Platform-Welder Applied to Ship Repair and New Construction

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TECHNOLOGY ADMINISTRATION

Presentation Outline

- Problem Statement/Solution
- NIST Platform-Welder

  Features, Ship Repair and New Construction, Capabilities, Pros/Cons, Basis, Previous Configurations Studied, Control Hierarchy
- Cost and System Components
- Next Steps

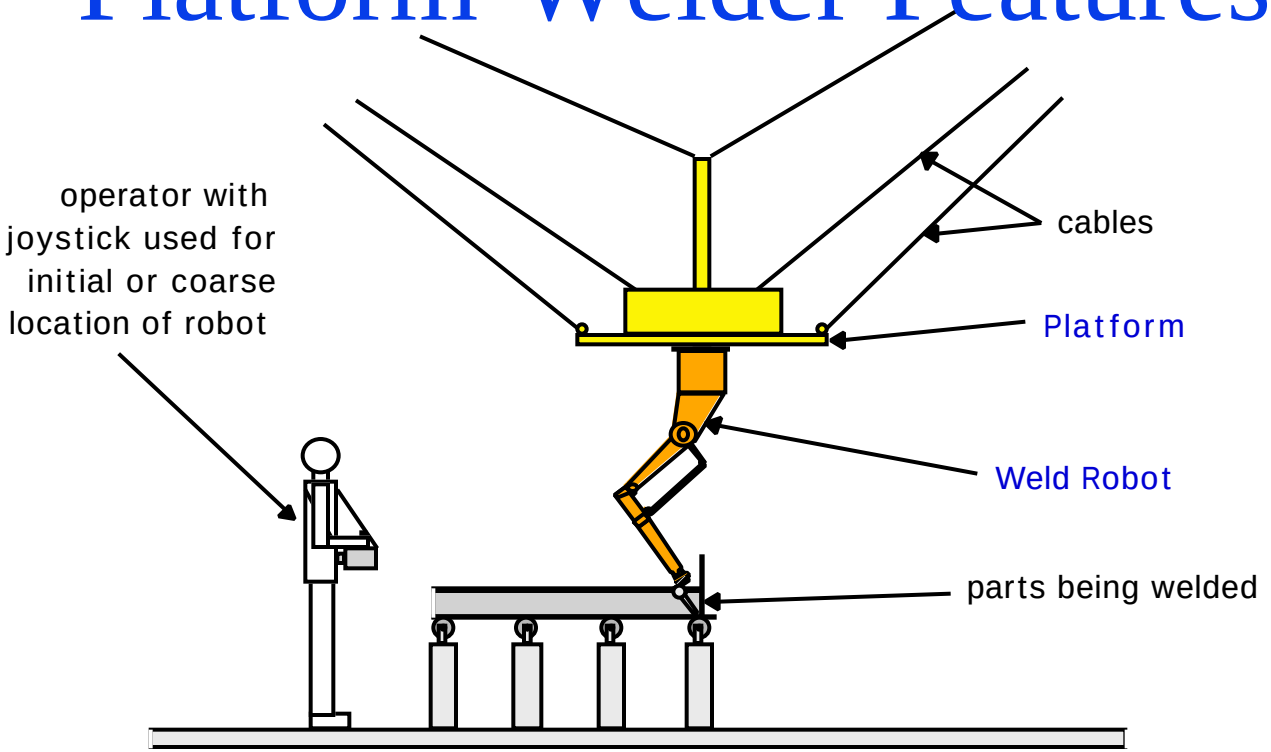
Problem Statement

Prolonged, tedious, and/or difficult-access welding can result in:

- reduced weld quality
- inefficient labor (minimal torch-on time)
- worker fatigue

- ***Solution***: ***Platform-Welder***
  - *For both new ship-construction and repair*
  - *Without huge infrastructure modification costs, disruptions!*

