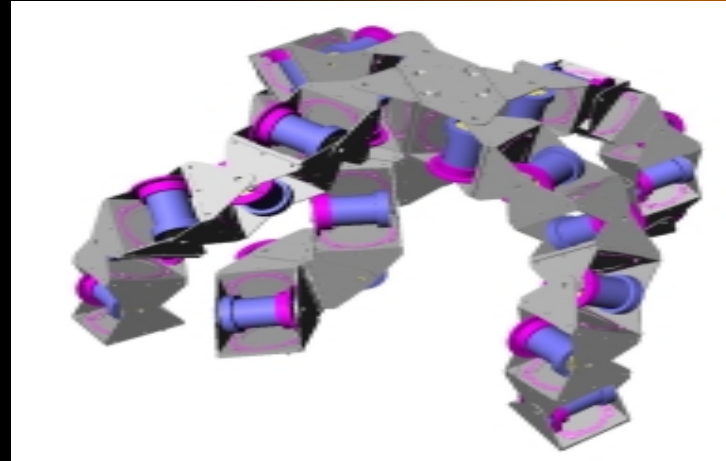
Background

- Modularity
 - Functional
 - Logical
- Our Modular System
 - Small mobile robot
 - electrical/mechanical
 - sensors and actuators



Other Work

- Polypod
- Hexplorer



Goals



- Communications Architecture
 - Network System
 - Protocol
- Modules
 - Control Electronics for Actuator Module
 - Sensor Modules

