Motors were designed and optimized for industrial processes that require continuous smooth rotation, which typically requires minimization of cogging torque. These motors operate efficiently at high speeds, but must be geared down to achieve velocities and torques typically needed for robotics. This leads to inefficient motors with no inherent compliance. As compliance ensures safety and prevents damage to the robot, researchers have attempted to address the issue. Current solutions, however, require auxiliary components resulting in large, ineffective, and complex systems.

University of Utah researchers are developing a new type of robot actuator, comprising an electromagnetic machine combined with a local controller implementing bioinspired motion primitives. The cogging-torque actuator will accept high-level commands and adjust its own behavior according to its local experience through a combination of controlled passive dynamics and high-bandwidth feedback control. This design will facilitate more robust operation by enabling distributed control, inherent sensing capability, controllable compliance, and leveraging the nonlinear dynamics of the actuator.

**TECHNOLOGY SUMMARY**

- Improves operation in highly dynamic environments.
- Increases energy efficiency.
- Facilitates passive holding torque.
- Enables controllable compliance.
- Enables distributed control.

**FEATURS AND BENEFITS**

- Simulations to demonstrate proof of concept in progress.
- Preliminary studies indicate large passive holding torques are achievable.
- Prototype construction and additional testing required.

**INVENTOR PROFILE**

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