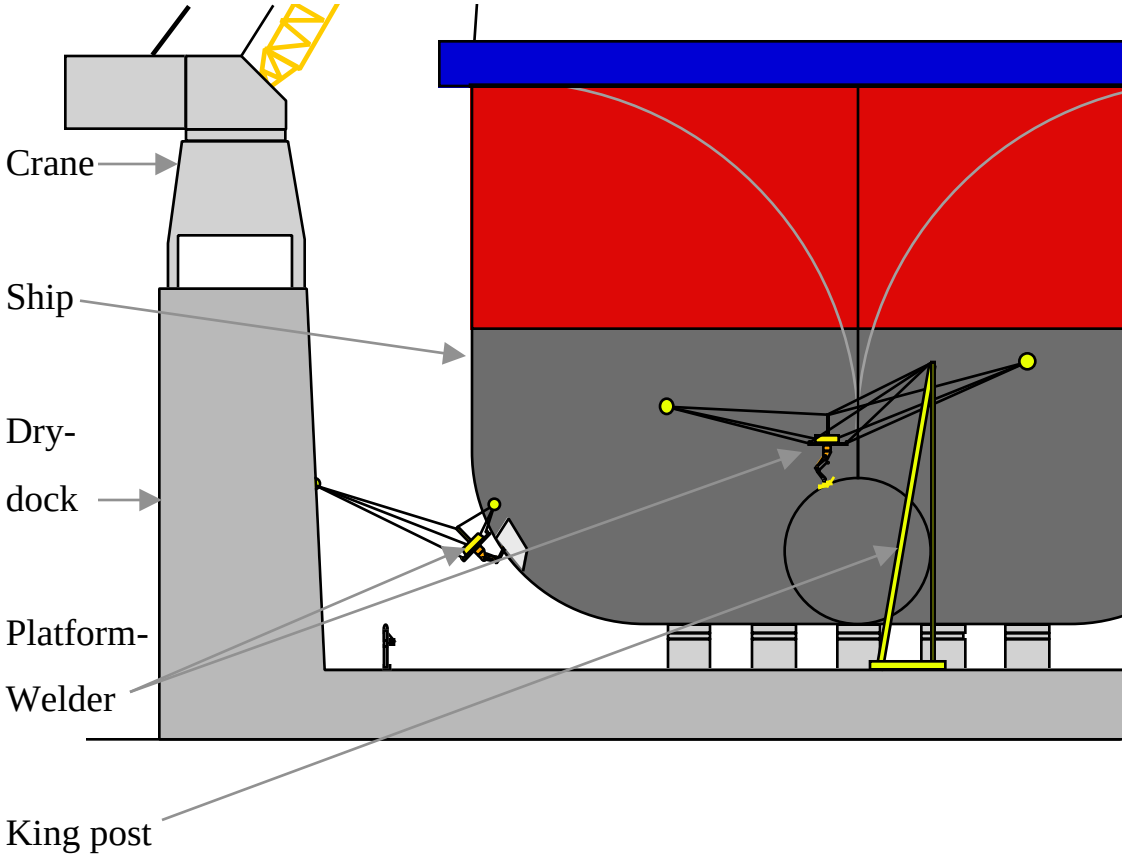
Platform-Welder Features



- Joystick, semi-autonomous controlled
- Reconfigurable platform for a variety of tasks
- 1 ton max. payload
- Full 6 degree-of-freedom platform and robot control for redundancy and accessibility
- Weight: ~1500 Lbs.
- Stable in 6 DOF

