Mathematical Geophysics Summer School, Stanford, August 1998

G. Beylkin [1]

I Introduction

The Fast Fourier Transform (FFT)

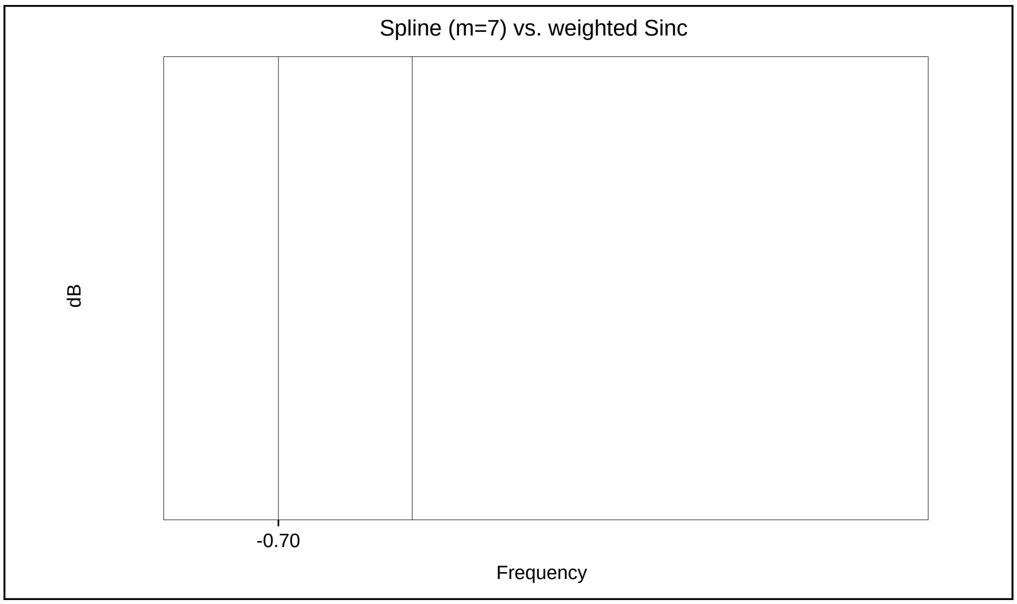
that point. Essentially the same idea was proposed by Brandt in [6]. In [16] the Taylor expansion was used to correct for deviations from an equally spaced grid. Although such approaches are significantly better than the direct evaluation of (1.2), they do not lead to very efficient algorithms especially in multidimensional generalizations. A more careful analysis and a much faster algorithm

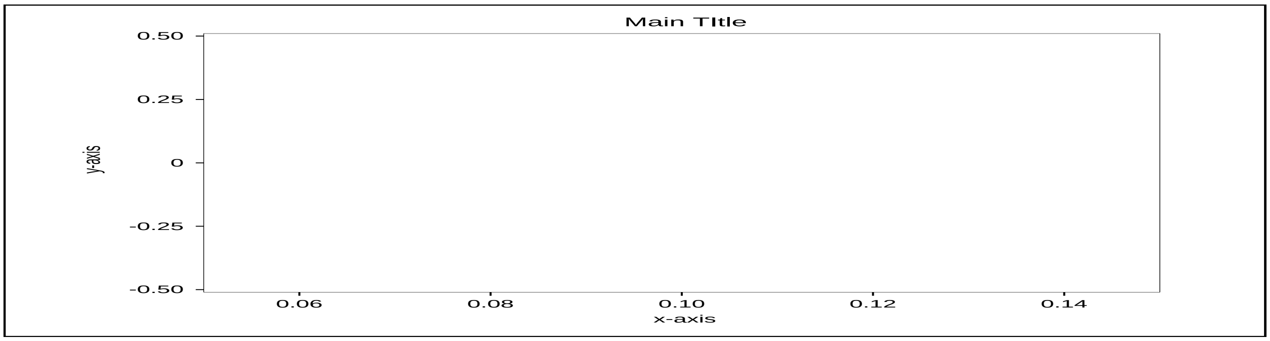
can be performed with the B-spline in the original domain (which accounts for the numerator in (2.3)) and the denominator in (2.3) can be applied in the Fourier domain (modi cation step). Such approach leads to a signi cant improvement in the overall performance. Algorithms in [9] (implicitly) have a similar feature.

We refer to [4] for estimates and details of the algorithms.

III Stolt Migr tion

An example of a low precision USFFT is Stolt migration [15]. A typical implementation uses the so-called Sinc interpolation. A slight improvement is possible even in this case [5].I


Spline (m=7) vs. weighted Sinc
dB
-0.70
Frequency


Main TItle
0.50
0.25
0
-0.25
-0.50
y-axis
0.06
0.08
0.10
0.12
0.14
x-axis

[14] E. Sorets. Fast Fourier Transform of Piecewise Constant Functions. 1993. Yale University Research Report, YALEU/DCS/RR-986.

[15] R. H. Stolt. Migration by fourier transform. Geophysics, 43:23{48, 1978.

[16] T. D. Sullivan. A technique for convolving unequally spaced samples using fast fourier transforms. 1990. Sandia Report.