Remote Pinpoint Leak Detection and process optimization technologies

Nautilus Technologies, LLC

Michael D. Nash, Ph.D.

NEW PRODUCT IN LARGE-SCALE IMPLEMENTATION STAGE

Leak Detection: Gas Pipelines

- Requires no modifications to existing pipelines
- Detect leaks at a distance of 6 miles and more
- Can detect leaks less than 0.1 percent of flow volume
- Constant monitoring with automatic alert system
- Smart system pinpoints leak for rapid response

Nautilus Technologies' leak detection system licensed to ProFlex, LLC

Successful Tests

- Kinder Morgan
- Apache
- Chevron
- Pipelines in the Permian

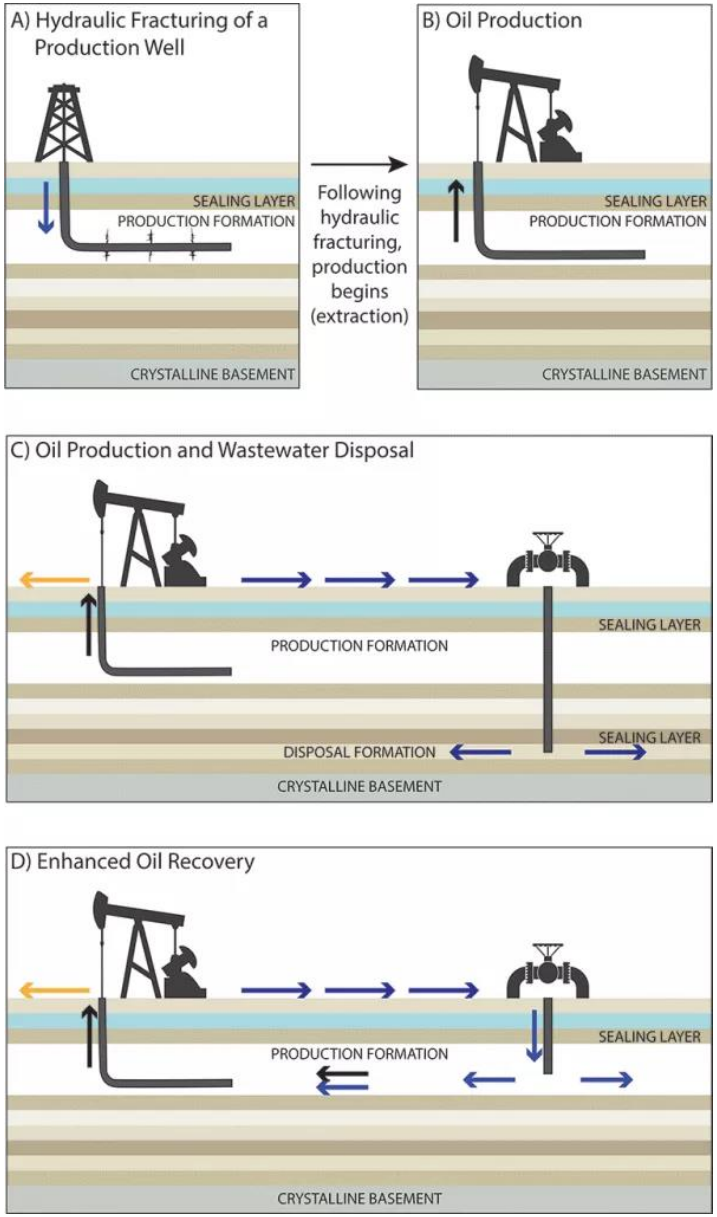
Licensed to Proflex, LLC

- Equipment fabricated by Lime Instruments
- On track for large-scale implementation, Summer 2019

NEW PRODUCT: AVAILABLE FOR LICENSING

New Product / Process Optimization: Water Disposal, EOR, and Avoiding Induced Seismicity

- New system with innovative devices and improved sensors
- Pinpoint precision
- Patent-pending “self-healing”
- Can identify gas locks and corrosion-created integrity issues and blockages
- Smart injection to avoid induced seismicity

