

Using Electrical Impedance Tomography to Control a Robot

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Abstract : Electrical impedance tomography is a non-invasive medical imaging technique suitable for medical applications. This paper describes an electrical impedance tomography device with the ability to navigate a robotic arm to manipulate a target object. The design of the device includes various hardware and software sections to perform medical imaging and control the robotic arm. In its hardware section an image is formed by 16 electrodes which are located around a container. This image is used to navigate a 3DOF robotic arm to reach the exact location of the target object. The data set to form the impedance imaging is obtained by having repeated current injections and voltage measurements between all electrode pairs. After performing the necessary calculations to obtain the impedance, information is transmitted to the computer. This data is fed and then executed in MATLAB which is interfaced with EIDORS (Electrical Impedance Tomography Reconstruction Software) to reconstruct the image based on the acquired data. In the next step, the coordinates of the center of the target object are calculated by image processing toolbox of MATLAB (IPT). Finally, these coordinates are used to calculate the angles of each joint of the robotic arm. The robotic arm moves to the desired tissue with the user command.

Keywords : electrical impedance tomography, EIT, surgeon robot, image processing of electrical impedance tomography

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