Cardiovascular Diagnosis from Ballistocardiogram

Organization
University of Missouri - Columbia

Industry:
Human Health

Researchers:
Giovanna Guidobani, PhD

Status of Intellectual Property:
Patent pending

Next Steps:
- More validation with more patients
- Refinement of model for improved accuracy
- Development of BCG sensing system
- Find an entrepreneur/licensee with cardiovascular expertise for partnering on validation: Medical grade application for physicians and remote monitoring applications such as embodying the invention in a chair, bed, etc.

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Customer Problem

Currently, cardiologists use electrocardiograms (ECGs) to diagnose heart condition. The output from an ECG, known as the ECG wave, is well understood and lends itself to diagnosing heart conditions. This allows physicians to diagnose heart problems based on where deviations occur relative to the standard ECG wave shown in the image below. For example, if a deviation is observed at P, then the patient is experiencing atrial depolarization.
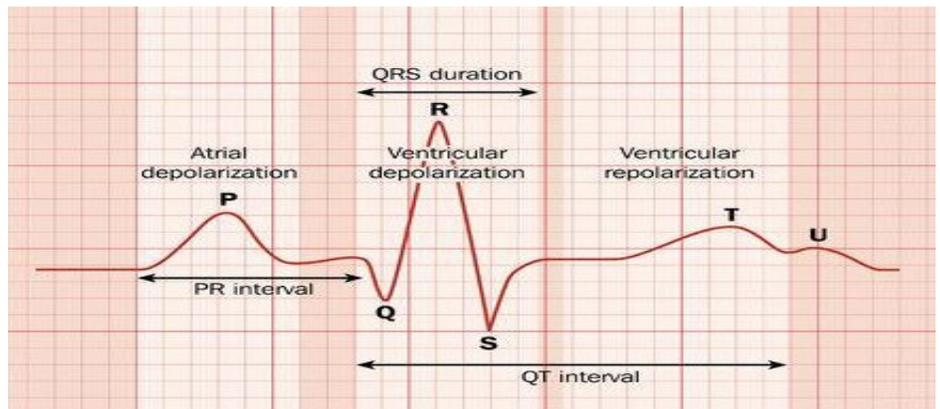
A ballistocardiogram (BCG) is another heart measurement related to heart condition that is the signal generated by the motion of the center of mass of the human body due to ejection of blood from the heart into the large vessels and its re-turn to the heart. However, despite considerable research, the BCG wave is not well understood and does not currently allow for any specific cardiovascular diagnosis beyond generic cardiovascular dysfunction. This is partly due to the additional complexity of the BCG wave, which models the entire cardiovascular system, whereas an ECG wave only models the heart.

A need therefore exists to develop the BCG wave into something that allows for cardiovascular diagnosis.

Potential Market Uses

This research allows for the BCG to provide actionable information to physicians related to cardiovascular health.

The innovation can be used with sensors placed within Accelerometers, Hydraulic Bed Sensors, Weighing Scale, etc. Potential customers include all patients in need of cardiovascular testing to determine the current state of their cardiovascular functions.

Innovation

Professor Guidoboni has characterized the BCG wave to model the entire cardiovascular system as illustrated to the below. This research allows for the BCG to provide actiona-ble information to physicians related to cardiovascular health.
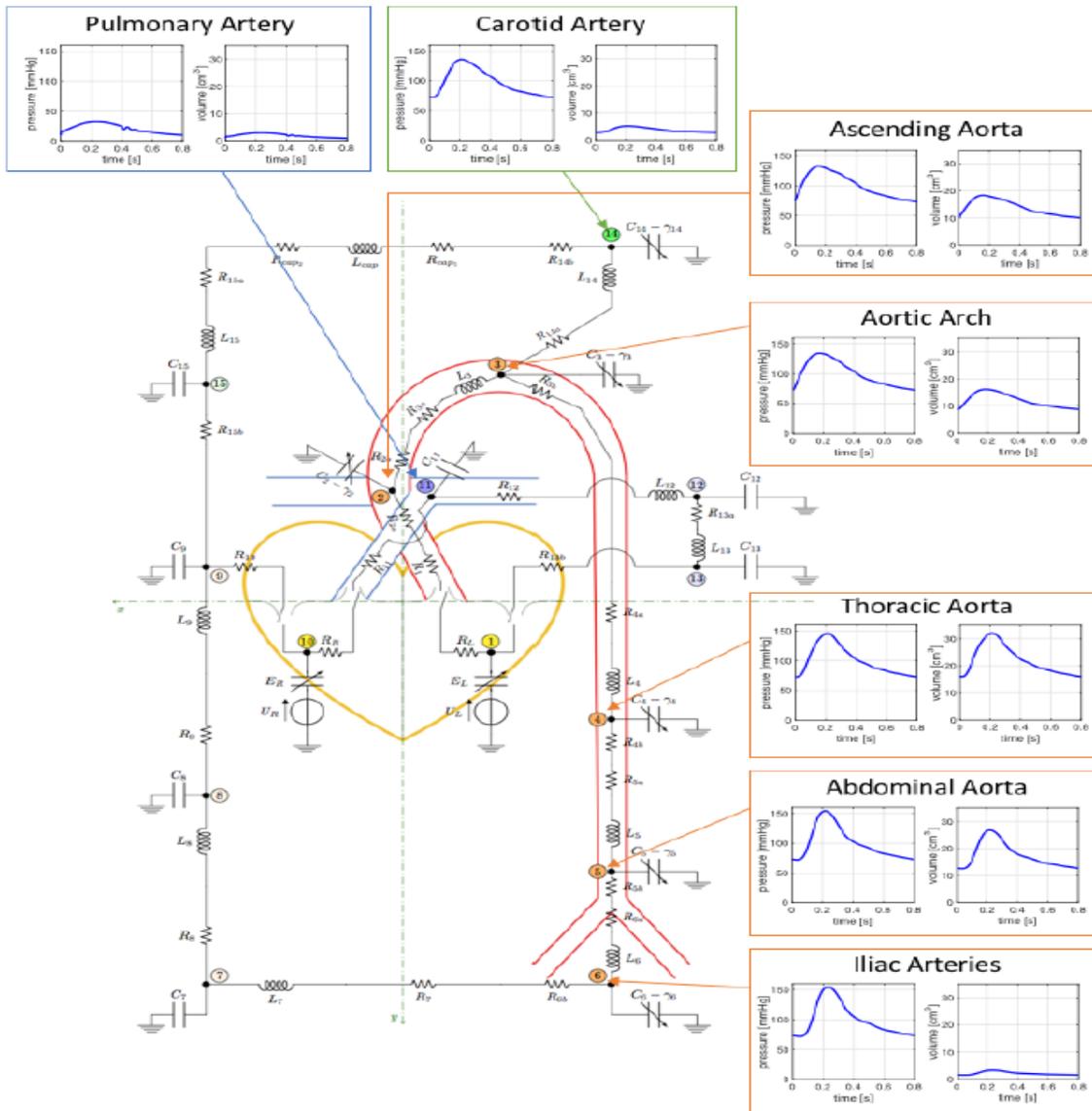
Stage of Development

Prototype built and tested on a small number of subjects.

Competitive Advantages

Current competitors contain consumer products with sensors that help detect certain cardiovascular measures e.g. a bathroom scale measuring blood pressure, but do not measure the entire cardiovascular system to help determine its function.