Researchers at the University of South Florida have developed multiple innovative motion and object interaction strategies for the advancement of intelligent robotics.

In daily life, people apply different grasps to objects. Those grasps, usually stable grasps that vary from power grasps to precision grasps, are executed for different manipulation purposes. In robotics, grasping problems have been studied for decades -- given an object and a manipulation task, finding a grasp of good quality for a robotic hand to execute. A good-quality grasp means an appropriate placement of contacts on an object. An appropriate contact placement needs to be reachable by suitable wrist location and orientation, and requires proper hand configuration.

One of the primary goals of the robotics field is automatically finding an appropriate grasp, in terms of task requirement and stability properties, given an object associated with a manipulation task to be performed. Furthermore, exploring functional relationships between objects is useful for object and motion recognition, and also important for robotic learning, as robots can learn functional relationship and associate it with manipulation skills.

University of South Florida inventors have developed an approach whereby robots can learn human-like motion and task-specific grasping strategies from human demonstration and analysis of a grasp quality metric based on distribution of task disturbance, and apply the learning results into planning, with respect to grasp qualities. Furthermore, they have developed a methodology to congregate object recognition and manipulation motion in an intelligent robot that connects interactive objects with their functional motions. These methods can be generalized to different robotic hand models.

**ADVANTAGES:**
- Improved grasp and grasp planning
- Improved motion recognition
- Objection relationship and interaction recognition
- Can withstand disturbance from the environment associated with performing task

**Improved Grasp and Object Interaction Recognition**

Corresponding small wrap and lateral pinch of robotic hand to human hand. They look similar to a human grasp but are different for a robotic grasp. Left: Small wrap grasps for a human hand (top) and a robotic hand (bottom). Right: Lateral pinch grasps for a human hand (top) and a robotic hand (bottom).

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