Coordinated Adaptive Robust Precision Control of Electro-Hydraulic Systems

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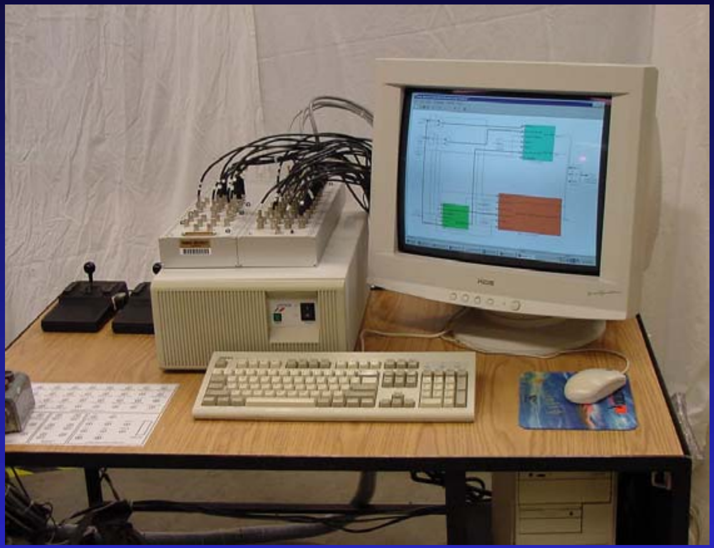
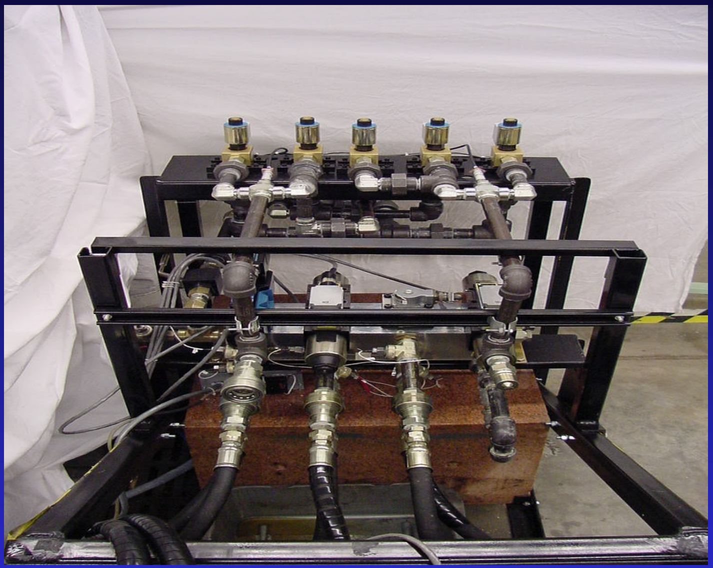
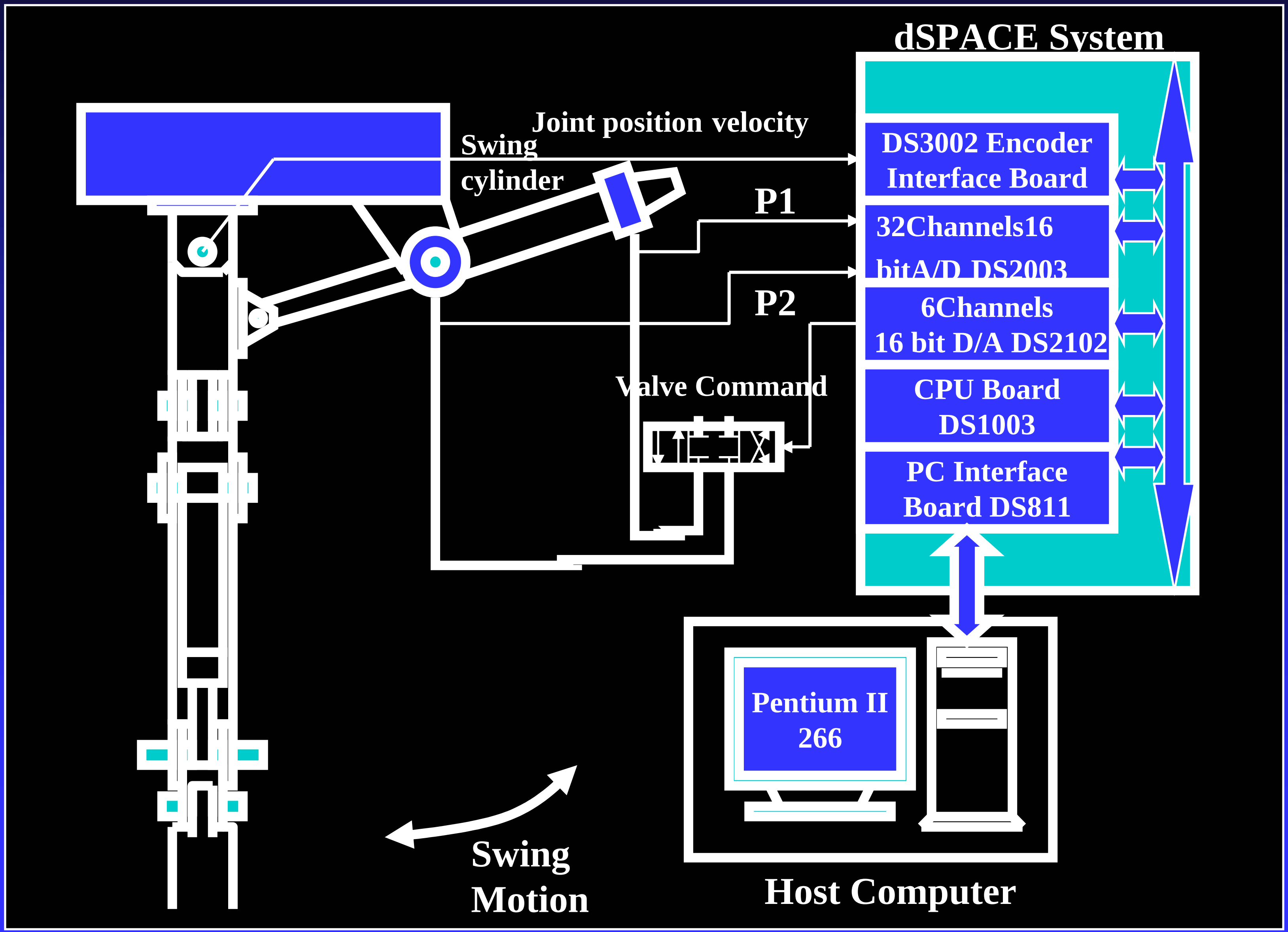
EXPERIMENTAL SETUP