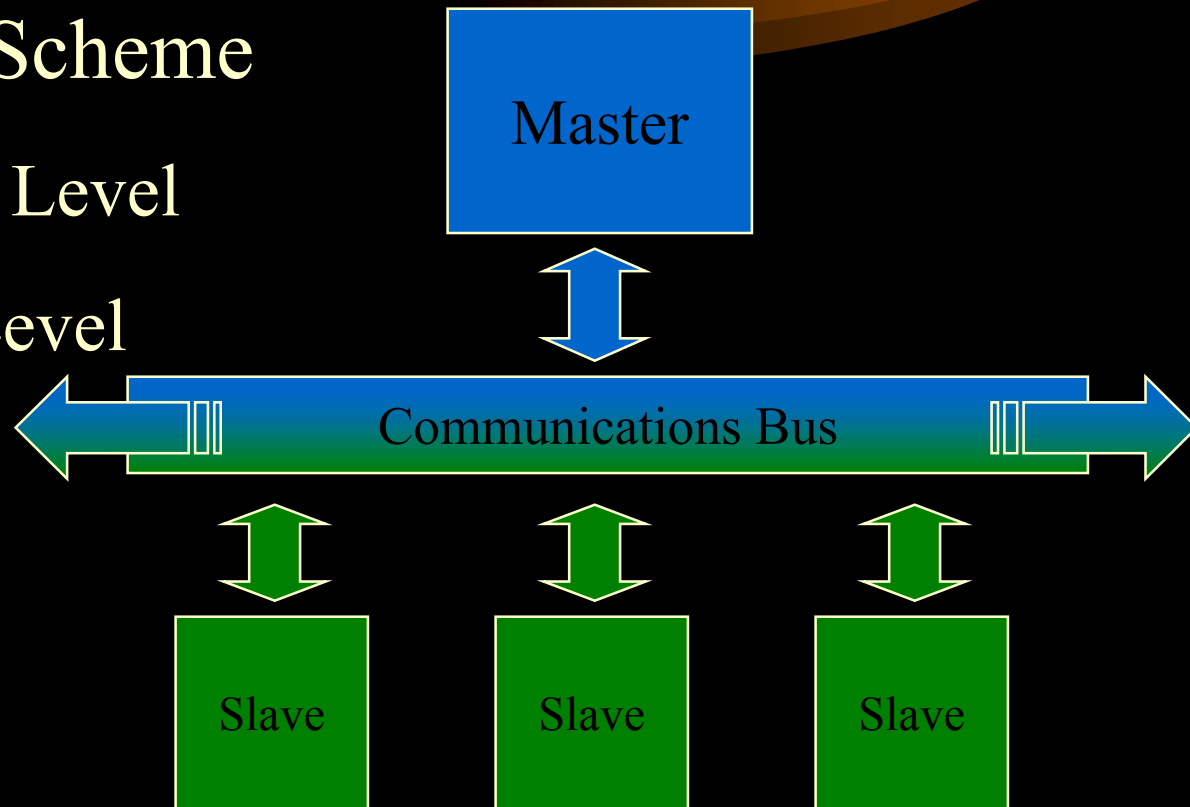
Communication

- Master/Slave Scheme

- Master: High Level
- Slave: Low Level

- Serial Bus

- Addressing



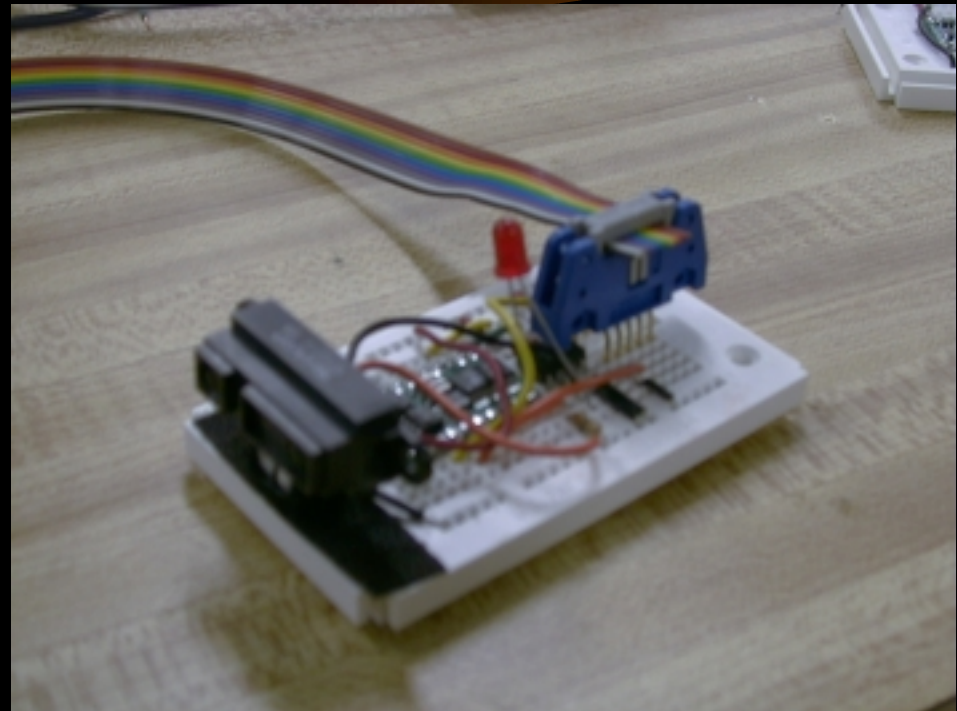
Communication



- Protocol
 - Bus Access Control
 - Modules on Bus
 - Data Frames
- Hardware
 - Microcontrollers
 - Bus

