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MRI-guided Focused Ultrasound Robotic system for preclinical research

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Summited Abstract:

Pre-clinical MRI guided robotic device using focused ultrasound

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Abstract

A magnetic resonance imaging (MRI)-robotic device with 4 computer-controlled axes (three linear and one angular) was developed. The positioning device holds a single element focused ultrasound (FUS) transducer. The purpose of this positioning device is to ablate small animals (mice, rats, cats, rabbits and small dogs) for preclinical research.

The robotic device includes MRI compatible piezoelectric motors, and optical encoders and ABS plastic. All the parts of the positioning device were developed using an industrial 3D printer. The diameter of the ultrasonic transducer can range from 20 to 60 mm. The transducer frequency was 2.6 MHz.

The MRI safety of the device was successfully evaluated in a GE 1.5 T MRI scanner. The robotic device has the ability to accurately move the transducer. The ability of the transducer to cause high temperatures was tested successfully in a water-agar phantom. A reliable, simple, cost effective, portable positioning device has been developed which can be used in virtually any MRI scanner since it can be placed on the scanner's table. The proposed positioning device can be used in the future for clinical trials for abdominal cancer treatment using FUS provided that it is evaluated extensively in animal models.

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