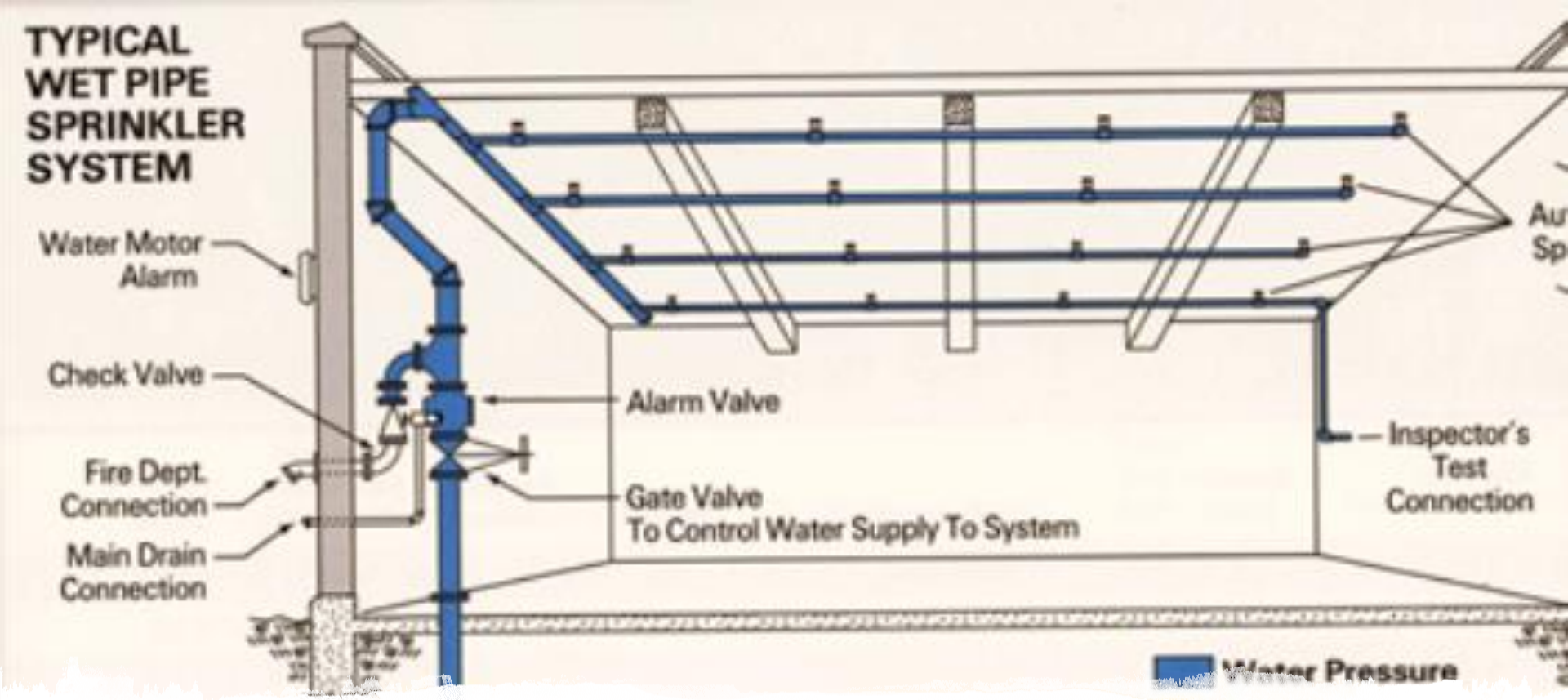


Developed by Nautilus Technologies, licensed by Proflex Technologies

Efficiency and Integrity Enhancement: Gas Gathering, Gas Conditioning, Integrated Systems