Platform-Welder

Applied to Dry-Dock Repairs and Conversion

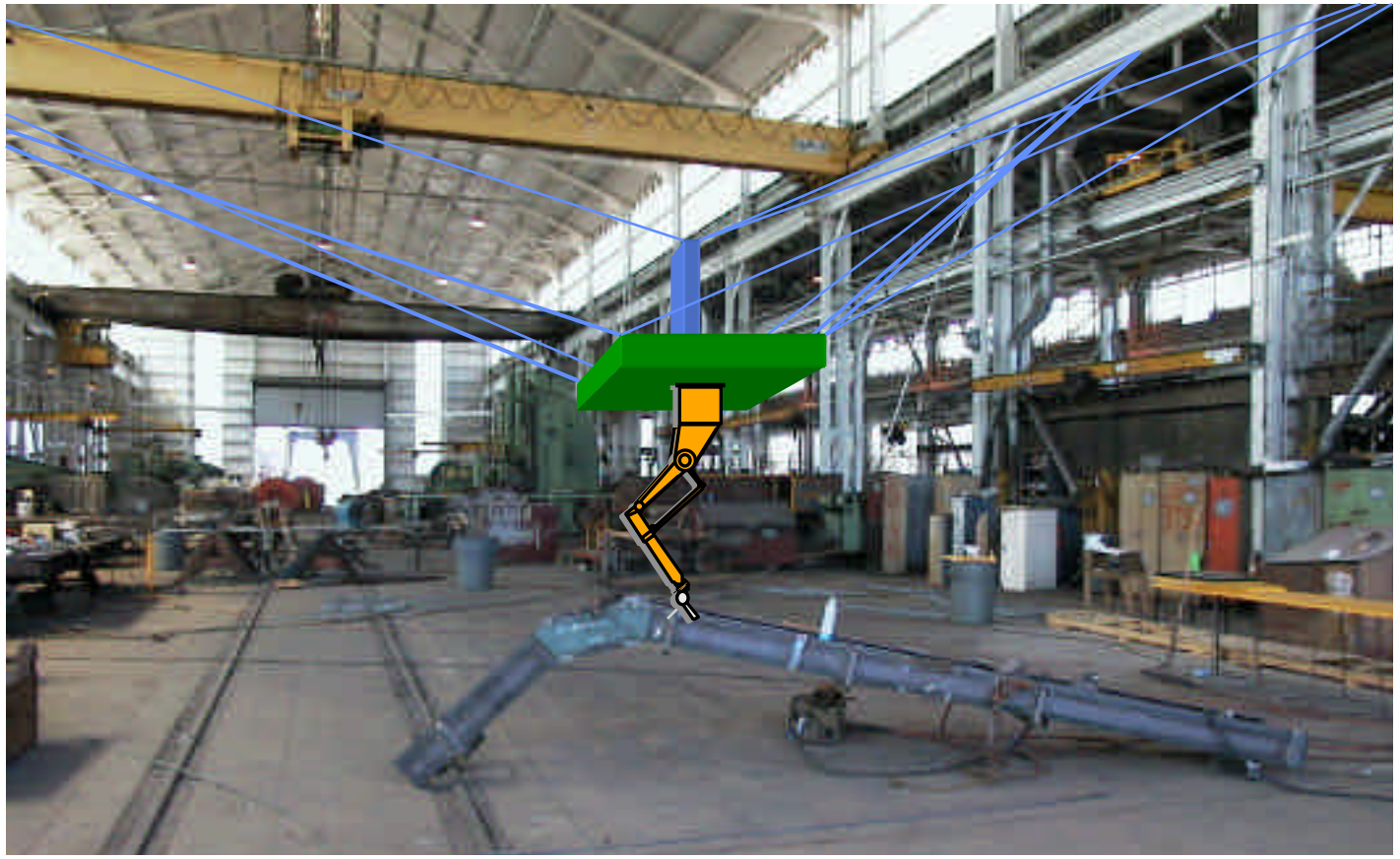


- Platform-Welder can be attached with electromagnets,pad-eyes, or hooks to dry-dock, ship, king-posts or other supports.

- By changing tools, the Platform-Welder can be used for welding, cutting, grinding, material handling and inspection tasks.

