



Frame-by-Frame 3-D Reconstruction of Dynamic Catheter Device

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Inventors: Michael Speidel, Charles Hatt

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new X-ray imaging technique to track the shape and position of a TAVR valve or other deformable device as it is deployed inside a patient.

Overview

Transcatheter aortic valve replacement (TAVR) is a less invasive treatment option for patients with severe aortic valve stenosis. The procedure involves precise positioning of a balloon-mounted prosthetic valve. Accurate device visualization is highly challenging and critical to success.

Traditional imaging processes are inadequate – conventional X-ray fluoroscopic imaging can only provide a 2-D view of the device, leading to ambiguities in position and orientation. Even cutting-edge multimodal registration systems fail to fully capture device status relative to a patient's anatomy.

Improved methods are needed enabling a clinician to track devices that change form and position during a procedure.

The Invention

UW–Madison researchers have developed a method to obtain frame-by-frame 3-D representations of a TAVR valve or other interventional device in a patient using bi-plane X-ray imaging.

Specifically, they developed a new pose estimation technique to compare measured X-ray images to forward projections of a dynamic 3-D model, which can assume different states of expansion and deformation. The model is defined by a limited set of parameters (ex., in the case of an expanding TAVR valve these include pitch, yaw, roll, proximal and distal diameter of the device) as well as *a priori* knowledge such as predictable changes in shape.

Other technologies have been developed based on a similar concept, but they assume a rigid, static object with a shape that has been fully characterized prior to X-ray imaging.

Applications

- Imaging software

Key Benefits

- Enables practical 3-D reconstruction in real time

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Stage of Development

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The new method has been used to produce accurate 3-D reconstructions from simulated bi-plane X-ray images of an expanding prosthetic valve.

Additional Information

For More Information About the Inventors

- [Michael Speidel](#)

Tech Fields

- [Medical Imaging : X-ray.](#)

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846

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