Piezoelectric Microactuator for Manufacturing

Auburn University is seeking a development partner for a novel piezoelectric microactuator for use in manufacturing.

Inventor:

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Status:

- Full US (20200075838) and EPO patent applications filed.
- This technology is available for exclusive or non-exclusive licensing.
- Simulations have successfully demonstrated the usability and practicality of the technology.

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Reference: 3DOF Micro/ Nano-Manipulator

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Overview: The rise of micro- and nanoscale technology has brought along with it a greater need for microactuators capable of completing the precise tasks required to manufacture these small scale devices, structures, and systems. Although today's microactuators attempt to fulfil these requirements, they often have prohibitive issues such as poor force or displacement magnification, low precision, or high voltage requirements. These issues are solved by the s-drive, a novel piezoelectric microactuator that can easily be configured to form a 3DOF micro/nano-manipulator. This technology has potential applications in the manufacturing, robotics, and biomedical sectors.

Advantages:

- **PRECISE -** Exercises very fine level of control with known motion over the micron range.
- **LOW VOLTAGE -** Requires 10s of volts, rather than the 100s of volts typically required by other piezoelectric microactuators.
- **HIGH DEFLECTION** - Upon applying the same voltage, experiences a deflection nearly 300 times larger than that of the comb drive.

Description: With the global market for nanotechnology expected to reach $2.1B by 2023, and microscale technology to boom similarly, it is necessary to utilize efficient manufacturing tools that minimize risk of assembly errors, as well as require low voltage and low production costs.

The basic component of this nano-manipulator is the s-drive. The s-drive is differentiated from a typical piezoelectric bimorph by its shape. While the top surface electrode of a piezoelectric bimorph maintains the same side along the top surface, the s-drive's top surface electrode switches sides halfway along the top surface. Thus, when voltage is applied, the typical piezoelectric bimorph forms a u-shape, while the s-drive forms an s-shape. This s-shape produces an increased and predictable deflection, allowing for highly repeatable and controlled motion. The unique shape of the microactuator also enables the s-drive to be connectable. By connecting pairs of s-drives and attaching them orthogonal to each other, three degree of freedom movement is possible, with applications ranging from data storage to micro-assembly to nanolithography.

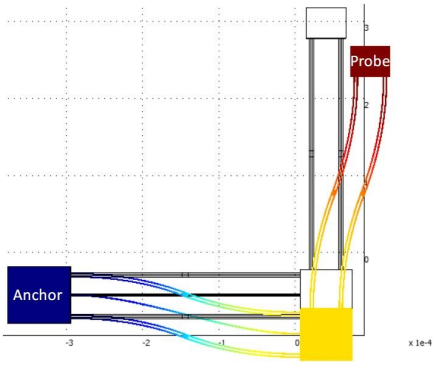

Figure: A potential configuration for a 3DOF micro/nano-manipulator using s-drives.

Concept → *Simulation* → *Prototype* → *Market Ready*