Researchers at the University of South Florida have developed a compliant force/torque sensor for robotic force control.

There are many robotics applications where the robot must perform tasks requiring contact with its environment. During these tasks, compliant motion of the manipulator is required to prevent position errors from causing large contact forces which may cause damage or lead to task failure. Force control is typically used in these tasks; however, a lack of compliance results in stability problems leading to unsafe behavior. Several force/torque sensing compliant wrist devices have been developed to alleviate stability issues. These designs have a separate compliant structure and mechanical sensing mechanism; this increases part count and manufacturing and assembly costs of these designs as well as makes them unsuitable for applications demanding safety like medical, service and rehabilitation.

In order to introduce safety and to reduce the cost, our inventors have developed a 3-axis compliant force/torque sensor based on an orthoplanar spring which employs Hall effect sensing. The orthoplanar spring provides the beneficial passive compliance, while force and torques are sensed using Hall effect sensors. Orthoplanar springs are compact and simple while the Hall effect sensors are low cost, contact free, and relatively easy to implement. Furthermore, no links or joints are required, thus there is minimal wear.

This unique design allows the robot to be used in applications where a robot must control contact forces with its environment, such as in surface cleaning tasks, manipulating doors, and removing threaded fasteners.

**ADVANTAGES:**
- Cost-effective manufacturing
- High reliability
- Highly compact
- High force control stability

**Low Cost Compliant Force / Torque Sensor for High Force Control Stability**

**Compliant Wrist Device with Orthoplanar Spring**

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