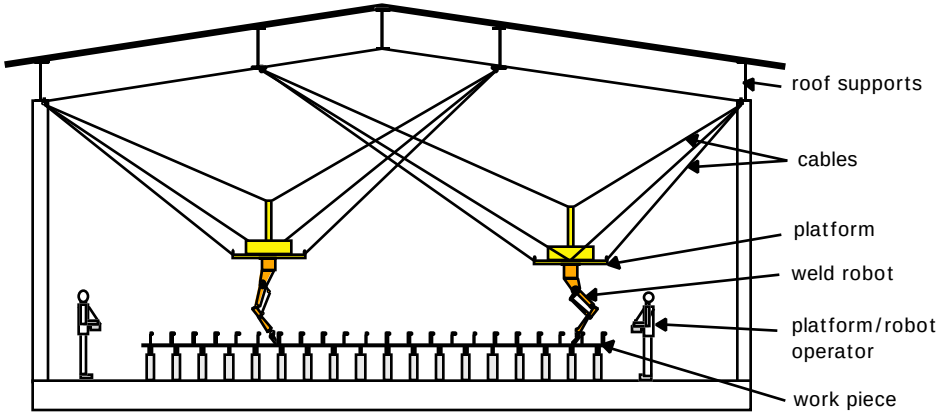
NIST Platform-Welder

Retrofit to Plate/Pipe Shop

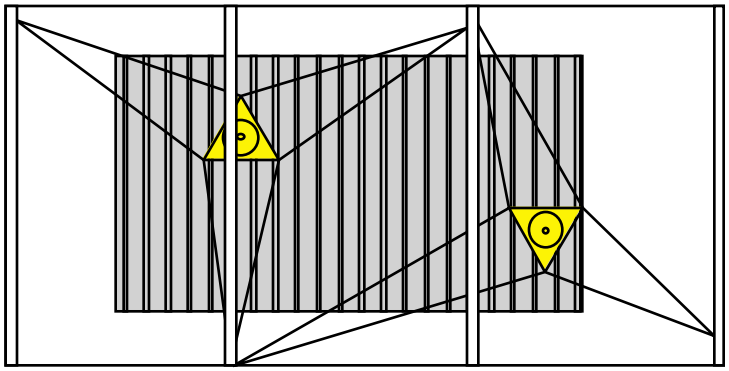


NIST Platform-Welder

Retrofit to New Construction Shop



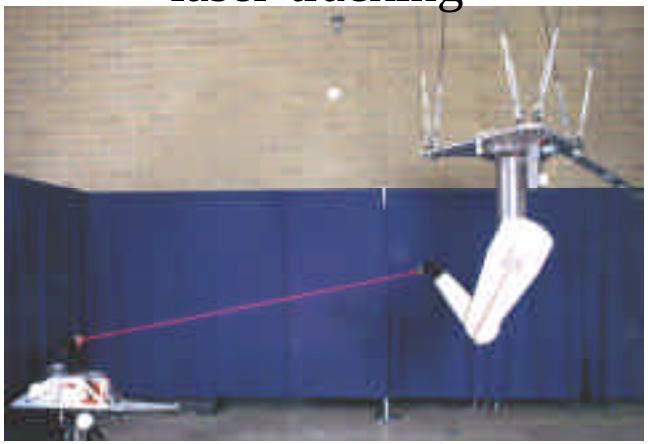
end view

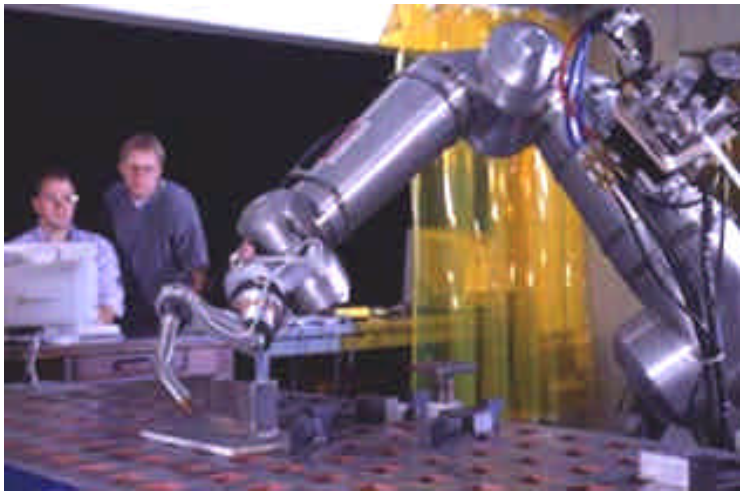


top view

Platform-Welder Basis

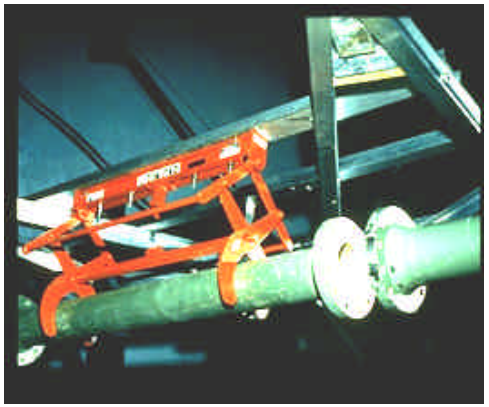
Platform-Robot test using laser-tracking





Advanced Welding Manufacturing System (AWMS) testing robot welding with sensor-based control

Platform configured as material handler/ installer using joystick control.



Platform welding directly (without robot) using off-line programming.

