NESL Networked & Embedded Systems Laboratory

UCLA

RagoWorld: The Next Generation in ReMote Gaming

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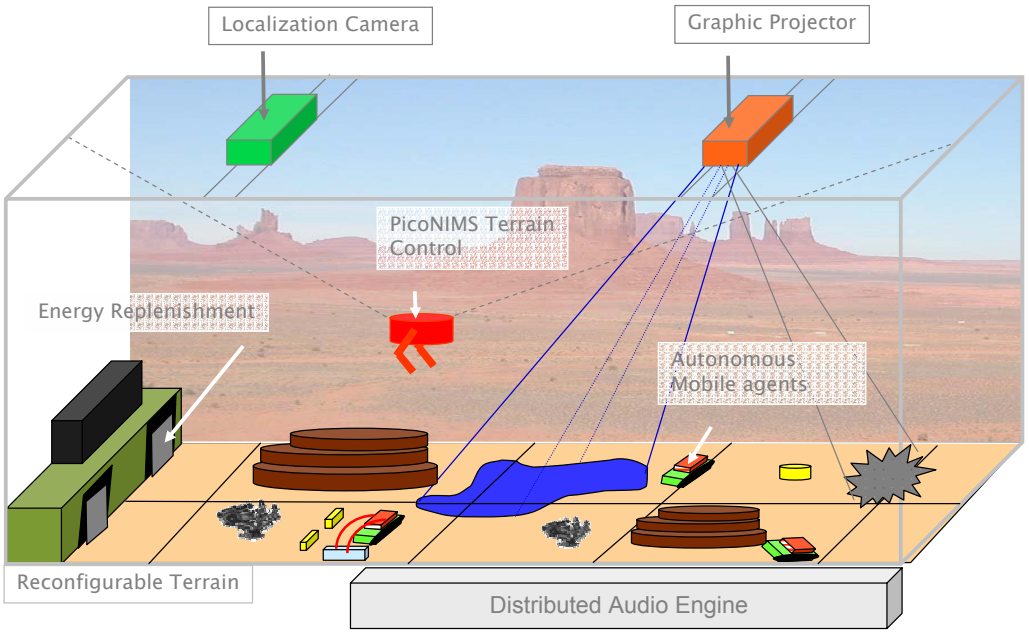
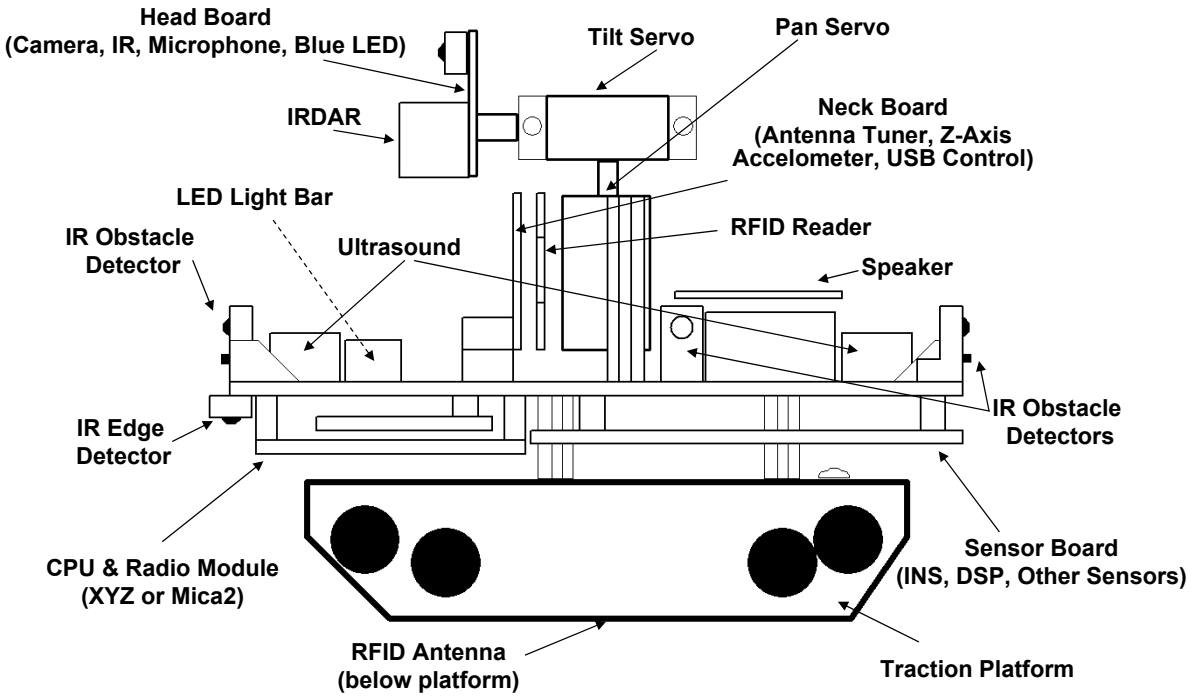
Behind the Bot: A RagoStory

