# Module 9

# Digital Filter Banks, Part I

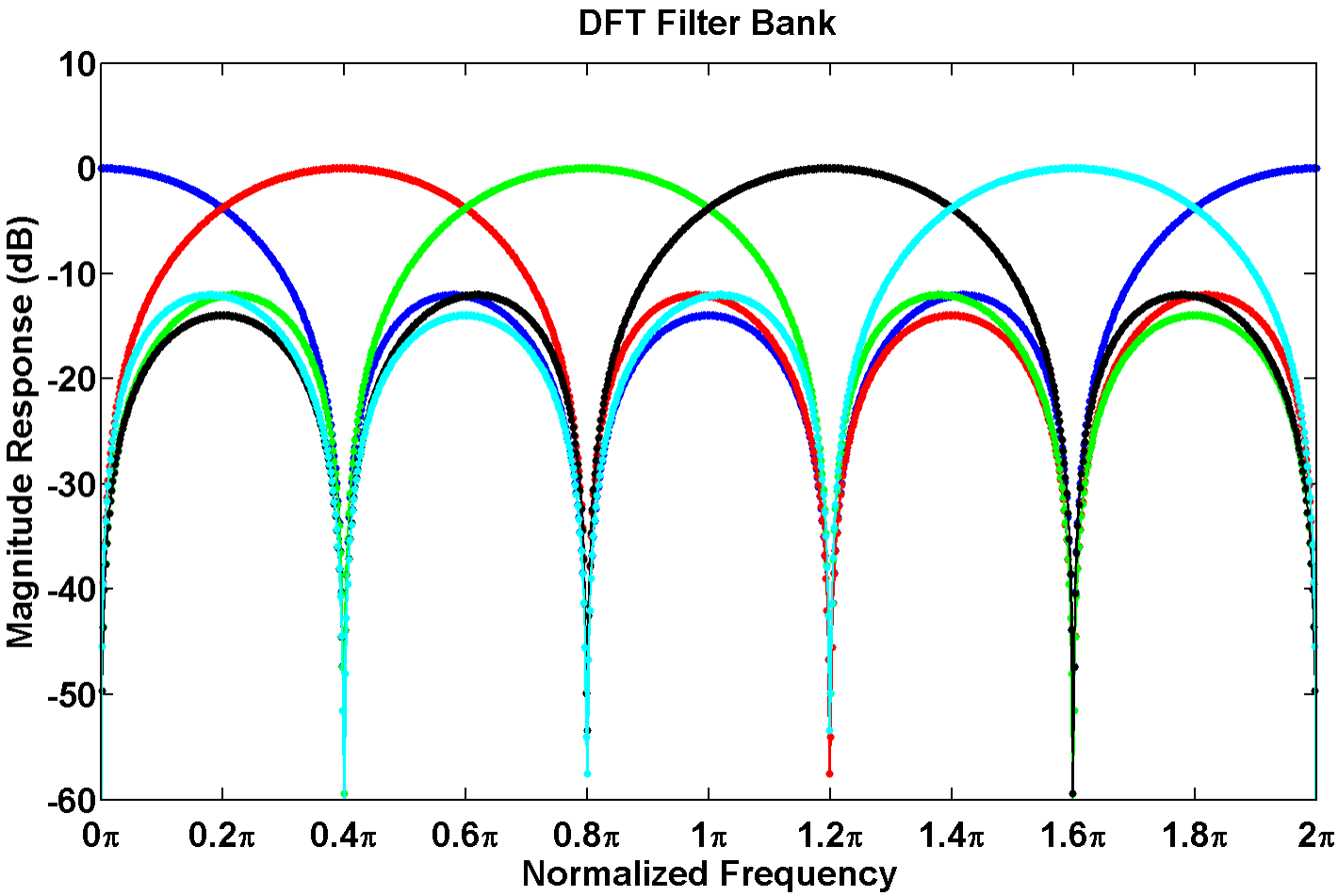
# Overview

- Analysis filter bank
- Synthesis filter bank
- DFT filter bank
- Polyphase implementation of uniform filter banks
- MATLAB examples

# MATLAB Examples

- Uniform Filter Bank with 5 Subbands
  - DFT
  - Prototype filter $H_0(z)$ designed using Parks-McClellan algorithm
    - Passband/stopband ripple
    - Overlap between subbands
  - Prototype filter $H_0(z)$ designed using eigenfilter technique
    - Overlap between subbands
    - Relative weight of passband/stopband errors