Platform-Welder Pros and Cons

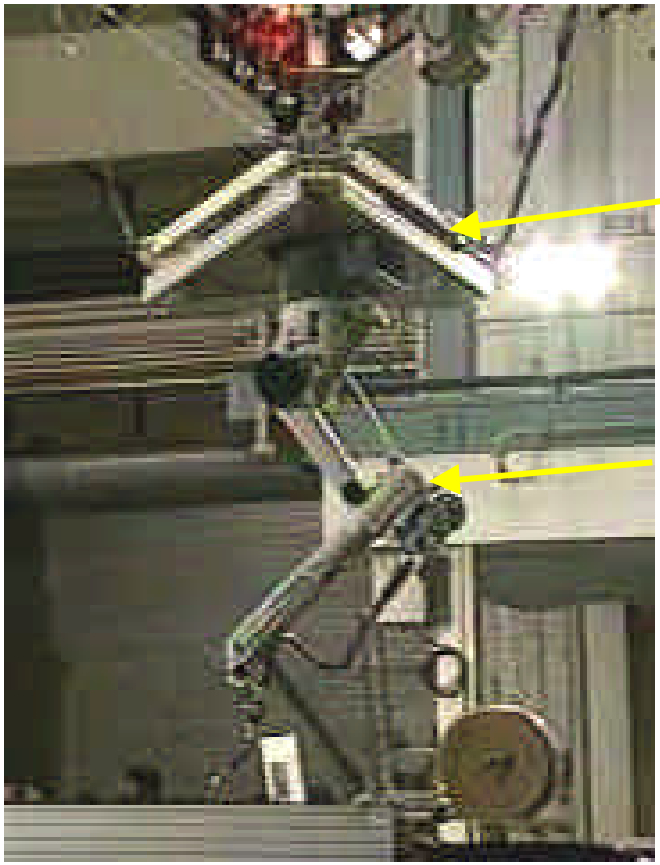
Pros

- does not require huge infrastructure modifications
- can provide quality robot-welds for extended time periods without interruptions.
- can maneuver over a large work-volume above typical work-sites
- can be retrofit to dry-dock (repair) or shop (new, repair) configurations
- can be retooled to weld, grind, cut, handle materials, or inspect.

Cons

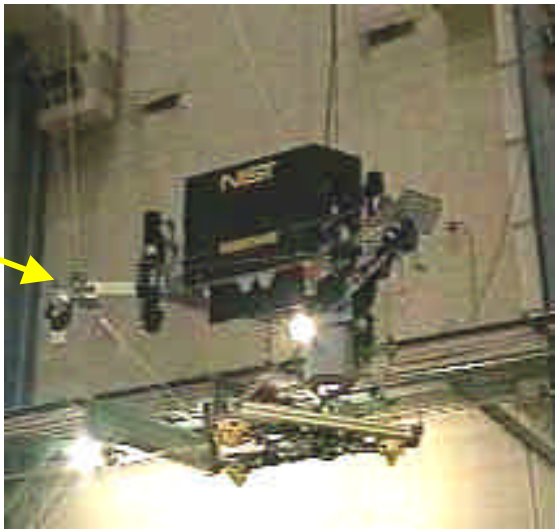
- would take more set-up time than manual welders
- requires simple teach-programming welds prior to welding.
- Platform and weld-robot are developed but, jointly require some further investigation.

