



# Faculty Member

## Timken Foundation Center for Precision Manufacturing

### Contact Information



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### Research Interests

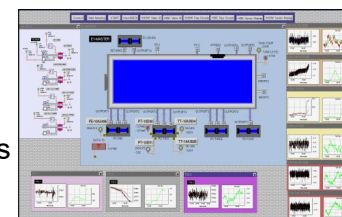
- Robotics, automation and controls
- Intelligent sensors, Industry 4.0
- Intelligent Systems Health Monitoring (ISHM)
- Intelligent systems (fuzzy logic, neural networks)
- Smart Optimization (genetic algorithms, simulated annealing, particle swarm theory)
- Knowledge based systems
- Signal processing
- NDE (image correlation, ultrasonics, etc)
- Biomedical devices and instrumentation

### Sample Research I:

#### Intelligent Systems Health Monitoring (ISHM)

After the Columbia disaster, an ISHM testbed was set up at NASA Stennis Space center for a rocket test facility to demonstrate knowledge-based systems could increase reliability of complex systems

- Physical/virtual intelligent sensors (IEEE 1451.X, TEDS/HEDS)
- Smart sensors output data, confidence level in data and their own health estimates
- A G2 simulation works in parallel to the actual test predicting all states, processes and outcomes



### Sample Research II:

#### Modeling C/C brake disk wear in Formula One

Formula One cars use C/C brakes that are difficult to model using math models

- A neural network (NN) model was developed using data from over 5 years (200 sensors, 3 drivers and 20 racetracks from all over the world)
- The model helped in setting up the car (disk thickness and air flow)
- Selecting thinner disks that last the race gives a competitive advantage racetime
- Such a model becomes a “living model” that updates itself after each race and becomes better with time

