MULTIPROBE MICROASSEMBLY

By

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ABSTRACT

This thesis describes the algorithm development and experimental results of a multiprobe microassembly system. The experimental testbed consists of two actuated probes, an actuated die stage, and vision feedback. The kinematic relationships for the probes, die stage, and part manipulation are derived and used for calibration and kinematics-based planning and control. The effect of adhesion forces on probe-part and part-stage contacts have been investigated in order to achieve grasp stability and robust part manipulation. Vision routines are developed to allow features to be located in three dimensional space through stereo vision. A detailed description of the experimental apparatus is presented.

By combining pre-planned manipulation sequences and vision-based manipulation, repeatable spatial (in contrast to planar) manipulation and insertion of a sub-millimeter part has been demonstrated. The insertion process only requires the operator to identify two features to initialize the calibration, and the remaining tasks involving part pick-up, manipulation, and insertion are all performed autonomously.