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Thermographic Venous Blood Flow Characterization with External Cooling Stimulation

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Abstract

Experimental characterization of blood flow in a human forearm is done with the application of continuous external cooling based active thermography method. Qualitative and quantitative detection of the blood vessel in a thermal image is done along with the evaluation of blood vessel diameter, blood flow direction, and velocity in the target blood vessel. Subtraction based image manipulation is done to enhance the feature contrast of the thermal image after removal of external cooling. To demonstrate the effect of occlusion diseases (obstruction), an external cuff based occlusion is applied after the removal of cooling and its effect on the skin rewarming is studied. Using external cooling, a transit time method based blood flow velocity estimation is done. From the results obtained, it is evident that an external cooling based active thermography method can be used to develop a diagnosis tool for superficial blood vessel diseases.

Keywords: Medical Infrared (IR) Thermography, External Cooling Stimulation, Skin Temperature, Superficial Skin Blood Flow, Venous Blood Activity Ratio.

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