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# Thermal detection of embedded tumors using infrared imaging.

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## Abstract

Breast cancer is the most common cancer among women. Thermography, also known as thermal or infrared imaging, is a procedure to determine if an abnormality is present in the breast tissue temperature distribution. This abnormality in temperature distribution might indicate the presence of an embedded tumor. Although thermography is currently used to indicate the presence of an abnormality, there are no standard procedures to interpret these and determine the location of an embedded tumor. This research is a first step towards this direction. It explores the relationship between the characteristics (location and power) of an embedded heat source and the resulting temperature distribution on the surface. Experiments were conducted using a resistance heater that was embedded in agar in order to simulate the heat produced by a tumor in the biological tissue. The resulting temperature distribution on the surface was imaged using an infrared camera. In order to estimate the location and heat generation rate of the source from these temperature distributions, a genetic algorithm was used as the estimation method. The genetic algorithm utilizes a finite difference scheme for the direct solution of the Pennes bioheat equation. It was determined that a genetic algorithm based approach is well suited for the estimation problem since both the depth and the heat generation rate of the heat source were accurately predicted.

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