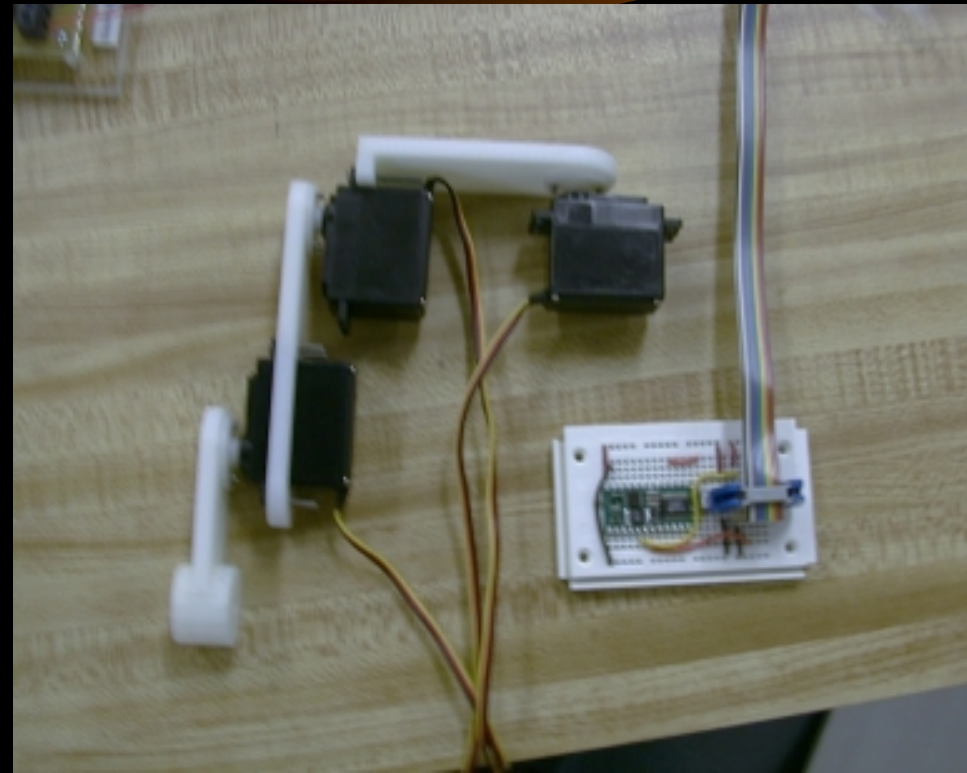
Modules

- Sensor Modules
 - Infrared
 - PSD (Position Sensitive Detector)
 - Near Infrared



