

Public Abstract

First Name:Hsuan-Ming

Middle Name:

Last Name:Huang

Adviser's First Name:Haidekker

Adviser's Last Name:Mark

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:FS 2007

Department:Biological Engineering

Degree:MS

Title:DEVELOPMENT OF HIGH-RESOLUTION OPTICAL TOMOGRAPHY WITH LARGER-SIZE PROJECTION ACQUISITION

In the industrial countries, the mortality from arteriosclerosis and cardiovascular diseases has been decreased, but they remain the most common circulatory disease. Recently, new tissue engineering technologies such as tissue-engineered blood vessels (TEBV), produced from a patient's own cells, are becoming available to treat these diseases. In order to monitor the quality of TEBV and assess biomechanical properties, a nondestructive and minimally invasive method is necessary. Optical Tomography (OT) is a proper imaging method because it satisfies the above requirements. Besides, the benefits of OT include: low cost, simple design and ultra fast acquisition.

The purpose of this project was to develop an ultra-fast 3D OT scanner by using a beam expander and larger-size CCD cameras instead of pencil beam and smaller-size detectors. The new device is capable of imaging an axial section of about 4mm height in one single revolution. The new OT scanner will primarily be used to obtain the biomechanical properties, the geometry and defects of TEBV. The new device was evaluated by using phantom studies and then tested its performance for the thin tissue layer of TEBV, obtained from Cytograft Tissue Engineering. The results show that the new system has the potential to be a low cost, high tissue contrast, rapid and simple scanner.