Researchers at the University of South Florida have developed a novel warping approach to quantify the dissimilarity of disease-altered patterns in 3-lead spatiotemporal Vectorcardiogram (VCG) diagnostics of cardiovascular diseases.

Myocardial infarction (MI) is also known as a heart attack; it is the leading cause of death in the United States. It often occurs due to the occlusion of coronary arteries, thereby leading to insufficient blood and oxygen supply that damage cardiac muscle cells. There is an urgent need to develop an Electrocardiographic imaging (ECGI) system that is real-time, low-cost, highly wearable, and provides high-quality data and advanced analytical tools for improving telemedicine-based health outcomes around the world.

The novel technology captures critical spatiotemporal heart dynamics by displaying the real-time motion of VCG cardiac vectors in a 3D space. The dynamic display can also be accomplished with only one lead ECG signal through an alternative lag-reconstructed ECG representation from nonlinear dynamics principles. In addition, the trajectories are color-coded with additional dynamical properties of space-time VCG signals, that is, the curvature, speed, octant and phase angles to enhance the information visibility. Spatiotemporal VCG signal representation facilitates the characterization of space-time cardiac pathological patterns and enhance the automatic assessment of cardiovascular diseases.

This technology is applicable to cardiovascular device industry.

**ADVANTAGES:**
- Low cost
- Wearable

**Cardiac Electrical Activities**

A Time-Domain ECG Trace with P Wave, QRS Complex, and T Wave

Cardiac Electrical Activities of Healthy Control (blue/solid) and Myocardial Infarction Subjects (red/dashed)