NEW PRODUCT: AVAILABLE FOR LICENSING

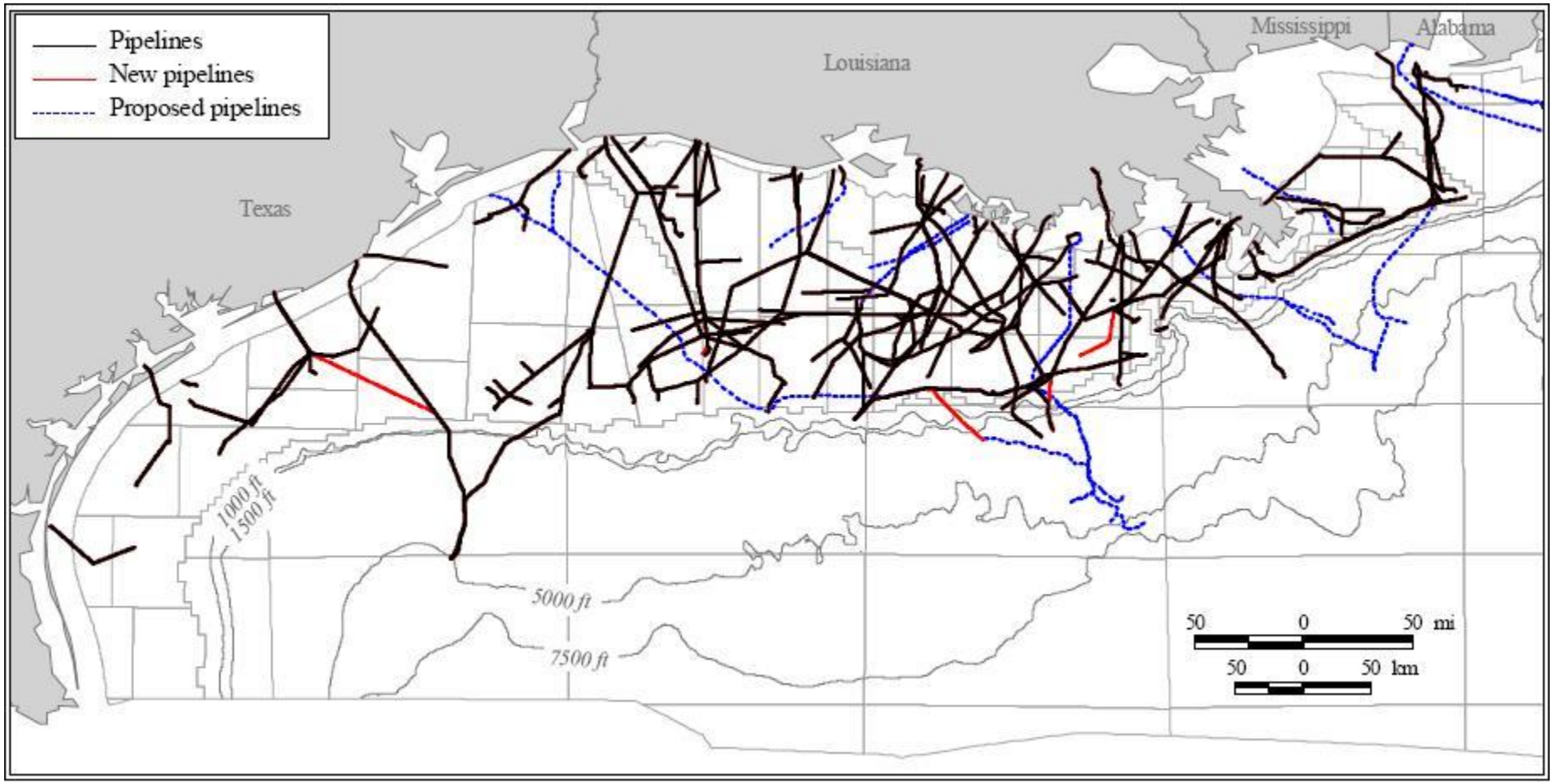
1. Requires no alterations to existing pipelines
2. Detect integrity issues at a distance of 6 miles and more
3. Can detect leaks less than 0.1 percent of flow volume
4. Constant monitoring; automatic alert system; integrates with water disposal
5. Smart system pinpoints issues for Patent-pending “self-healing”



Remote Pinpoint Leak Detection**PLUS**: Fire Suppression Systems and Plumbing in Buildings