- Entertainment
  - Provide new interactive gaming environment
  - Visual interesting and new potential games
- Education
  - Fun platform for students to learn about embedded robots
  - Provide teaching aids for complex systems
- Research
  - Provide reconfigurable mobile platform for embedded research
  - New directions in adaptive actuation and coordinated operation
  - Isolate test algorithms by shifting other functionality to central server

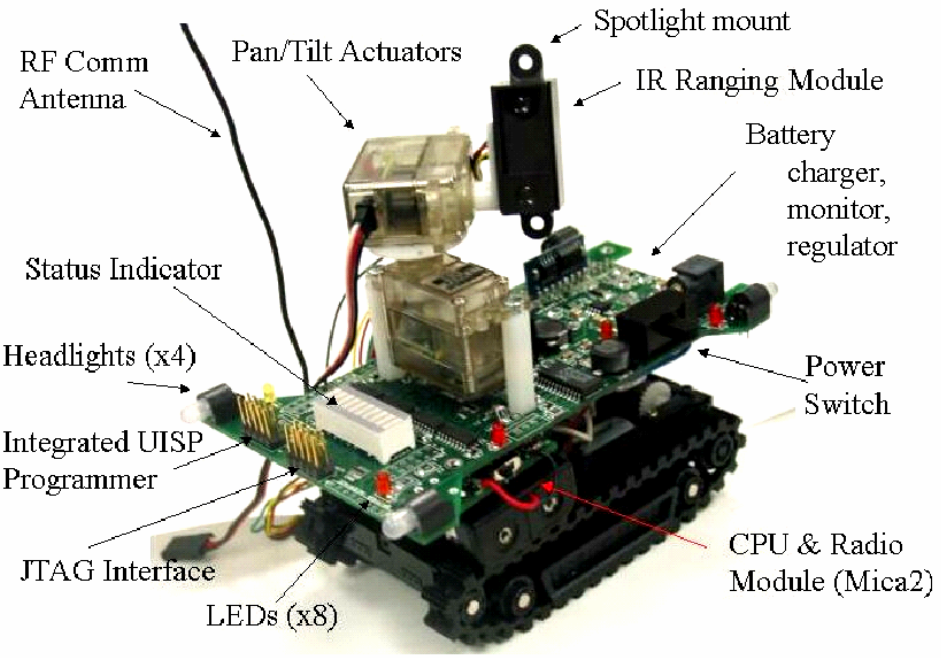
RagoWorld: Robogaming Environment



