Auto-Registration for Stereotactic Procedures

Rafi Avitsian, MD, Pablo Recinos, Sean Nagel, MD, Efstathios Kondylis, MD, Stephen Jones, MD, PhD

UNMET NEED

External Ventricular Drain (EVD) placement in patients almost always occurs emergently and is performed at the bedside in the emergency room or intensive care unit setting and it is rarely performed in the operating room (OR). EVD placement is performed using mainly 1) Anatomic landmarks- "Blind", or 2) Neuronavigation- Fiducial registration or surface merging. Neuronavigation systems for the placement of EVD are bulky and cannot be used outside the operating room because they are expensive and time-consuming. Freehand typically involves multiple attempts and has ~25% misplacement rate, which can result in significant and potentially catastrophic complications such as intracranial hemorrhage. There is a need for a navigation system outside of the OR to place EVD and reduce the risk of complications.

SOLUTION

An Automated Surface Registration System that utilizes an array of bend sensors to trace the contour of the forehead/face anatomy along with a "searching function" algorithm would help to identify optimal fit. Two systems have been developed for co-registering the contour with the anatomy displayed in imaging: 1) Patch-based- flexible, adhesive patch for contour tracing and 2) Spider-based - "Spider" device for point-cloud sensing. A patch prototype has been developed. The patch is embedded with two bend sensors and conforms to the contour of the surface's anatomy without causing distortion. It can be placed with an adhesive backing to affix to the desired location. Each individual sensor within the array is arranged on the patch so that the position of each sensor is fixed and known relative to that of the other sensors.

Optical tracking unit worn by the user

Stylet

Computer hardware/software

Adhesive patch with flexible sensors