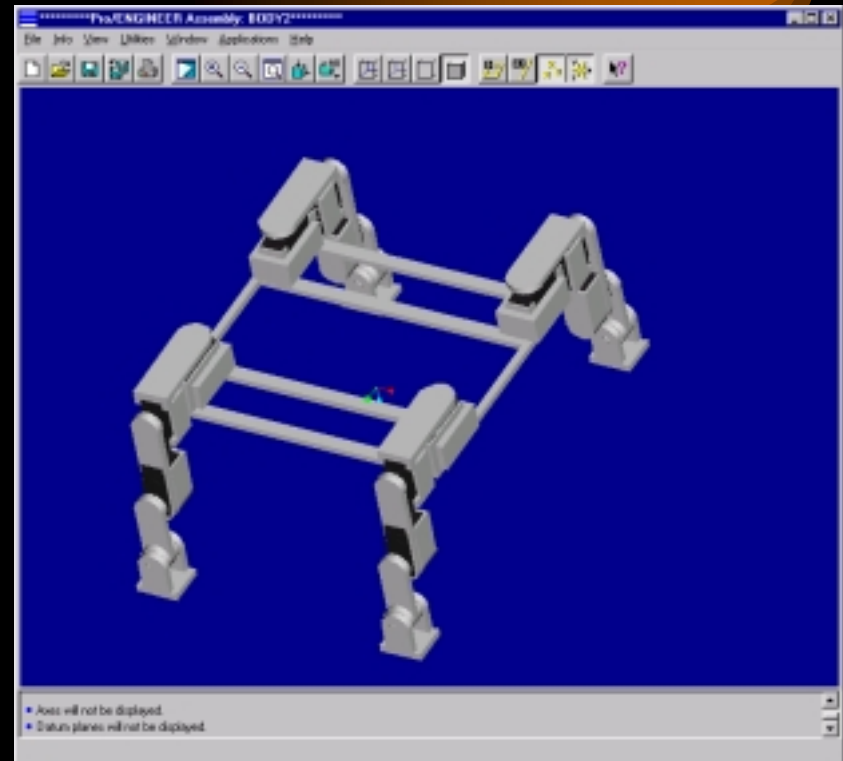
Modules

- Actuator Module
 - Three DOF leg
 - Control Electronics for leg



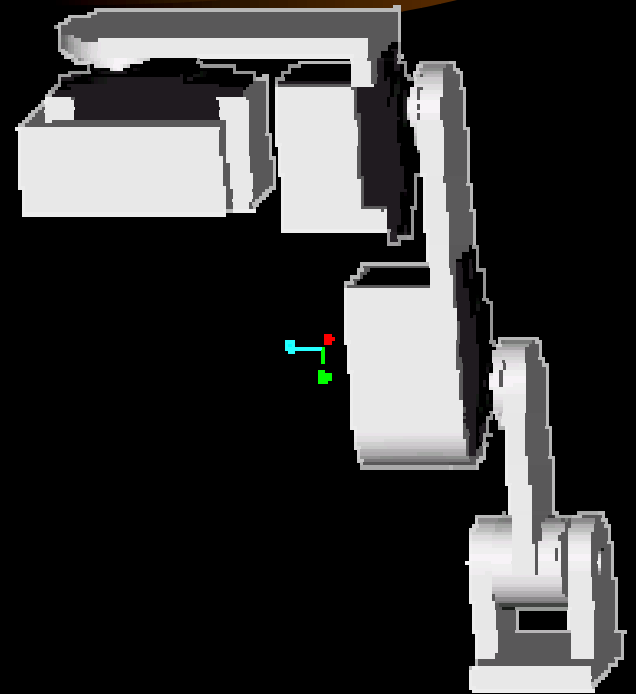
Mechanical Design

- LEG MODULE DESIGN
- BODY DESIGN



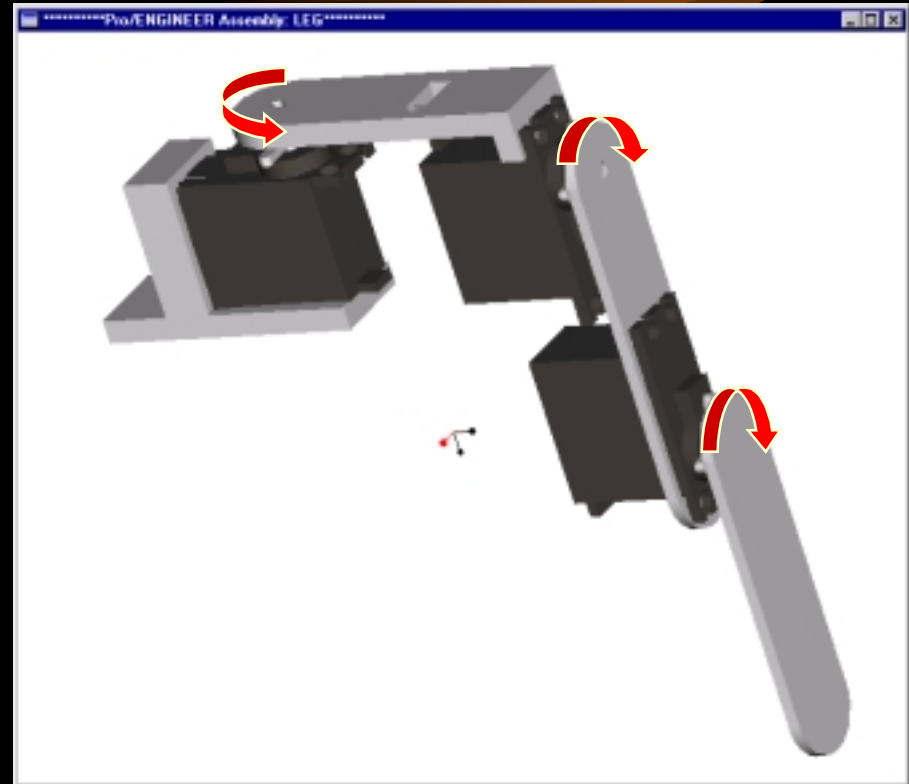
Mechanical Design

- **Separate components**
- **Easily replaced**
- **Lightweight**



Mechanical Design

- Leg Module
 - Three degrees of freedom
 - Servomotor
 - 8 “ tall x 1.25 “ thick



