

**A NOVEL MULTI-DIMENSIONAL IIR NOTCH FILTER  
FOR ATTENUATING MULTIPLE NARROWBAND  
INTERFERENCES**

Pattiya Kumburage Tharindu Chandima

(168453J)

Degree of Master of Science in Electronics and Automation

Department of Electronic and Telecommunication Engineering

University of Moratuwa

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## **DECLARATION**

“I declare that, this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name of the supervisor: Dr. Chamira U. S. Edussooriya

Signature of the supervisor:

Date:

## **ABSTRACT**

Notch filters are a class of filters that are used to attenuate narrowband interferences. Previously reported finite impulse response (FIR) or infinite impulse response (IIR) notch filters are predominantly limited to one-dimensional (1-D) or two-dimensional (2-D) signals. With emerging multi-dimensional (M-D) signals, such as four-dimensional (4-D) light fields and five-dimensional (5-D) light field videos, design techniques for M-D notch filters, beyond 2-D notch filters, are required to be investigated.

In this dissertation, a novel M-D multi notch IIR filter is proposed to attenuate multiple narrowband interferences. The structure of the notch filter is derived by cascading notch filter pairs. Initially, 1-D filter structure is presented and afterwards it is expanded as an M-D filter. The key factor of the proposed notch filter is the flexibility of placing the notches, adding any number of notches in to M-D and bandwidth can be controlled independently.

Narrowband interference attenuation has been verified using monochromatic image and a video. Capabilities of the proposed filter are compared against the existing filtering method using unity three-dimensional (3-D) signal. It is clearly noticeable that, the proposed M-D multi notch IIR filter has better performance as well as greater flexibility.

## **DEDICATION**

To my parents

Rohana Pattiya Kumburage and Ramya Thejani Pattiya Kumburage

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## LIST OF ABBREVIATIONS

1-D	One-Dimensional
2-D	Two-Dimensional
3-D	Three-Dimensional
4-D	Four-Dimensional
5-D	Five-Dimensional
7-D	Seven-Dimensional
BIBO	Bounded-Input-Bounded-Output
DSP	Digital Signal Processing
ECG	Electrocardiography
FIR	Finite Impulse Response
fMRI	Functional Magnetic Resonance Imaging
IIR	Infinite Impulse Response
M-D	Multi-Dimensional
SIR	Signal-to-Interference Ratio