

Engineering Research Center for

Reconfigurable Manufacturing Systems

Virtual Fusion: The Complete Integration of Simulated and Actual

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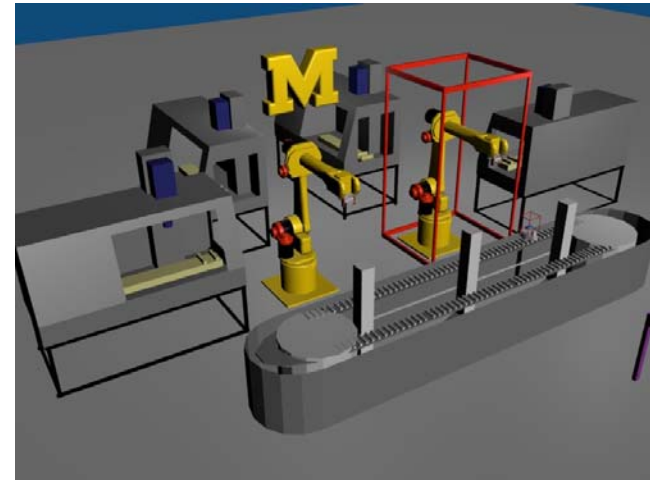
NSF Engineering Research Center for Reconfigurable Manufacturing Systems
University of Michigan College of Engineering

The University of Michigan, Ann Arbor

Virtual Fusion: The Complete Integration of Simulated and Actual- *Ongoing (Fall '06) ; Core Project; 1 Student; GM Partner*

- **Objectives**

- *Develop methodology for logic control verification and validation*
- *Pre-launch validation, online monitoring, maintenance and operator training*



- **Key Deliverables**

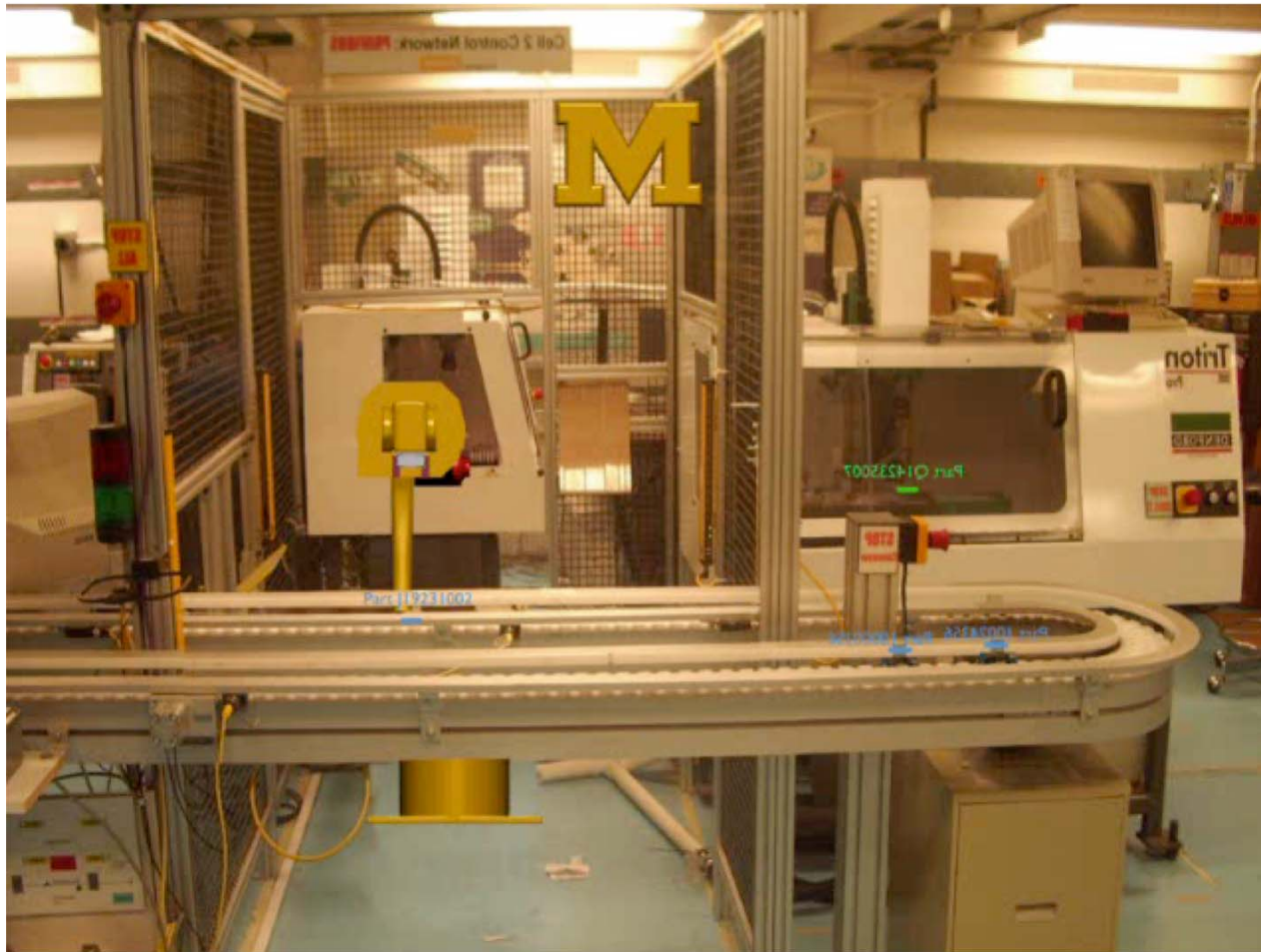
- ✓ *HIL tools and logic validation survey (CASE 2007)*
- ✓ *Methodology on use of HIL for logic validation*
- ✓ *Software solution for use of HIL in monitoring*
- *Software and hardware solution for remote assisted maintenance*

