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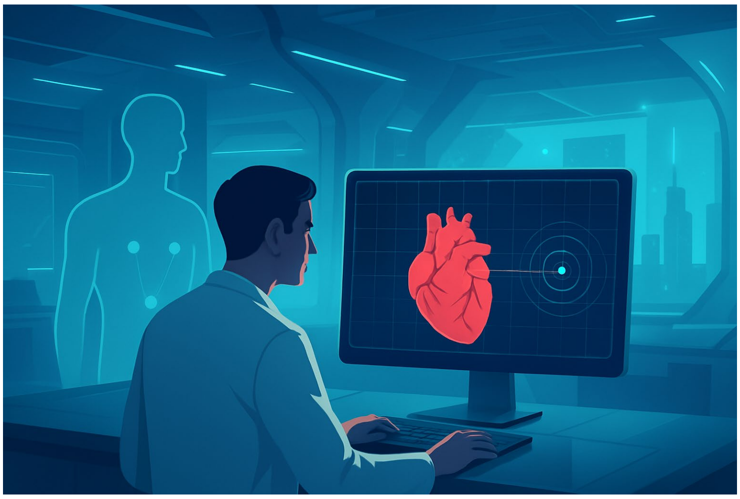
Licensing Opportunity

TTO – Technology Transfer Office

Time-Reversal Cardiac Electrical Mapping System



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Keywords

Cardiac electrical mapping, time-reversal simulation, bioelectrical signal processing, arrhythmia localization, computational cardiac model

Intellectual Property

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Description

This technology introduces a transformative method and system for identifying and locating cells that generate abnormal electrical signals within a subject's body—particularly within cardiac tissue.
The system records electrical activity via patient-mounted electrodes, applies a time-reversal transformation to these signals, and injects them into a high-fidelity computational anatomical model. Through the physical reciprocity of signal propagation, the time-reversed excitation naturally converges within the model at the precise anatomical region responsible for the anomaly.
The resulting "focusing" behavior enables clinicians to pinpoint arrhythmogenic cell groups with far greater accuracy. The system then maps these model-identified regions back onto the patient's actual anatomy, enabling targeted, efficient, and minimally invasive interventions.
This combined approach of data-driven signal acquisition and physics-based simulation offers a precise, non-invasive, and computationally robust pathway to arrhythmia localization—supporting faster, safer, and more effective cardiac procedures.

Advantages

- High-precision localization of pathological electrical sources through time-reversal focusing
- Non-invasive pre-mapping capability to reduce the need for prolonged catheter-based exploration
- Improved signal robustness even in low-quality or noisy recordings
- Enhanced procedural efficiency, enabling shorter and more targeted ablation sessions
- Anatomically accurate mapping, leveraging personalized anatomical models
- Fully computational and scalable, allowing integration with clinical systems and software platforms
- Applicable to multiple electrical tissues, including cardiac and neuromuscular domains

Applications

- Cardiac electrophysiology (atrial fibrillation, tachyarrhythmia mapping)
- Guided catheter ablation procedures
- Non-invasive cardiac diagnostic systems
- Biomedical signal processing and computational modelling