Previous Platform-Welder Configurations Studied



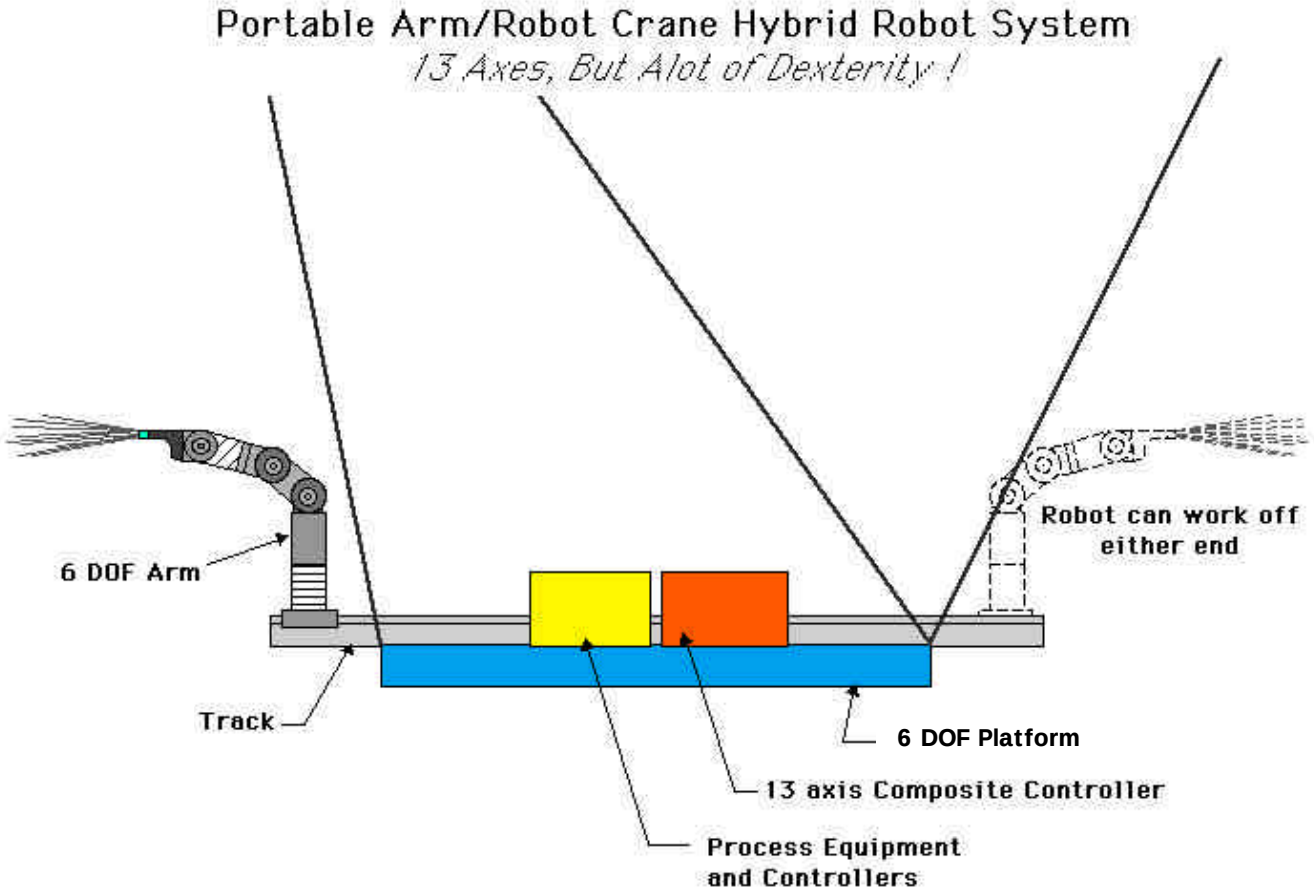
Platform

Weld-Robot

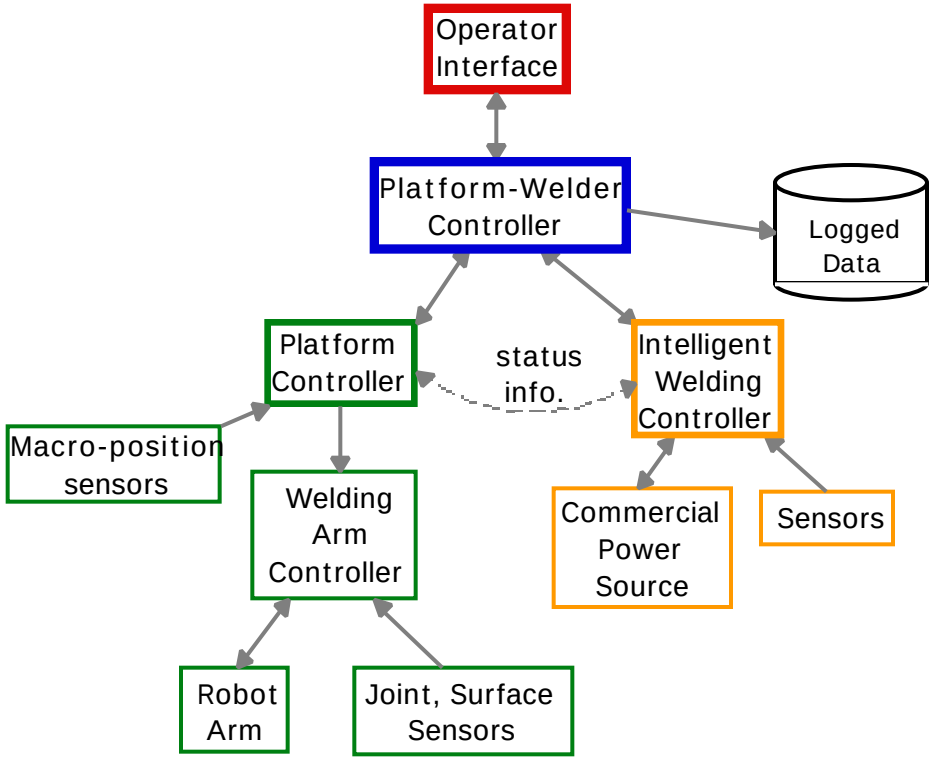


A commercial weld-robot was attached to a Platform prototype to demonstrate large work-volume motion and reconfigurability of a weld-robot while suspended within a high bay.

Previous Platform-Welder Configurations Studied (cont.)



Control Hierarchy



- Controller is modular allowing additional sensors and equipment control to be easily implemented.
- Hierarchy provides low- through high-level control of system components.

Platform-Welder
Estimated Cost and Components

Platform: $97 k + Weld Robot: $90 k

(these figures include estimated costs for Platform parts plus an off-the-shelf weld-robot)

System Components*:

– 8’ Platform:	$20K
– 9 winches/amps: ($3000 x 9 =)	$27K
– Controller:	$50K
– Weld Robot with wire feed, torch:	$90K
	$187K

* NIST does not endorse products. Names and model numbers are simply used for reference only and do not demonstrate an endorsement of these products. Costs are Feb. 2000 estimates.

Next Steps

- Collaborate with Shipyard(s) using Shipyard, Maritech, and/or other source combined with NIST-matching funds.
  - NIST Goal: to measure the performance of a micro/macro manipulator used for small-batch manufacturing processes.
- Invite shipyards and other industries to prototype-system demonstrations at NIST and a Shipyard.
- Transfer Technology to Shipyard through Platform-Welder Manufacturer/Maintainer