

THE NUMERICAL ANALYSIS OF THERMOGRAPHIC IMAGES IN THE MEASUREMENT OF SURFACE TEMPERATURES

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The estimation of mean surface temperatures from a limited number of measurement sites has long been a controversial topic, and in many circumstances may prove very inaccurate. Infra-red thermography now offers the ability to estimate with higher accuracy, and without any physical contact, the surface temperature at many sites within a small or large area. This information can be stored and analysed on relatively cheap microcomputers. This study was undertaken to assist in the quantification of a peripheral cold stress test used to assess cold sensitisation following cold injury.

Volunteer control subjects and patients referred for the assessment of cold injury underwent a standardised cold stress, immersion of hand or foot in stirred water at 15 degrees C for one minute. Infra-red images were recorded using an Agaema Thermovision 870 system, and stored in a microcomputer running Agaema TIC software. The images file were then transferred to another microcomputer for further analysis using specialised image-processing software which is designed to divide the individual point temperatures by area, and thus enable various analytical techniques to be applied.

Whilst images may not always prove amenable to automatic analysis, suitable background temperatures enable the foreground object to be separated out, and sub-divided again by area. Simple programming techniques can eliminate edge effects (which lead to erroneous data) and even reconstruct apparently lost portions of the image (for example, when temperatures are below the chosen threshold). Statistical analysis can then be applied to each area, making thermographic techniques more objective.

Further development of image analysis for infra-red thermal analysis will refine these early techniques considerably. They offer the only practical way of studying detailed regional surface temperature changes, such as are required in the cold stress test described. They may also have significant advantages in the standardisation of more discrete thermistor-based estimates of mean surface temperature.