A Web-based Visualization Tool for Transforming the 12-lead ECG into a Body Surface Potential Map

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The 12-lead ECG is the most commonly used technique for assessing cardiac activity. With just six precordial electrodes, it is often criticized for its lack of right sided and posterior leads. In contrast, the Body Surface Potential Map (BSPM) can use over 200 electrodes to capture information from the entire surface of the torso. Although BSPMs have been shown to be more sensitive in detecting cardiac pathologies, a large number of electrodes are impractical in routine clinical practice. This reality has lead to the development of reduced lead sets, where a small number of leads are recorded and a mathematical solution is used to derive additional leads. In this study, we have developed a web based ECG viewer that provides a platform to transform the 12-lead ECG into a BSPM.

The viewer was developed using lossless vector graphics technology (Adobe Flash). A user can load a Health Level Seven Annotated Electrocardiogram (HL7 aECG) 12-lead ECG. A set of pre-stored coefficients can be selected or a new set can be uploaded. Subsequently, the 12-lead ECG is transformed into a BSPM, which can be further explored using isopotential and isointegral tools. The BSPM can also be saved using an open storage format called XML-BSPM.

This tool was tested by transforming 20 12-lead aECG files into 192 lead BSPMs (Lux format). This was performed using transformation coefficients developed from an existing set of 192 lead BSPMs. The average transformation time on a PC (3GHz CPU, 3GB RAM) was 1.35 seconds. This included the time to parse coefficients from the XML, perform the transformation and to generate the XML-BSPM file.

This tool presents more information than would be available with the 12-lead ECG. It could outperform current methods used to display ST elevation (24-lead view) and could therefore improve the accuracy of a diagnosis.