Application of the innovative data fusion based non-invasive approach for management of the diabetes mellitus / SkinDetector

the objective of the project

To develop a non-invasive early-stage detection, diagnosis and monitoring system of the microvascular and macrovascular complications of diabetes mellitus.

motivation

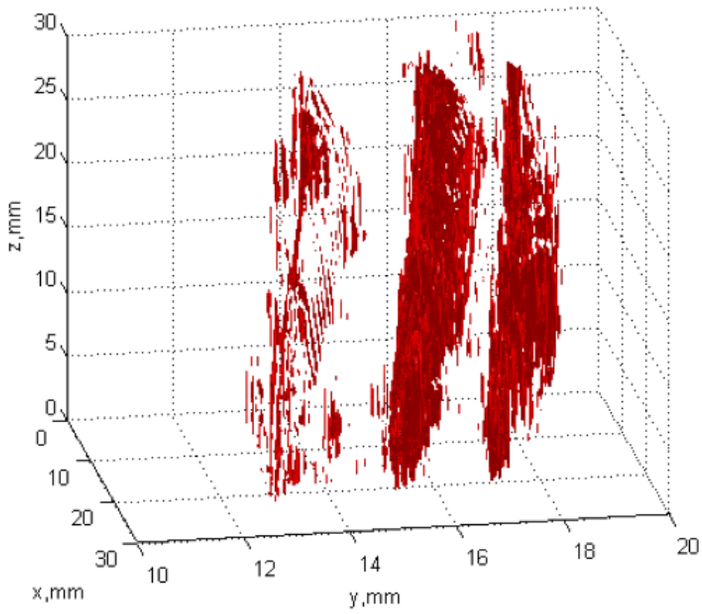
At least 30% of persons with diabetes mellitus have cutaneous involvement during the course of their chronic disease. Diabetic foot with ulceration is a major cutaneous complication of diabetes mellitus and consumes a major portion of the resources allocated for the treatment of diabetes. Neuropathy and peripheral vascular disease (microangiopathy) have been identified as major risk factors for diabetic foot ulceration and amputation. The epidermal plantar skin becomes thinner and plantar soft tissues stiffen in people with diabetes, particularly in persons who have neuropathy or ulceration, which increases the risk of tissue breakdown and ulceration formation. Higher foot temperature in diabetic patients with peripheral neuropathy is an early sign in the detection and prevention of risk of injury evolution. Early referral to the dermatologist may help to detect complications of the skin in diabetes at an early stage and may prevent disability caused by these complications. The created “smart” diagnostic system and portable equipment is indented to be used by offices of general practitioners and local primary care clinics. Also, the low weight and mobile equipment will be suitable to be used for patient homecare as well.

ultrasound institute

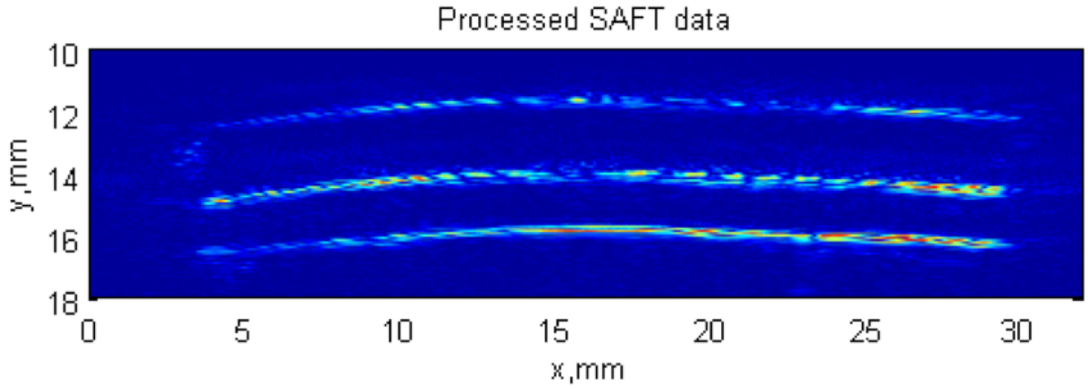
Participated in development of imaging device, algorithms for data fusion of dermatoscopic (optical images), thermographic images and ultrasonic data. The algorithms of spatially distributed 3D focusing and post-processing consisting of SAFT, TFM, spatial contouring and volumetric rendering techniques were proposed and tested on developed special phantoms of superficial tissue. The mentioned phantoms possessed the internal reflectors, also the multi-layered structure. In addition, numerical simulations, analysis and modification of the 3D beamforming algorithms were performed.

Ultrasound Institute of Kaunas University of Technology
http://ultrasound.ktu.edu

Ultrasonic imaging device



Reconstructed 3D shape and spatial dimensions of internal lesions of the multi-layered phantom (superficial tissue of diabetic foot)



The post-processed B-scan image of multi-layered phantom (superficial tissue of diabetic foot)

project partners

Innovative Technology and Science Limited (UK), UAB Metis Baltic (Lithuania), Boynedun Limited (Ireland), Dotsoft Oloklиromenes Efarmoges Diadiktioy kai Vaseon Dedomenom AE (Greece), Dasel SL (Spain), Optomed OY (Finland), Technische Universitaet Dresden (Germany), Lithuanian University of Health Sciences (Lithuania), TWI (UK), Kaunas University of Technology (Lithuania).

project homepage

http://www.skindetector.eu