



UNIVERSITA' CAMPUS BIO-MEDICO DI ROMA

Facoltà Dipartimentale di Ingegneria

Overview of Image Guided Minimal Invasive Surgery

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Abstract:

The current trend in modern surgery is towards minimal invasive intervention. Instead of using the traditional surgeon knife with its associated wounds, stitches and long healing process, laparoscopic devices and techniques are continuously being developed. One prominent approach which has gained popularity in recent years is thermal ablation. The concept is to elevate the temperature at the region of interest to the extent where irreversible damage is inflicted to the target tissue. Two main techniques lead the field. The first is based on the insertion of a needle type applicator to the target region (commonly a tumor) and dispensing at its tip some form of energy such as: laser, radio-frequency or microwave. As a result, the local temperature is elevated and ablation occurs. The second leading technique utilizes High Intensity Focused Ultrasound (HIFU). With this technique, a special ultrasound transducer (or an array of transducers) located outside the body focuses high acoustic energy at a focal spot within the body. This creates a virtual "knife" which destroys non-invasively a small volume of tissue.

Regardless of the technique implemented, there are several challenges which are associated with such procedures. The main ones are: target identification, image guidance, non-invasive thermal monitoring and non-invasive damage control. In this lecture some of the technical challenges will be presented and suggested solutions developed by our group and others using ultrasound, MRI and CT will be introduced. Finally, a short video clip depicting a noninvasive brain surgery in an awake patient will be presented.

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