Paper Summary

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Computer Integrated Surgery II

Performance of Robotic Augmentation in Microsurgery – Scale Motions

Abstract
The experiments test users ability to position a common surgical tool to 250, 200, and 150 micrometer accuracy. Time, success rate, error rate, and number of attempts are included measurements of accuracy of the robot with and without human cooperation. The results are that the new steady hand eye robot augments human performance.

Introduction
Cooperative control systems have the advantage of integrating safety and information integration into the procedure without taking away control from the human surgeon. Tremor reduction increases the accuracy of pick-and-place motions at limits of human motor motion. The common medical relevance is anastomosis (suturing in and out of the vessel wall). The limits of human dexterity is 10s of micrometers.

Methods and Materials
Hardware
- steady hand eye robot with RCM
- LARS robot

Subjects
- 6 subjects
- grad students
- subjects performed task with and without aid of robot

Three trial types
- Unassisted series: without the aid of the robot
- Hand held series: using the robot
- Autonomous series: the robot moving itself

Results
The use of the robots dramatically increased precision of subjects performance in the pick-and-place experiment when compared to the experiment without the use of robots. The Eye Robot, in fact, was even more accurate than the LARS robot. Without the use of the robot in the unassisted series, for instance, there was a 43% success rate in subjects ability to place a needle in a hole of 150 microns wide. However with the LARS robot, that percent increased to 46% and with the Eye Robot, 79%.