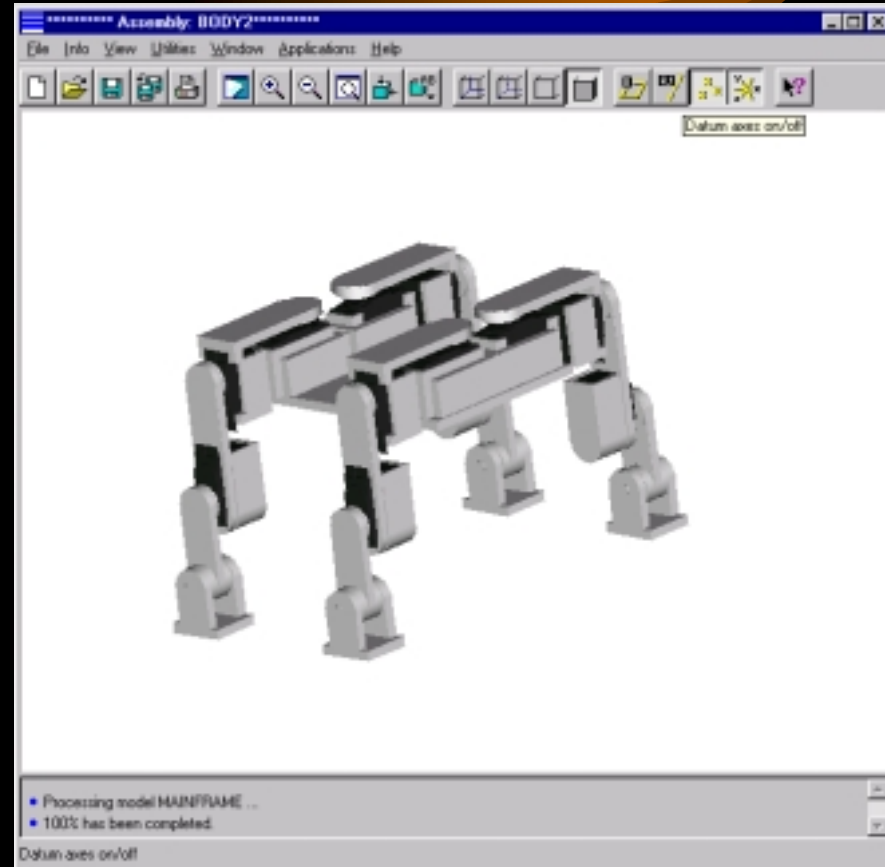
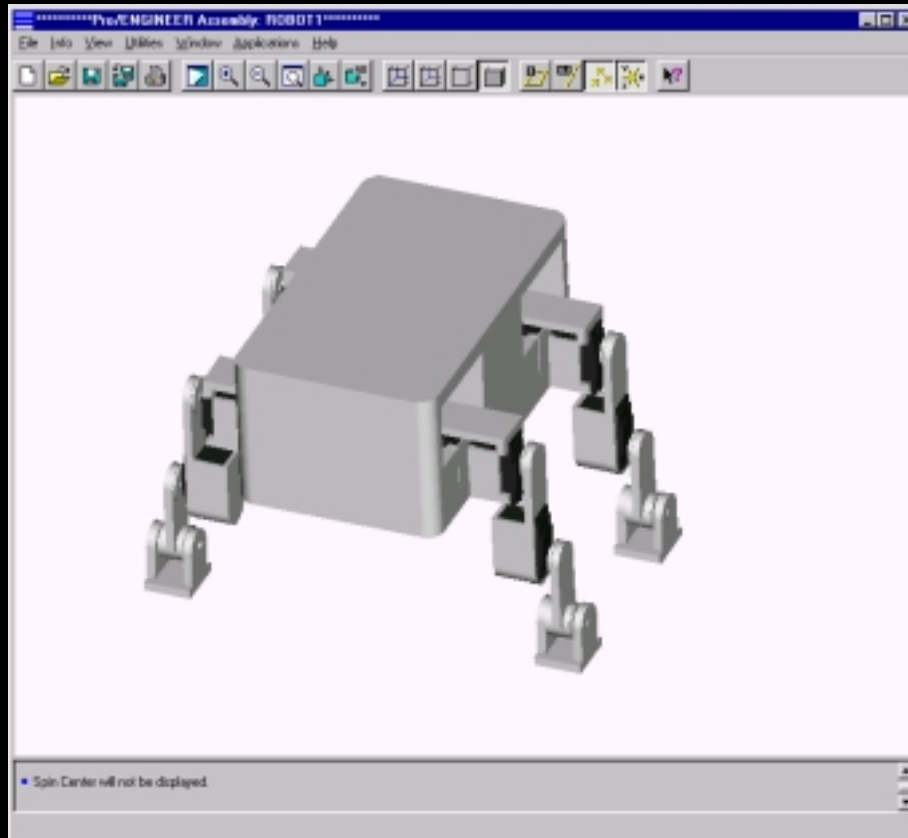
Construction

