Bioelectric Localization and Navigation (BLN)

Published date: Oct. 7, 2014

Technology description

Novelty:
A novel system for localization, tracking, and navigation of interventional devices, such as catheters and endoscopes, without using external imaging.
Value Proposition:
Guidance of interventional devices generally relies on external imaging such as fluoroscopy, CT, or MRI. These techniques often subject patients to dangerous and unnecessary levels of radiation, putting patients at risk for cancer and other injuries. The proposed system utilizes extremely low-voltage signals generated and/or measured by an array of electrodes on the medical device. These signals create an electric image of the local tissue surrounding the device and can be used for localization and navigation. This novel approach eliminates the need for electromagnetic tracking or radiation for guidance during the positioning of the interventional device by combining diagnostic or interventional pre-surgical imaging with intra-operative signal processing. Additional advantages of this system include:
Technical Details:
Johns Hopkins researchers have developed a system for localization and navigation of small medical devices through vessels. Prior to the medical intervention, a standard external imaging modality is used to collect initial images of vessel characteristics and layout. By means of one or multiple signal emitters on the interventional device, on the patients skin, or in other well-defined positions, a weak electrical signal is emitted into the patients body. This signal is received and measured by multiple electrodes placed on the interventional device, on the patients surface, or in other well-defined positions. This setup creates an electrical field which propagates through fluids and tissue. Depending on the electrical properties of the surrounding tissue, the field is distorted, and the distribution of the received signals varies between the electrodes. The resulting electric image is therefore dependent on the variations of tissue within the electrical field between the emitters and electrodes. During the intervention, the measured properties are compared to pre-intervention vessel images, allowing providers to estimate the current position the interventional devices with respect to the image.
Data Availability:
Prototype

Advantages

• Applicable in a wide variety of minimally invasive proceduress
• Eliminates imaging effects on biological tissue through use of low-voltage signal
• Requires minimal changes to workflow

Institution

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