Docket #: S24-222

Novel intrinsically safe light-weight dexterous torque controlled robotic manipulator

Stanford researchers have designed a safer, lighter, and nimbler robotic arm.

Robotic applications are gaining traction in both industrial settings and everyday workloads. Designing robots to work alongside humans in environments such as medical facilities or factories requires thorough consideration of performance, control, and safety.

Stanford team proposed a new design that achieves improved dynamic and kinematic performance without reducing payload capacity as compared to existing robotic arms. The arm has a compact, dexterous and singularity free wrist design which enables superior orientation and payload handling capabilities.

Compared to existing robotic arms on the market, it can carry a payload of 3 kg, which is comparable to the Franka Panda (3 kg) and Kinova Gen 3 (4 kg) robotic arms, with the wrist volume approximately 85% and 92% smaller than the two, respectively.

The arm can also integrate a reconfigurable joint limiter module (separate patent) which gives the arm the ability to have user-reconfigurable mechanical hard stops that limit the range of motion of the joints. This allows the arm to have reconfigurable workspace customizable to specific tasks giving it an extra layer of hardware-level safety beyond software controls.

Applications

- **Medical robots**
- **Humanoid robots**

- **Robotic manipulators**

Advantages

- **Torque control**
- **More compact**
- **More efficient use of workspace:** Singularity-free wrist design
- **Decoupled position and orientation:** Intersecting wrist axes
- **Intrinsically safer:** User reconfigurable mechanical joint limits
- **Light weight**

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