- Can detect leaks in water pipes in the water sprinkler systems in buildings
- Requires no modification to system
- Constant monitoring; instant alert system
- Can pinpoint the location, relative intensity of the leak and the flow
- Can include “self-healing” feature

NEW PRODUCT: AVAILABLE FOR LICENSING



Offshore pipelines, gas gathering, gas conditioning integrity integration

- Offshore pipeline and gas gathering systems
- Integrates with Underwater Autonomous Vehicles & Robots
- Shallow: new and old gathering and conditioning systems
- Remote, automated, continuous system integrity monitoring

Nautilus Technologies

Forward-looking goals

Ongoing Technology Development

What is Nautilus Technologies?

The home of new solutions, technologies, and engineering solutions

- System insight for process optimization
- Robotics
- Intelligent systems
- Control systems
- Cutting-edge measurement and sensing
- Onsight technology consultation: finding appropriate solutions

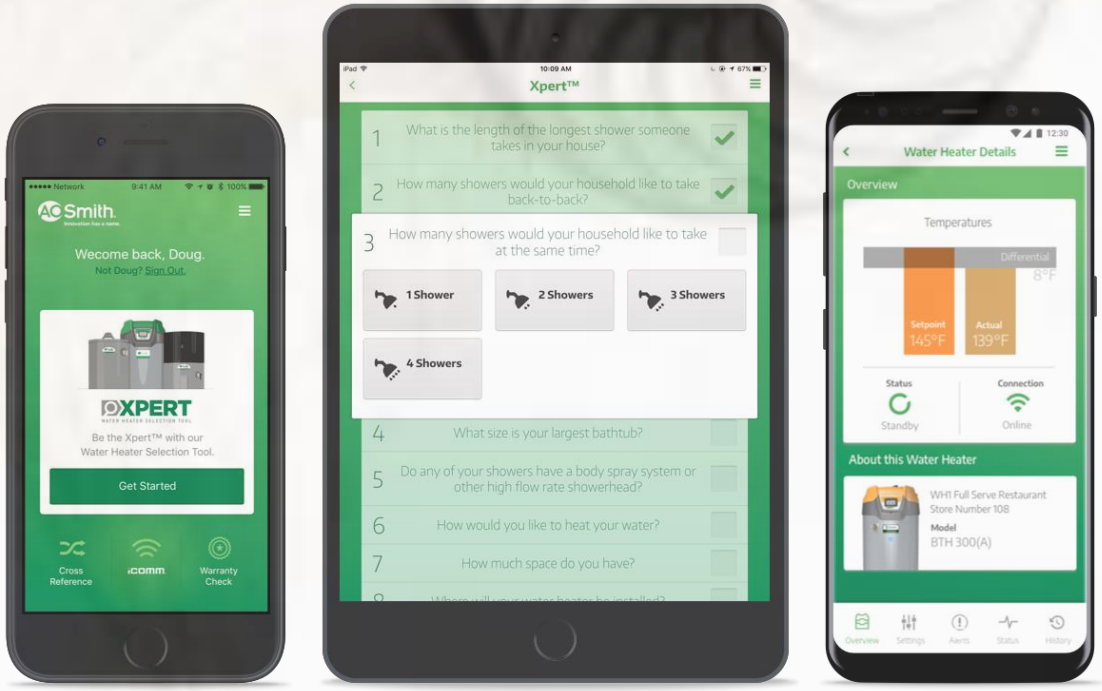
Industries

- Energy
- Transportation
- Aerospace
- Nautical / ocean-based
- Robotics operations