- **CAM**

- PRO/E
- QuickSlice
- FDM

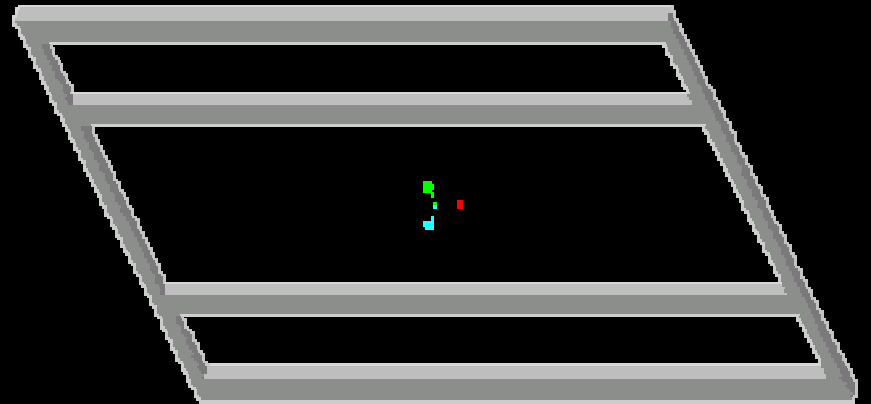


Considerations

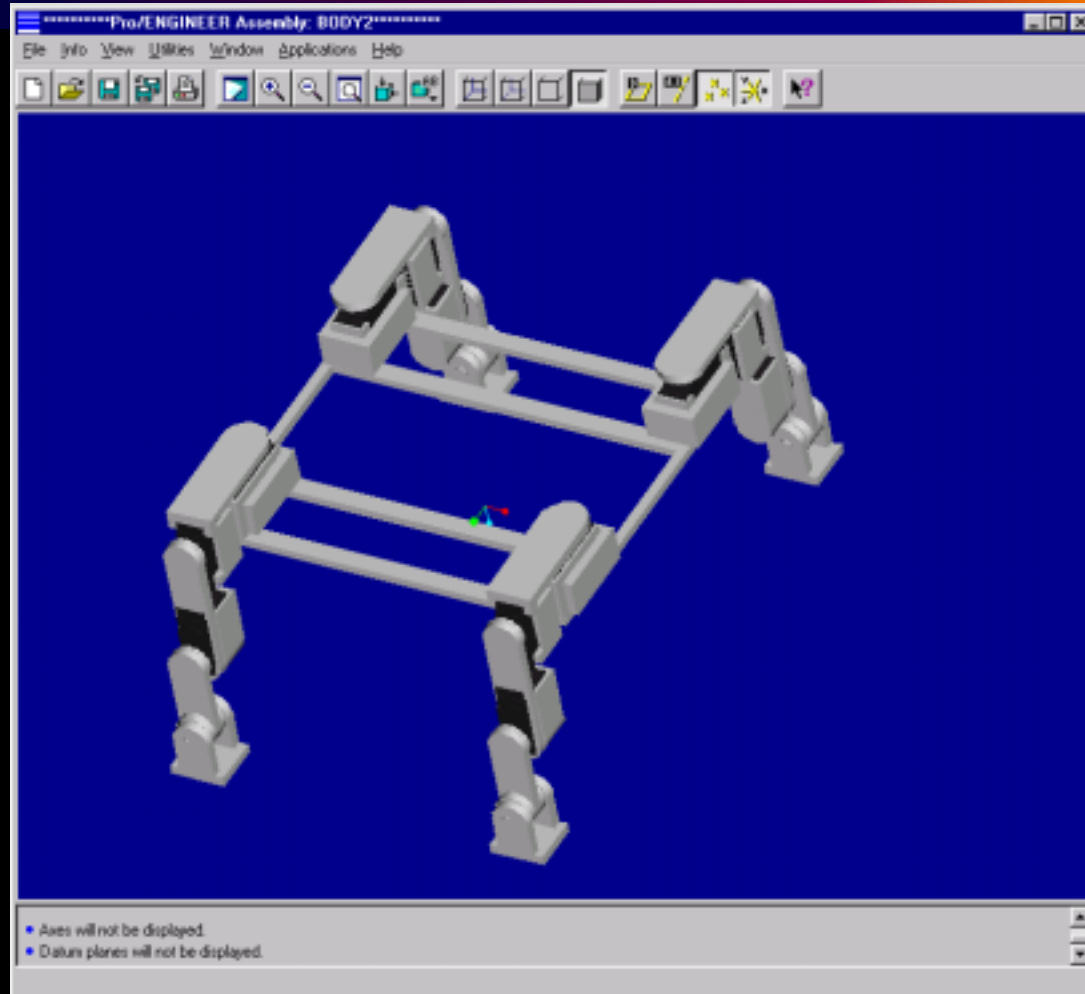


Mechanical Design

- **Aluminum Frame**
- **Plexiglas Components**

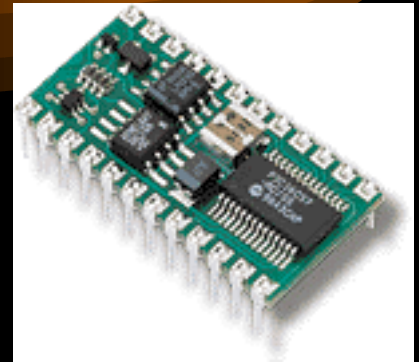


Mechanical Design



Implementation

- Microcontroller
 - BASIC Stamp II
 - Successfully networked
 - Used Master/Slave scheme
- Serial Bus
- Power Bus



