Docket #: S14-007

Passive surface grasping mechanism using directional adhesives

Stanford researchers have designed and successfully tested two prototype dynamic surface grasping devices. These devices use opposed pairs of gecko-inspired directional adhesives to attach to any smooth surface. They require very little energy for attachment and detachment, work on many surfaces, can undergo many attach/release cycles and can be scaled to either small or large applications. Dynamic surface grasping is applicable to landing of micro air vehicles (MAVs) and to grappling objects in space. It can also be used for climbing robots, toys, or any application requiring frequent attachment and detachment from smooth surfaces.

Stage of Research

- Two prototype grasper designs tested successfully via physical testing and computer simulations
- Continuing research to incorporate these prototypes into MAVs and into space grappling devices for environment testing to simulate orbital conditions

Applications

- **Micro-air vehicles (MAVs)** that perch on walls and ceilings
- **Space objects grasping** such as large panels, fuel tanks, and other orbital debris in space
- Climbing robots, toys, or any application requiring frequent attachment and detachment from surfaces

Advantages

- Low effort and rapid attachment and detachment on any smooth surface
- Can undergo many attach/release cycles

- Can be scaled to either small or large applications
- Does not require suction or a vacuum
- Does not use glue or other sticky adhesives
- The materials do not need to be magnetic

Publications

- Hawkes, E.W., Christensen, D.L., Eason, E.V., Estrada, M.A., Heverly, M., Hilgemann, E., Jiang, H., Pope, M.T., Parness, A., and Cutkosky, M.R., Dynamic Surface Grasping with Directional Adhesion," IEEE/RSJ IROS 2013, Nov. 2013.

Patents

- Published Application: 20170066138

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