Intelligent Hot Water Heater Network

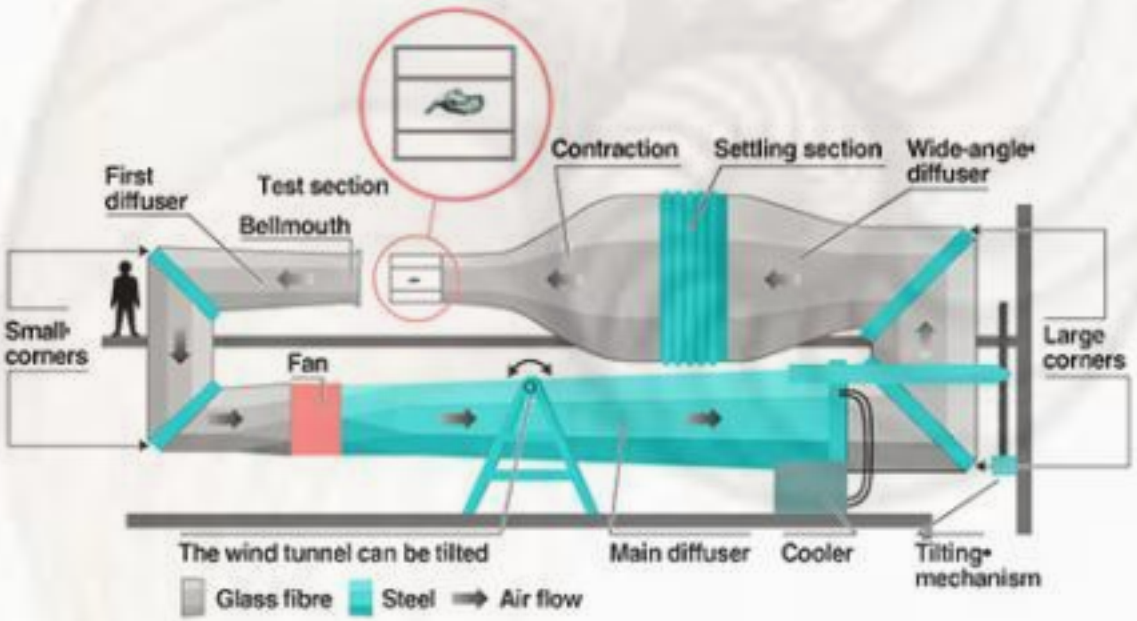
National Hot Water

- integrated monitoring of hot water systems in national network of restaurants
- control systems
- control pressure and temperature



University of Oklahoma Wind Tunnel Redesign and Aircraft Integrity testing

- Drones (all sizes) with customization and testing
- Small aircraft
- Structural integrity
- Analytics / predictive maintenance
- Precision surveillance



Robotics for Performance Enhancement: Crawler

On the lead engineering team for bio-robotics:

To detect cerebral palsy in infants, researchers at the University of Oklahoma have developed a motorized robot for children to wear, tracking brain activity and muscle coordination using artificial intelligence.
The robot—a cross between an exoskeleton, a skateboard, and a onesie—is designed to prevent muscle atrophy in children who have difficulty crawling.

https://www.pcmag.com/news/346567/with-robotic-exoskeleton-scientists-teach-kids-to-crawl