Now Presenting: Ragobot



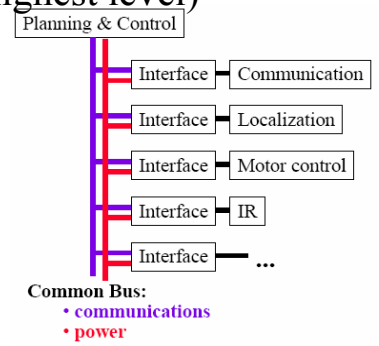
Ragobot Rev. 1, Say Cheese



Hierarchy of Modularity: Concept

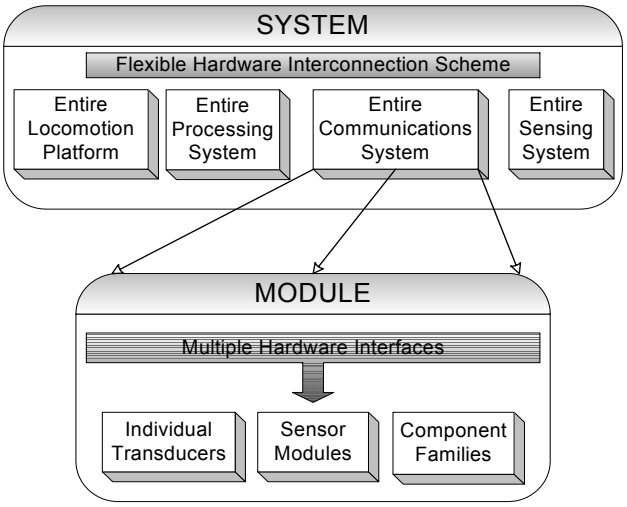
Advancing Small-Scale Robotics!

Static Modules
(modularity only at highest level)

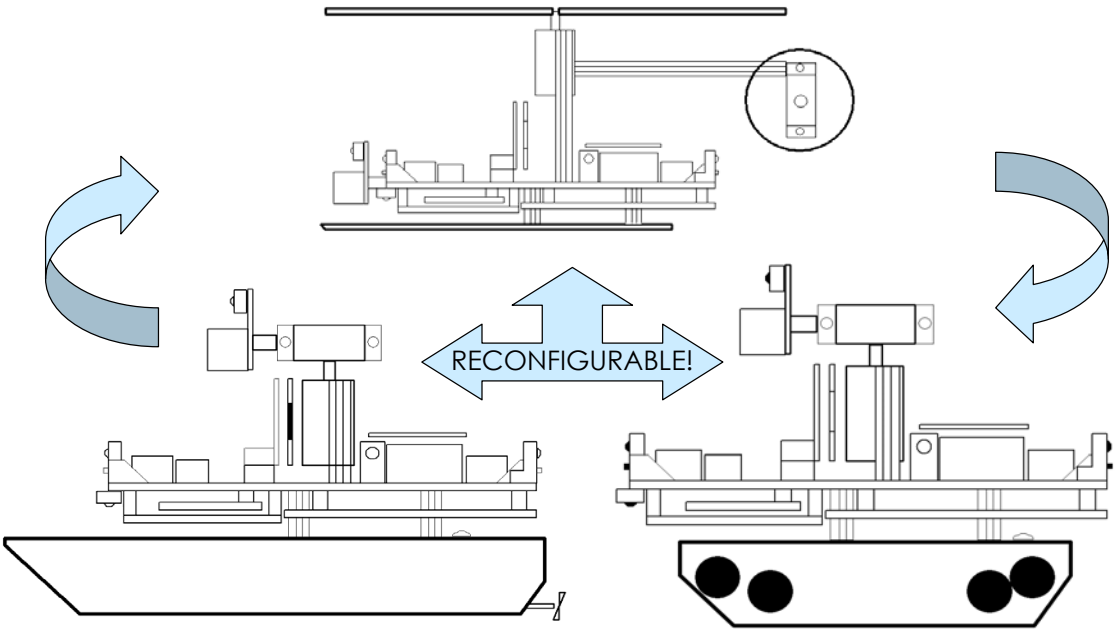


Source: L. Navarro-Serment, R. Grabowski, C. Paredis, P. Khosla. Robotics Institute, Carnegie Mellon University, *Modularity in Small Distributed Robots*

Dynamic Modules
(modules within modules)