EXPERIMENTAL SETUP



Comparative Experiment Results

- ARC

For simplicity, adapt Inertia and lumped disturbance only

$$k_p = k_2 = k_3 = 19, \quad s_{c3} = 2.8085\times 10^6, \quad s_{c4} = 0.8588$$

$$\gamma_1 = 0.01, \quad \gamma_2 = 0.08$$

- DRC

Same controller law with ARC but without using parameter adaptation

- Parker Motion Controller

Parker's PMC-6270ANI 2-Axis Motion Controller. Controller gains are obtained by following the tuning process in the "Servo Tuner User Guide"

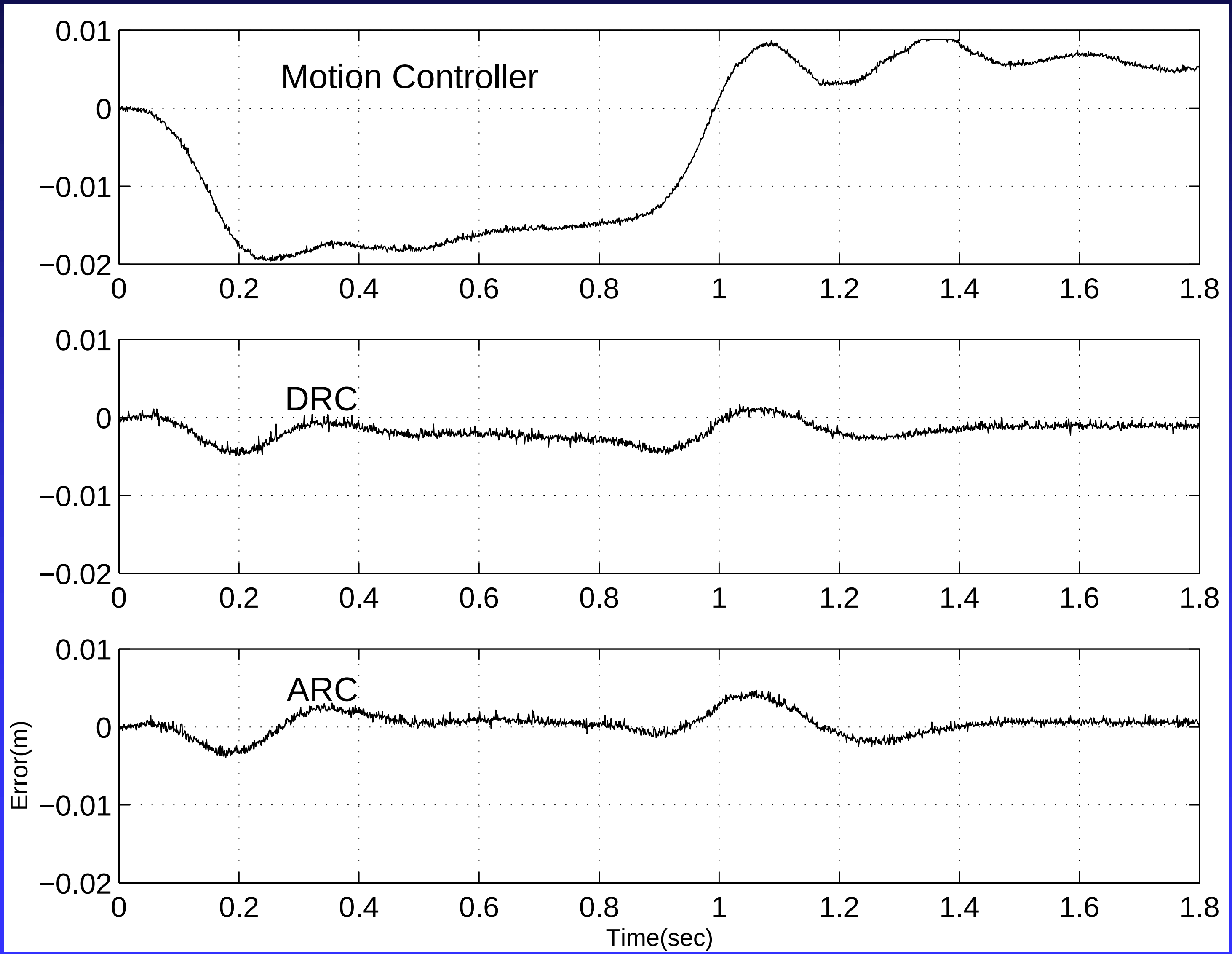
$$SGP = 20, SGI = 0.5, SGV = 22$$

$$SGVF = 100, SGAF = 0.02$$

EH EXPERIMENTS (UNLOADED)

Tracking Errors For Point to Point Motion (No Load)

Maximum Acceleration: 3m/sec^2, Maximum Velocity: 0.3m/sec



EH EXPERIMENTS (LOADED)

COORDINATED CONTROL EXPERIMENTS

CONCLUSIONS

- **Essence of Adaptive Robust Control Strategy**
  - **Nonlinear *local high-gain* robust feedback for fast instance reaction to maximize the attenuation of various model uncertainties for a guaranteed robust performance**
  - ***Controlled* parameter adaptation and learning to achieve a fine tuned high performance**
  - **By-product of learning process such as *accurate parameter estimates* to add *built-in machine intelligences***

$\Rightarrow$

A well-built **BRAIN**

for

Intelligent and **Precision** ***Mechatronic*** **Systems**