_____	VDD
_____	GND
_____	Slave SND
_____	Slave REC
_____	IRQ

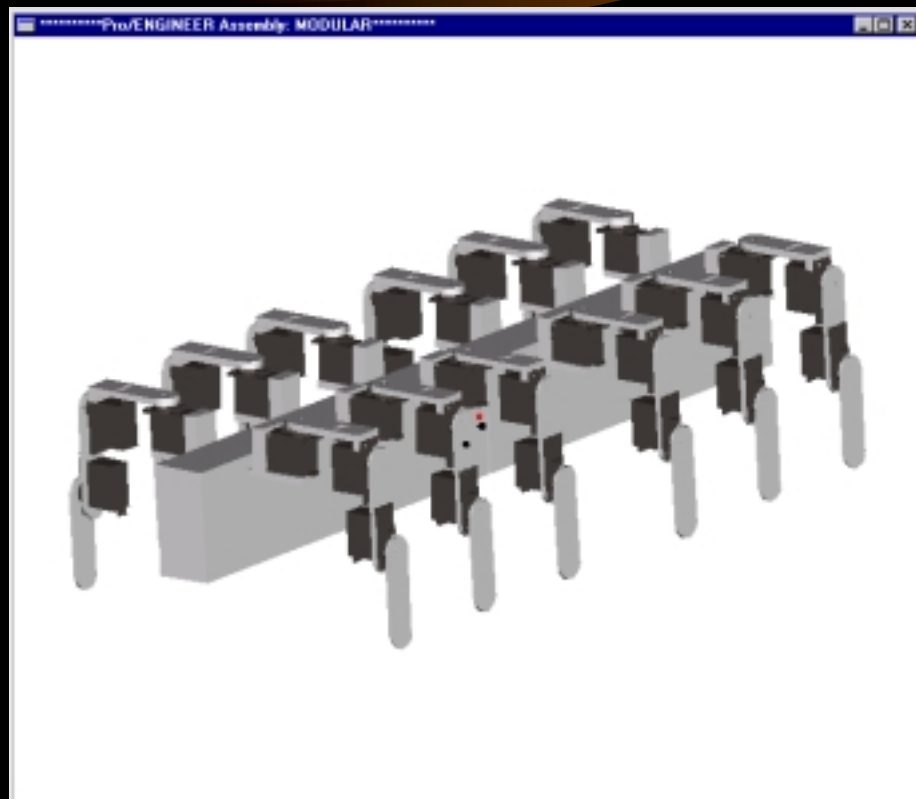
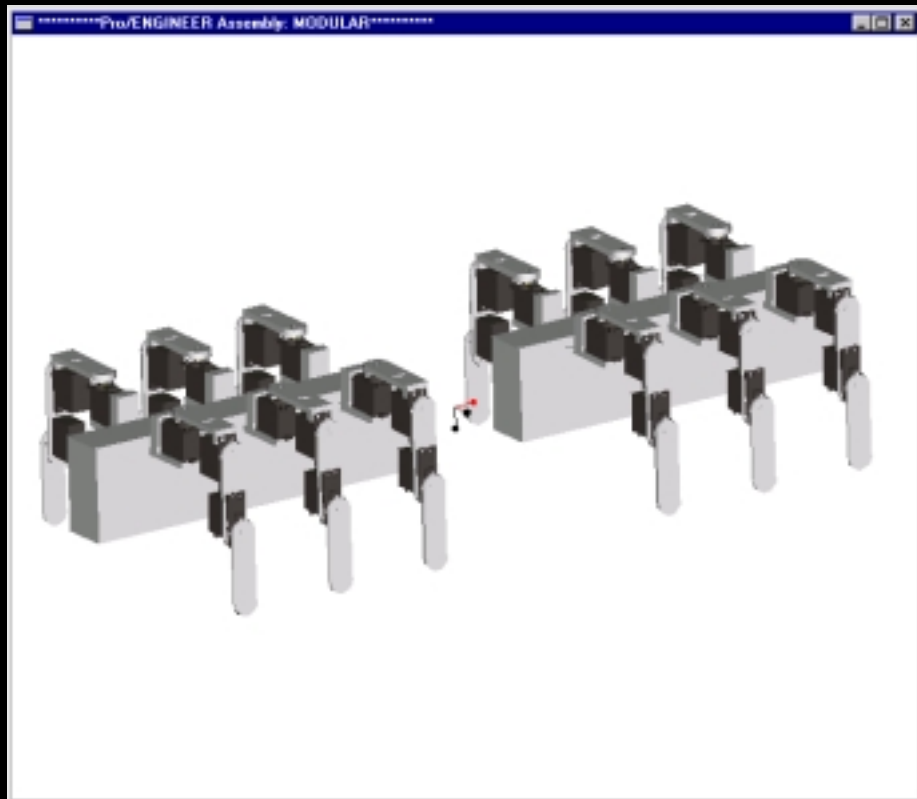
_____	V1
_____	V2
_____	GND