- **Benefits to Industry**

- *Identify the state-of-the-art of HIL in manufacturing industry*
- *Reduce ramp-up and unscheduled down time due to unanticipated behavior*
- *Provide a platform for real-time monitoring and remote maintenance*



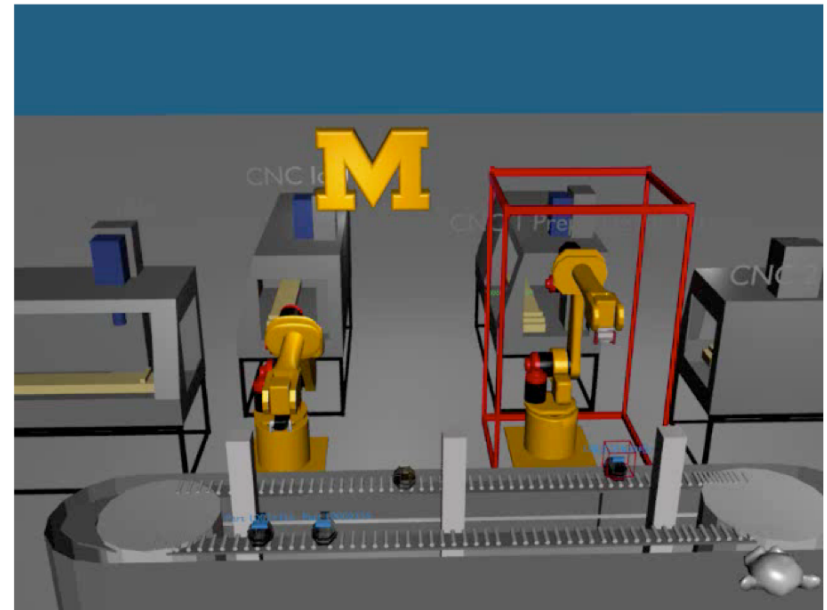
Integrating Simulation into Real Processes



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Monitoring System Real Time Data

- **Virtual world reflects real time “ground truth” of the plant floor**
- **Improved information visualization leads to better understanding of system operation, rapid fault diagnosis and reduced downtime**



Current Accomplishments and Next Steps

- **Accomplishments to date**

- **Virtual Entity Integration**

- » **Addition: Simulated Supply Cell added**
 - » **Replacement: real Fanuc Robot and entire Cell 1 replaced**
 - » **Integration of higher fidelity proprietary simulation**

