Handheld Ultrasound Transducer Array for 3D Transcranial Ultrasound and Acoustoelectric Imaging and Related Modalities

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Title: Handheld Ultrasound Transducer Array for 3D Transcranial Ultrasound and Acoustoelectric Imaging and Related Modalities

Invention: This invention is a hand-held ultrasound array that utilizes acoustoelectric technology to develop accurate, real-time and volumetric images of the human skull in order to diagnose and treat brain disorders.

Background: Acoustoelectric imaging utilizes an interaction between local pressure (pulsed ultrasound) and resistivity to detect and image tissue densities. Functional magnetic imaging, positron emission tomography, and optical imaging of intrinsic signals suffer from limited resolution on the order of a spatial resolution and the “inverse problem.” Magnetoencephalography improves resolution, but the equipment is bulky, expensive, and does not solve the inverse problem. Therefore, there is an unmet need to improve mapping of electrical brain activity on a detailed scale.

Applications:
- Animal models
- Laboratory equipment
- Pharmaceuticals
- Brain disorders like traumatic brain injury, intractable epilepsy, neonatal hypoxic ischemic encephalopathy and Parkinson's disease

Advantages:
- Non-invasive imaging at ultrasound spatial resolution < 2 mm
- 4D electrical imaging (volume and time)
- Reduction in background physiologic noise
- Flexible parameters (resolution, penetration, frame rate, scan area)
- Focused ultrasound for neuromodulation

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