Results & Conclusions

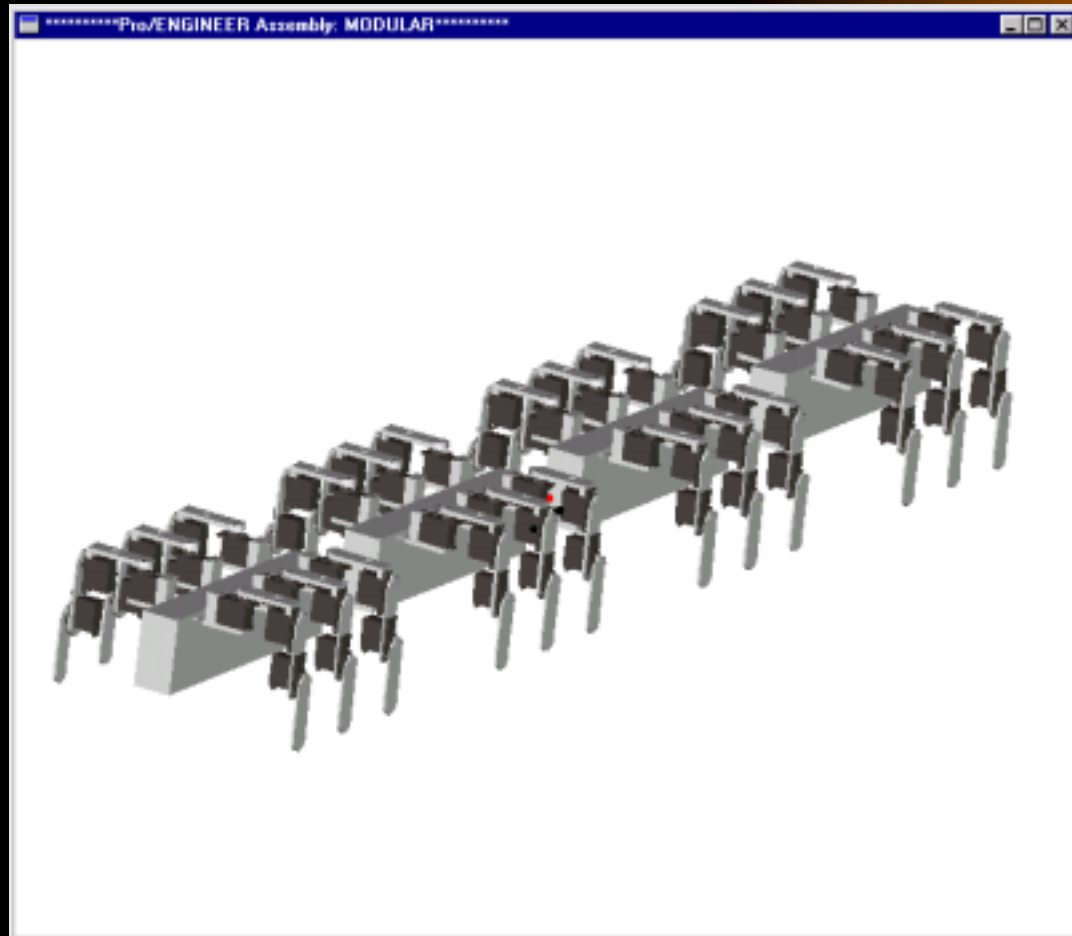


- Multiple Sensor and Actuator Slaves were controlled by a Master on the Bus
- This Architecture has great potential for the control of a modular robot
- Further testing is needed to ascertain all of the strengths and weaknesses of this architecture

Possibilities



The possibilities are endless. . .



Future



- Finish Construction of Prototype
- Further Research on Modular Connectors
- Design and Construction of more modules

QUESTION/ANSWER



- Questions?