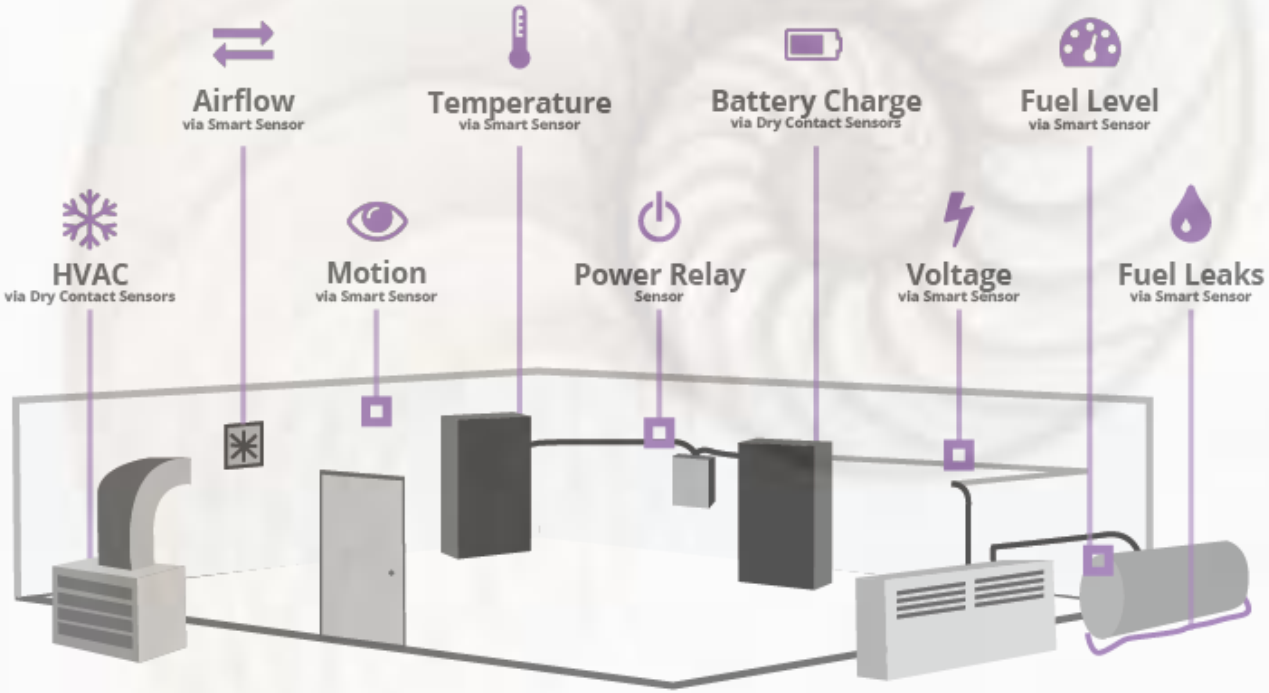
UNDER DEVELOPMENT

Oilfield Security Systems

New sensors / system incorporating smart systems and analytics

- Anti-theft
- Safety
- Performance
- Optimization
- Efficiency

- Predictive
- Forensics



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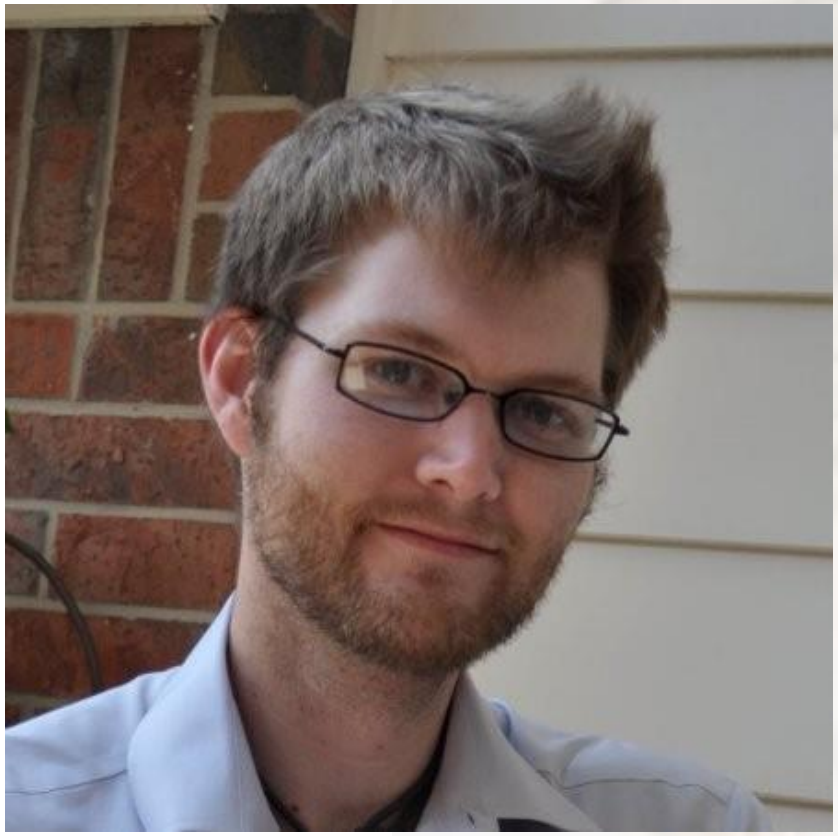

Ph.D. in Mechanical Engineering

Concentrations in robotics, automation/intelligent systems and sensor engineering.

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