

THE UNIVERSITY OF TEXAS AT AUSTIN  
Dept. of Electrical and Computer Engineering

*EE381K-14 Multidimensional Digital Signal Processing*  
Problem Set #5: Non-Separable FIR Filter Design

Date assigned: March 22, 2008

Date due: April 1, 2008

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Reading: D&M, Chapter 3

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You may use any computer program to help you solve these problems, check answers, etc.

Homework is due on Tuesday, April 1st, by 11:00 AM in class.

Regularly scheduled office hours for Prof. Evans are Wednesdays 10–11 AM, Thursdays 12:30–1:30 PM, and Fridays 9:00–10:00 AM in ENS 433B. Feel free to send questions by e-mail to bevans@ece.utexas.edu.

Be sure to submit your own independent homework solutions.

**Problem 5.1** Fan Filter Design Using Constrained Least-Squares Approach  
Dudgeon & Mersereau, problem 3.6.

In addition, please complete the following:

- (d) Compute the impulse response
- (e) Plot the magnitude and phase response

**Problem 5.2** Fan Filter Design Using Constrained Least-Squares Approach  
Dudgeon & Mersereau, problem 3.8.

**Problem 5.3** Fan Filter Design Using Constrained Least-Squares Approach II

- (a) Please compute the coefficients for the  $5 \times 5$  filter for the fan filter in problem 5.2.
- (b) Plot the magnitude and phase for the filter in part (a).
- (c) Apply the filter in part (a) to the lena image. Print the resulting image. Comment on the resulting image.
- (d) Apply the filter in part (a) to the barbara image. Print the resulting image. Comment on the resulting image.

**Problem 5.4** Fan Filter Design Using a McClellan Transformation  
Dudgeon & Mersereau, problem 3.14.

**Problem 5.5** Fan Filter Design Using a McClellan Transformation II

- (a) Please compute the coefficients for the  $5 \times 5$  filter for the fan filter in problem 5.4.
- (b) Plot the magnitude and phase for the filter in part (a).
- (c) Apply the filter in part (a) to the lena image. Print the resulting image. Comment on the resulting image.
- (d) Apply the filter in part (a) to the barbara image. Print the resulting image. Comment on the resulting image.