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Automated Ultrasonic Skin Thickness Meter

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ABSTRACT

Skin thickness measurement is an important part of cutaneous investigation techniques. It is a useful tool in diagnosis, therapy control, and the testing of medicaments. Ultrasound in dermatology is widely used for these purposes, but until now there has been no standardisation in the instruments. Standardisation and automation of the ultrasonic skin thickness instrument are very important in order to gain accuracy and speed in clinical routine.

The objective of this work was to design, implement and test an automated skin thickness meter using an ultrasound technique. This thesis describes the design approach that was used to implement the meter and presents the results that were obtained from the instrument.

The system hardware consists of a 14 MHz ultrasound transducer, an ultrasound pulser and receiver, thickness measurement circuit, envelope detection circuit and a personal computer with the necessary interface boards. Computer programs were written in LabVIEW language to control the functions of the meter and to automate the collection of the data.

The system hardware and software were tested successfully on two test materials, perspex and human skin.

The thesis also describes and evaluates the results of deconvolution signal processing performed on A-scan ultrasound pulse-echo signals from human skin in vivo, with the aim of identifying the best method for achieving a reproducible automatic measurement of skin thickness.