A Four-Chamber Multimodal Cardiac Phantom for Imaging Experiments (12053)

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Technology description

Features and Benefits

The phantom simulate the cardiac asymmetric wall motion, blood flow, and valve motion which is in between the atria and ventricles as in a real human heart.

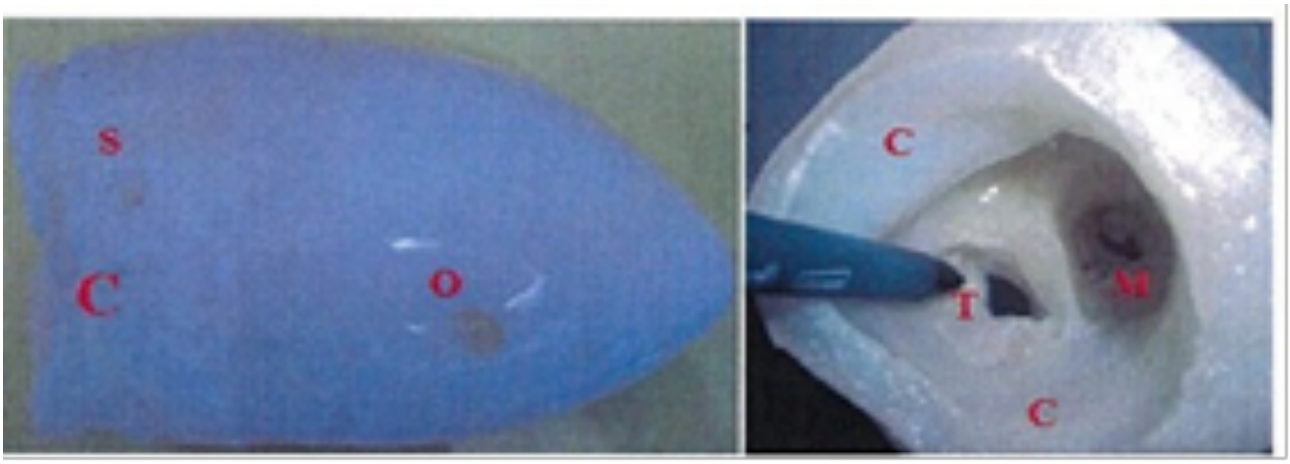
Aids in the validation of cardiac motion detection and segmentation algorithms.

Can be connected to a manual or electric fluid pump allowing the pump to contract and expand the phantom.

This Technology is available for licensing, further development, or industrial partnering

Technology

Heart disease is the leading cause of death in the world in which the main contributor is coronary occlusion Coronary blood flow occlusion leads to myocardial compromise presenting as decreased range of displacement of the myocardium and reduced thickening. Therefore, clinicians make use of imaging techniques for the assessment of heart motion and the underlying myocardial perfusion. The clinicians assess the myocardial motion subjectively; however, the conventional myocardial motility scoring is subjective and suffers from inter and intra observer variability. Registration and motion estimation algorithms are significant areas of research in the medical imaging community with the goal of aiding the clinicians achieve more objective outputs. Nevertheless, in vivo validation of registration techniques is not a trivial task since the ground truth motion field of the cardiac displacement is not known exactly.



One approach to validation is a controlled experimental phantom setup that can simulate the anatomy and physiology of the heart. We've developed a cardiac phantom (shown above). Panel (a) shows the outside view of the phantom and panel (b) shows the inside view of the phantom as well as the valves (T: tricuspid valve, M: mitral valve, C: connector, 0: outlet of the left ventricle, s: holes to place the connecting plastic screws). It is made with Poly Vinyl Alcohol (PVA) solution that has the ability to mimic elasticity, ultrasound and magnetic properties of the normal and abnormal cardiac tissues using a four chamber cardiac mold. It contains two stiff polymers in the apical and Mid-antero-lateral regions that mimic the infracted region of the heart as well as several MRI and ultrasound markers which may be used as landmarks for the validation of motion detection techniques.

Markets Addressed

The University of Louisville is seeking a business partner interested in developing and commercializing a four chamber multimodal cardiac phantom which simulate normal and pathologic hearts with different degrees of infarction and scar tissues. The cardiac phantom could be used for imaging studies using MRI, ultrasound, and CT. It could be used as an interventional platform phantom for robotic surgical experiments such as valve replacement and cardiac surgery. It contains a valve/blood flow model for ultrasound/Doppler imaging studies. Furthermore it could serve as an educational platform for residents, researchers, engineers and technical operators. The cardiac phantom could also be extended to a practice platform for medical procedures such as catheterization and CVP insertion.

Technology Status

Fields of Use Available: Please Inquire

Institution

University of Louisville

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