Technology Offer CSIC/JG/012

Personalised ultrasonic neuromodulation guided by low-field magnetic resonance imaging

Low-field magnetic resonance-guided ultrasonic neuromodulation system that enables personalised, precise and lower-cost brain treatments. Applicable to non-invasive neuromodulation and targeted drug delivery.

Intellectual Property

Priority patent application

Intended Collaboration

Licensing and/or co-development

Stage of development

Technology ready to be tested in an real environment.

Contact

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Market need

Neurological diseases are a major health challenge and require non-invasive, personalised therapies. Focused ultrasound is a promising technology for neuromodulation and reversible opening of the blood-brain barrier, but its clinical implementation is limited by the high cost of MRI-guided systems, the need for complex infrastructure, and the difficulty of use in outpatient settings. There is therefore a need for solutions that maintain therapeutic precision while reducing cost and complexity.

Proposed solution

An integrated system for personalised ultrasonic neuromodulation is presented, combining acoustic holography, low-field magnetic resonance imaging and robotic positioning to perform precise and reproducible brain treatments. The system uses holographic lenses manufactured by 3D printing, guided by low-field magnetic resonance imaging for spatial verification and a robotic system for precise transducer positioning. The procedure includes personalised planning, holographic element fabrication, image guidance, and ultrasonic treatment application.

Its applications include non-invasive neuromodulation, localised opening of the blood-brain barrier for drug delivery, and preclinical research in neurological therapies.

Competitive advantages

- Reduced cost compared to commercial MRI-guided ultrasound systems.
- Treatment customisation using acoustic holograms specific to each patient.
- High precision in treatment positioning and guidance.
- More compact system with potential for adaptation to outpatient settings.
- Rapid, low-cost manufacturing of focusing elements using 3D printing.