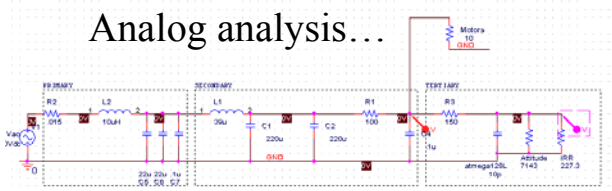


Hierarchy of Modularity: The RagoFamily

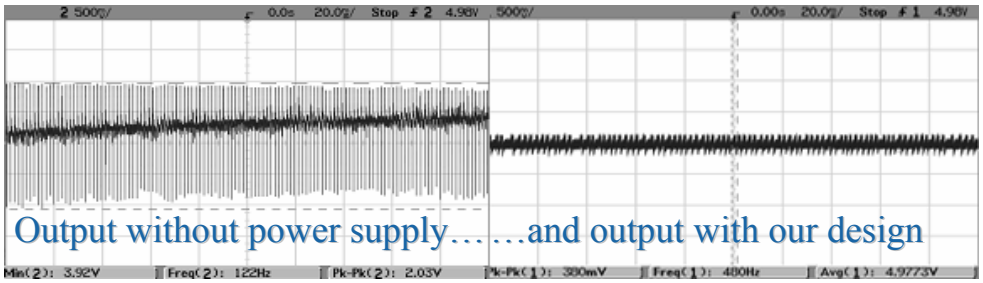


State-of-the-Art Design: Power Supply

Analog analysis…



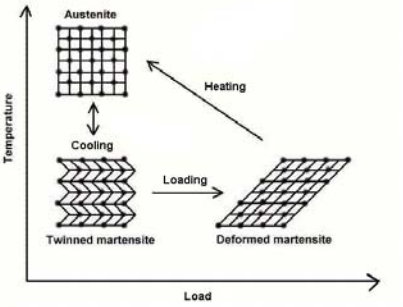
…matches actual hardware!

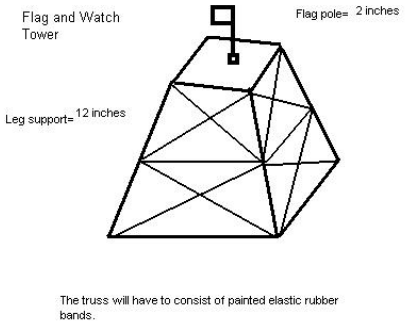


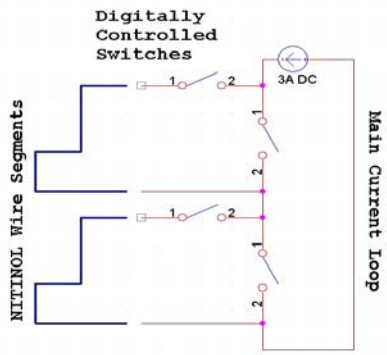
Worst case performance is **only 3.8% fluctuation** to high-current systems and **only 0.9% fluctuation** to sensors, processor, and radio under ½ Amp surge at **94% efficiency**!