- **Virtual Testbed**

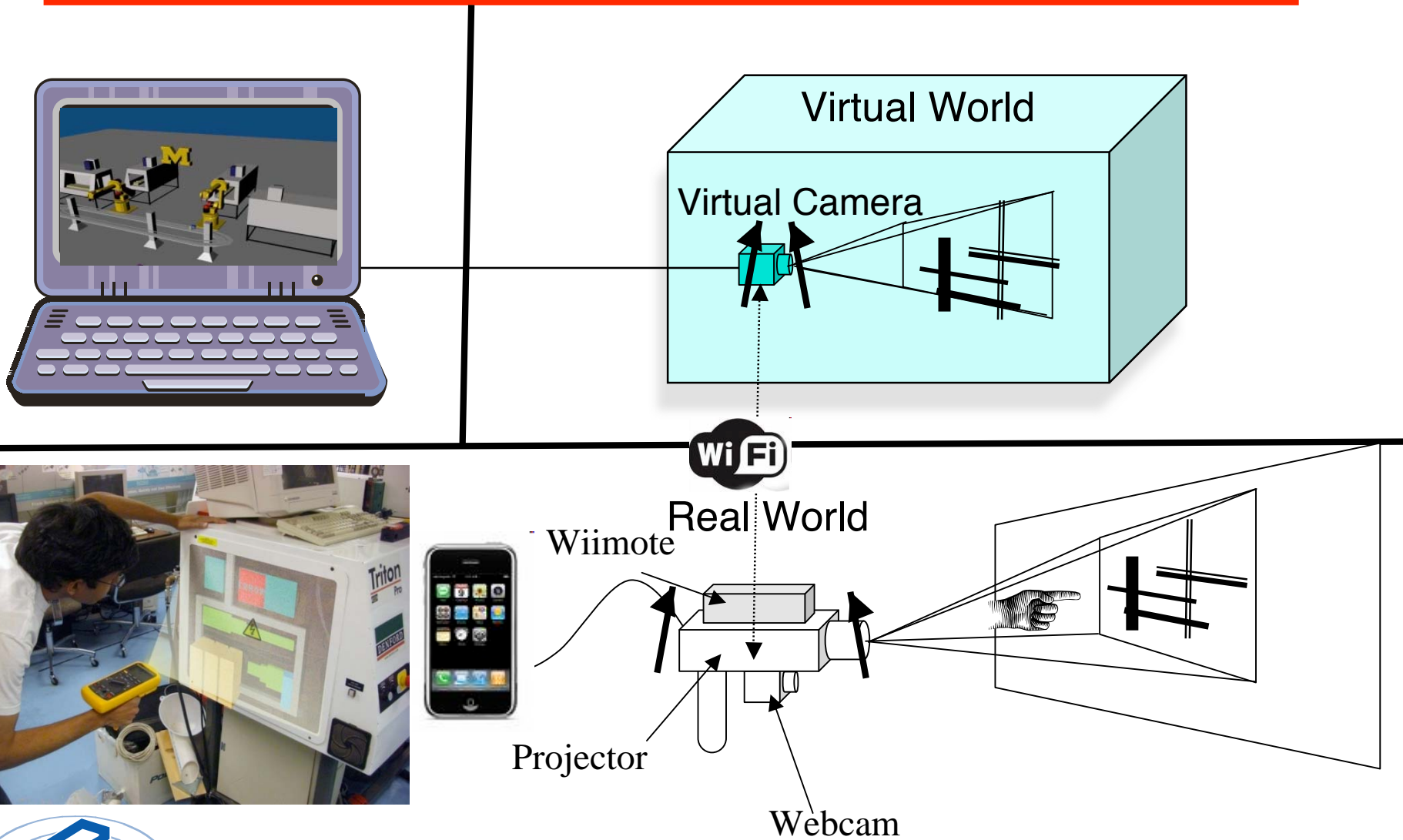
- » **Entire ERC area recreated in 3d interactive virtual environment**
 - » **Real time interaction from and to the real RFT**

- **Next Steps:**

- **Bring people into the loop**



How Descriptive Junction And Integration



Descriptive Junction and Integration (DJAI)

- **DJAI is an augmented reality portal used for information fusion and communication that will enable maintenance people on the plant floor to take advantage of the monitoring system**
 - **Portable information enhanced environments**
 - **Remote assisted maintenance**
 - **Assisted operation**



The Descriptive Junction and Interface Merges Four Fields in a New Way

- **Information Sharing**
 - SCADA meets information sharing applications, on a game engine platform
- **Augmented reality**
 - Portable large scale context aware
- **Indoor Location Awareness**
 - WiFi, RFID, Time of Flight, 2D image processing
- **Mobile Computing**



Milestones and Future Plans

