

Software Suite for High Precision Robot based Neurosurgery

An initiative is undertaken by Division of Remote Handling & Robotics (DRHR) and Computer Division, BARC to extend affordable high quality neurosurgical practice in India. Under this initiative, a high precision 6D PKM (6 DOF Parallel Kinematic Mechanism) based robot and Surgical Coordinate Measuring Mechanism (SCMM) are developed by DRHR while the software suit integrating the above mechanisms and providing neuro-registration, neuro-navigation and 3D visualization features is developed by Computer Division.

A high precision 6D PKM robot is used to perform neurosurgical procedure. It supports surgical attachments to guide the surgical tool along a preset direction to the present extent automatically or manually while a high precision SCMM provides precise measurement the coordinates of the anatomical point and is required for registration & navigation. The main goal of the software is to aid the surgeon to plan, confirm and then perform high accuracy surgical procedures and provide real time feedback by means of visualization of surgical tool in MRI images and in the reconstructed 3D model of patient's brain. It is achieved by providing features to facilitate a three-way registration between the patient, medical imaging data (DICOM) and the Robot (6DPKM) using SCMM. After registration, tools provided by the software for neuro navigation can be used for confirmation as well as for conducting medical procedures. A semi-automatic robotic process for conducting actual medical procedure can also be initiated through software.

The entire system is being continuously enhanced based on the feedback received from two medical facilities of national repute viz. National Institute of Mental Health and Neuro-Sciences (NIMHANS), Bengaluru and Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Navi Mumbai where initial assessments are being carried out.