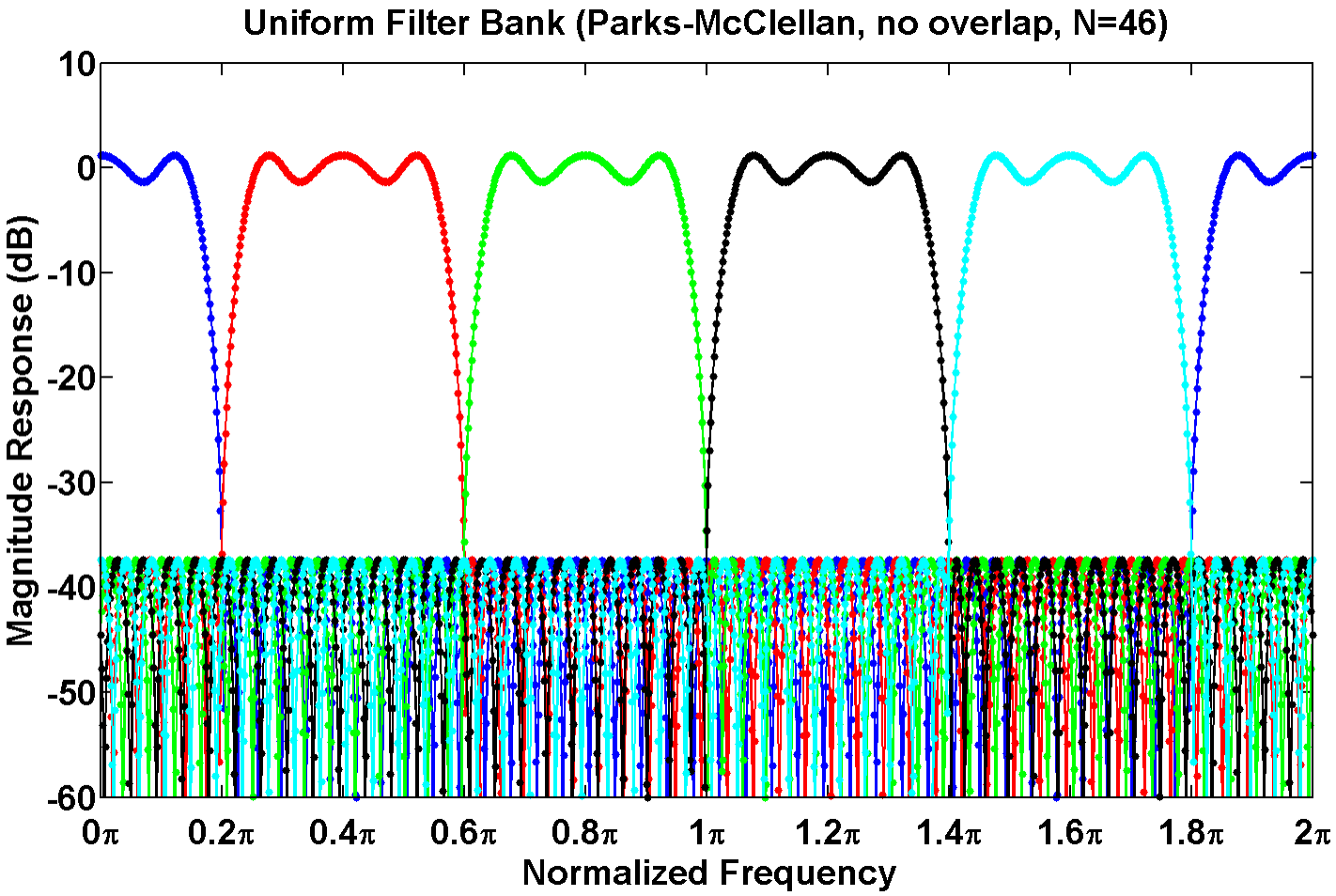
# DFT Filter Bank



# Uniform Filter Bank (Parks-McClellan)

- Design parameters
  - o Passband ripple - 1dB
  - o Stopband attenuation – 40dB
  - o Passband cutoff frequency – $\omega_p=\pi/M - \pi/20$
  - o Stopband cutoff frequency – $\omega_s=\pi/M$
- Required filter order N=46

# Uniform Filter Bank (Parks-McClellan)



# Uniform Filter Bank (Eigenfilter)

- Design parameters
  - o Filter order N=46
  - o Passband cutoff frequency – $\omega_p=\pi/M - \pi/20$
  - o Stopband cutoff frequency – $\omega_s=\pi/M + \pi/20$
  - o Stopband error weight $\alpha=0.2$ (passband error weight is $1-\alpha$)

# Uniform Filter Bank (Eigenfilter)