Actuated Structures

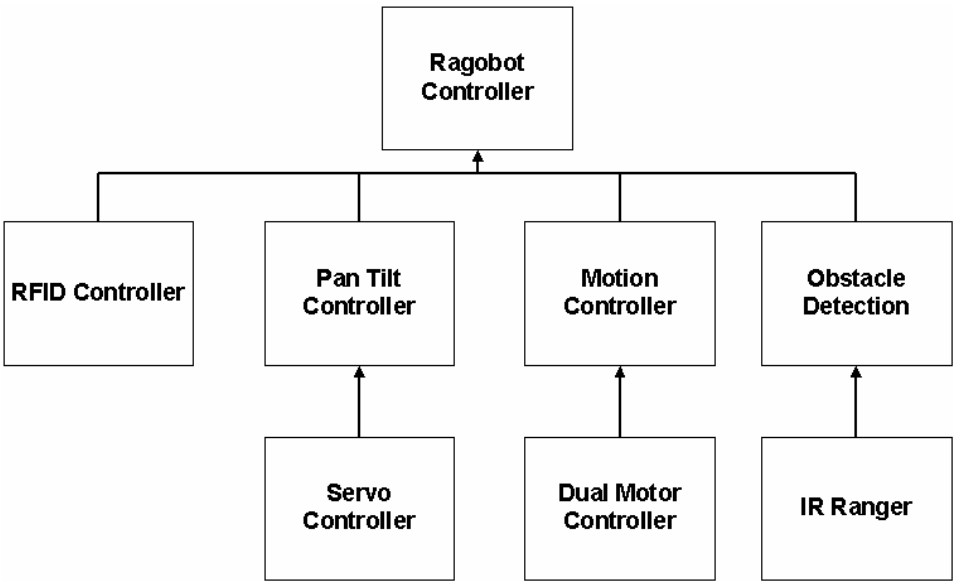
Shape Memory Alloys (Ni-Ti Alloy) allow electronic control of physical game structures and obstacles



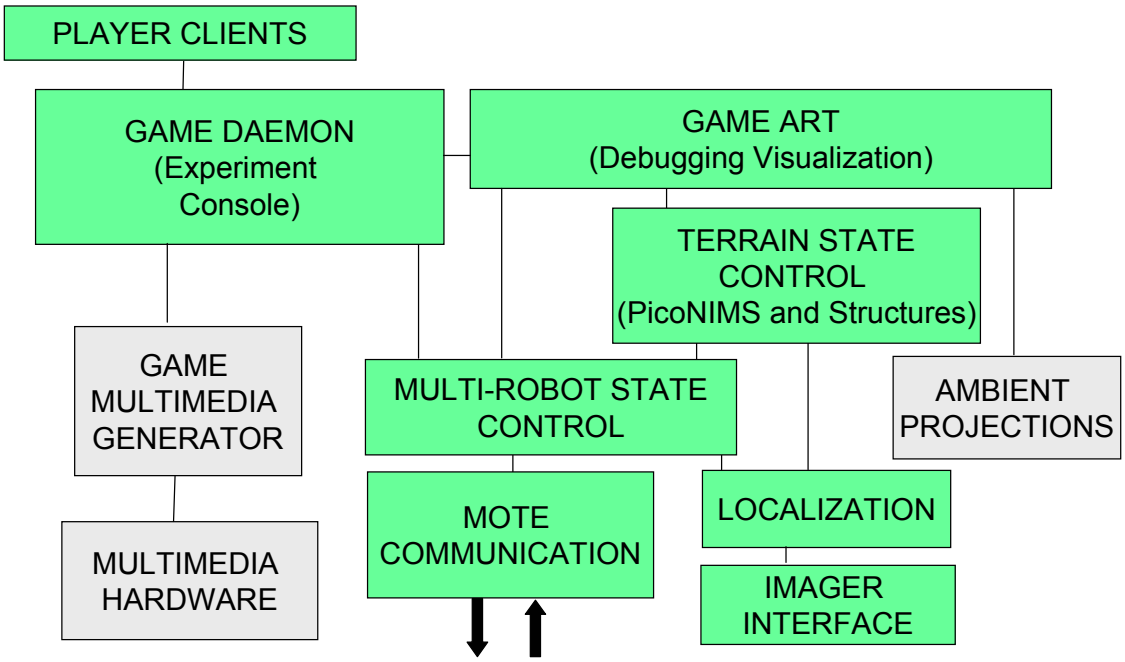




Software Architecture



Game Server



Ongoing Work

- Remaining hardware components being developed
  - Low noise ultrasound localization
  - Video sensor
  - Inertial navigation system
  - Microphone and speaker system
- Robot navigation
  - Higher level navigation functionality under development
- Robot communication protocol
  - Between server and robots
    - Currently based on ID based packet transfer
  - Among robots
- Multi-robot control primitives
  - Collaborative team operation