



OFFICE OF ECONOMIC DEVELOPMENT

ROBOTIC CRAWLER FOR AUTONOMOUS INSPECTION AND MAINTENANCE OF SMALL DIAMETER COMPLEX PIPING NETWORK



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LICENSING OPPORTUNITIES

South Dakota School of Mines Office of Economic Development is actively seeking exclusive and/or nonexclusive licensing opportunities. Joint development opportunities are also available.

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Description:

Most of existing inspection robots are not suitable to small varying diameter complex pipe networks. Current invention proposes a hybrid legged design that allows more modules to participate in gripping the pipe wall for improving the pull force. Using a sensorless control strategy, the distance that the feet are extended can be varied to conform to variable piping diameters. Additionally, a steering mechanism comprised of four shape-memory alloy springs allows the crawler to actively navigate through complex branches in piping network.

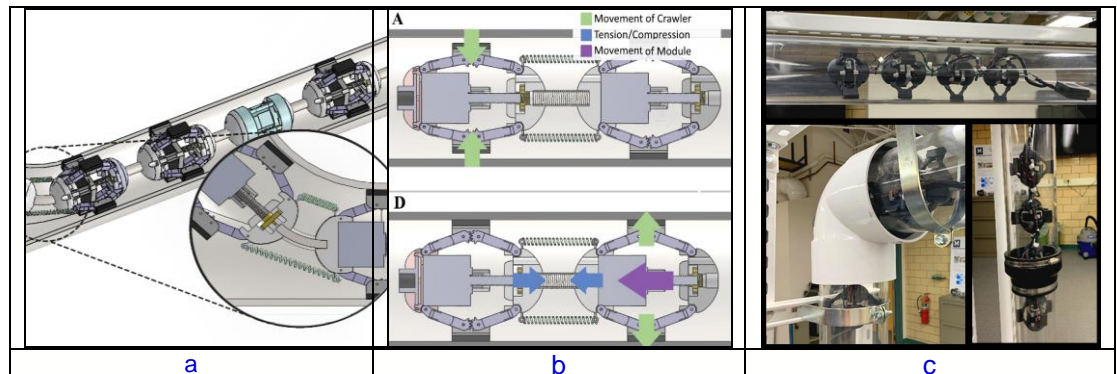


Fig. 1: (a) Articulated steering mechanism using single acting Nitinol SMA tension springs (b) Peristaltic locomotion concept using novel hybrid design to generate maximum pull force (c) Verified performance reliability through experimental test set-up and engineering scale mock-up

Applications

- Submarine trim and drain piping system
- Nuclear facilities and power plants
- Oil and gas refineries
- Chemical industries
- Search and rescue operations in disaster zone
- Marine offshore piping systems
- Urban gas line inspection
- Remote to access areas such as underground facilities

Advantages

- Increased load carrying capability
- Adaptability to varying small pipe diameters
- Modular design for flexibility of implementation
- Low cost and scalable for variety of applications
- Broad obstacle avoidance capabilities (sudden diameter change, weld seams, valves, bending, branches, etc.)