

A Medical CAD/CAM System for Minimally Invasive Surgery using a Compact Surgical Robot

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【Outline of survey】

Sophisticated equipment, such as CT and MRI, are used in pre-operational medical diagnosis. However, most clinical procedures in the surgical theater depend on the surgeon's manual abilities. In recent times, there are increasing requests from patients for improved surgical procedures that are both minimally invasive (short incision) and require less recovery time. The introduction of surgical robots has the potential to increase surgical accuracy, improve the capabilities of less experienced surgeons, and deliver the expertise of specialists to remote locations, thereby leveling geographical disparities in the quality of surgical procedures. In the study, the knowledge and experience of a surgeon will be incorporated in a computer-integrated surgical system by integrating the following subsystems: (1) A medical CAD/CAM system to generate motion data based on information from the minimally invasive pre-planning system. (2) A navigation system to guide the operation along the calculated plan. (3) A surgical robot to conduct minimally invasive surgery.

【Expected results】

Mechanical components customized for the implementation of a medical robot will be developed. In addition, a generalized method for the design and construction of medical CAD/CAM and navigation systems will be developed and tested in abdominal and skeletal surgery and in microsurgery, such as neurosurgery. A database of actual results from pre-planning through post-operational evaluation of operations performed by superior surgeons will be established and used to realize a total simulation system. This database will provide an environment for the construction of a high-level medical education system. As the result, the number of the surgeons who have highly developed surgical technique will be increased, widely increasing the availability of advanced medical care.

【References by the principal researcher】

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- Mitsuishi,M., et al., "A Study of Bone Micro-Cutting Characteristics Using a Newly Developed Advanced Bone Cutting Machine Tool for Total Knee Arthroplasty," CIRP Annals., Vol.54, No.1, pp.41-46, 2005.

【Term of project】 FY2006 - 2010

【Budget allocation】 30,300,000 Yen

【Homepage address】

<http://www.nml.t.u-tokyo.ac.jp/index.html>