Nerve contours tracking in ultrasound images for robotic surgery

Xavier Cortés†
LiFAT
Université de Tours,
Tours, Indre-et-Loire, France
xavier.cortes@univ-tours.fr

Donatello Conte†
LiFAT
Université de Tours,
Tours, Indre-et-Loire, France
donatello.conte@univ-tours.fr

Pascal Makris†
LiFAT
Université de Tours,
Tours, Indre-et-Loire, France
pascal.makris@univ-tours.fr

ABSTRACT

Robotic surgery has emerged as one of the most hopeful fields in medicine integrating a wide variety of cutting-edge technologies [1]. The main advantage that it brings is to improve safety during surgical procedures reducing the uncertainty produced by the human factor. However, there are many challenges to overcome in order to develop completely autonomous systems. Our work is part of a bigger project developed in parallel by different research teams aiming to build a semi-autonomous robotic system to inject regional anesthesia to patients during surgical procedures. In this paper we present a model for Ultrasound-Guided Regional Anesthesia (UGRA) technique [2] to track and detect in ultrasound videos the nerve contours helping the system to decide where the regional anesthesia must be provided.

We propose a procedure divided into three different steps that are processed iteratively for each frame of the video sequence after an initialization step in which the human operator imposes a bounding box where the nerve is inside. The first step consists in tracking the region inside the bounding box through the frames sequence [3-7]. The second step is to reduce the noise of the region detected by the tracker in order to increase the quality of the contour detection [8] and finally the third step aims to detect the contour points inside the region bounded by the tracked box applying thresholding [9] to binarize the targeted region and the canny edges detector [10] to detect the edges.

The experimental results show that the proposed model works within an acceptable margin of error.

CCS CONCEPTS

• **Applied computing~Bioinformatics** • Computing methodologies~Tracking • Computing methodologies~Video segmentation

KEYWORDS

Nerves, Contour; Tracking, Robotic Surgery, Regional Anesthesia.

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