UNIVERSITI PUTRA MALAYSIA

SIMULATION OF MICROWAVE BISTATIC RADAR FOR BREAST CANCER DETECTION APPLICATION

OCTARINA NUR SAMIJAYANI

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By

OCTARINA NUR SAMIJAYANI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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DEDICATION

This thesis is especially dedicated To

My beloved parents, my sisters and all my dearest friends

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

SIMULATION OF MICROWAVE BISTATIC RADAR FOR BREAST CANCER DETECTION APPLICATION

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OCTARINA NUR SAMIJAYANI

May 2011

Chairman : Y.M Raja Syamsul Azmir bin Raja Abdullah, PhD

Faculty : Engineering

ABSTRACT

The implementation of microwave active imaging technique for breast cancer detection is being developed recently and highly supported by the property of tumor which has high contrast in electrical properties compared to normal breast tissue. The tumor causes a significant scattering than normal tissue when exposed in microwave. Ultra wideband (UWB) microwave bistatic radar is simulated with a moving transmitter in the edge of breast utilizing the Doppler parameter for breast cancer detection. Doppler frequency is derived in terms both the changing of UWB pulse width and Pulse Repetition Frequency (PRF). The received signal is modelled and then processed using three Doppler Extraction Methods; *Power Frequency Analysis, Correlation Method,* and *Doppler Frequency Separation*.

Doppler Frequency Separation is a better technique to extract the Doppler feature. Although the frequency changing caused by the Doppler Effect in this proposed system is small enough compared to its carrier frequency, the comparison result using correlation coefficient formula obtains the feasibility of this proposed radar to differentiate between a healthy and cancerous breast is about 0.2-0.5 of dissimilarity level.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

SIMULASI RADAR BISTATIK GELOMBANG MIKRO UNTUK APLIKASI PENGESANAN BARAH PAYUDARA

Oleh

OCTARINA NUR SAMIJAYANI

Mei 2011

Pengerusi : Y.M Raja Syamsul Azmir bin Raja Abdullah, PhD

Fakulti : Kejuruteraan

Pelaksanaan teknik pengimejan aktif gelombang mikro untuk pengesanan barah payudara sedang dibangunkan pada masa kini dan amat disokong oleh sifat ketumbuhan yang mempunyai perbezaan ketara dari segi sifat elektrikal berbanding tisu payudara normal. Ketumbuhan akan menyebabkan satu selerakan yang ketara berbanding tisu normal apabila didedahkan kepada gelombang mikro. Radar bistatik gelombang mikro jalur luas ultra (UWB) disimulasikan dengan suatu penghantar bergerak di pinggir payudara dengan menggunakan parameter Doppler untuk pengesanan ketumbuhan/barah. Frekuensi Doppler diterbitkan dari kedua-dua segi iaitu perubahan lebar denyut UWB dan frekuensi pengulangan denyut (PRF). Isyarat

diterima dimodelkan dan diproses menggunakan tiga kaedah pengekstrakan Doppler; analisis frekuensi kuasa, kaedah korelasi dan pemisahan frekuensi Doppler.

Pemisahan frekuensi Doppler merupakan teknik yang lebih baik untuk mengestrak ciri Doppler. Walaupun perubahan frekuensi yang disebabkan oleh Doppler di dalam sistem yang dicadangkan ini adalah cukup kecil berbanding frekuensi pembawa 6GHz, perbandingan hasil menggunakan formula pekali korelasi mencapai keboleharapan radar yang dicadangkan untuk membezakan payudara sihat dan payudara yang dijangkiti barah adalah sekitar ketidaksamarataan 0.2-0.5.

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I certify that a Thesis Examination Committee has met on 31st May 2011 to conduct the final examination of **Octarina Nur Samijayani** on her thesis entitled "Simulation of Microwave Bistatic Radar For Breast Cancer Detection Application" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

OCTARINA NUR SAMIJAYANI

Date: 31 May 2011

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