Finding the spectrum of a signal swiftly has been an ever-growing demand in Digital Signal Processing. In quest to meet this stipulation, Discrete Hartley Transform (DHT) is becoming as an encouraging substitute to the more popular discrete Fourier transform. Fast methods to compute the DHT are in existence and are named as fast Hartley transforms (FHTs). In this thesis, a new split-radix FHT algorithm for real-symmetric data, which discloses the dispensable computations, is developed. New radix-3, 6 and 12 FHT algorithms are derived with the help of an efficacious indexing scheme by pairing the rotating factors. When the needed number of Hartley transform samples is larger than the number of samples in the time-domain, a generalized input pruning procedure is prefaced to disjoin the undesirable computations in radix-2 decimation-in-frequency algorithm. Similarly, output pruning procedure is introduced in the context in which the required transform samples are fewer than the input samples. Finally, a generalized prefolding procedure, to find shape of the transformed sequence expeditiously but with fewer number of transform samples, is introduced at the input of the decimation-in-time (DIT) and decimation-in-frequency (DIF) FHT algorithms.

This is the abstract of the Master of Science Thesis published during May 1991 by Nagesh V. Anupindi in Department of Electrical Engineering at Indian Institute of Technology, Madras, India.

Reports by the Evaluation Committee of Honorary Professors at Indian Institute of Technology on Nagesh V. Anupindi’s M.S. Thesis:
The work carried out by Sri Nagesh Anupindi in his M.S. Thesis entitled "Some New Results in Fast Hartley Transform Algorithms" is an outstanding research work for the M.S. degree. The author has clearly shown the advantages of FHTs over the FFTs in computational savings. The author has developed a new algorithm for Split Radix FHT for real-symmetrical data and has shown its computational savings as compared to the algorithms developed by Sorenson et al and Soo Chang et al. In addition, the author has also developed New Radix-3, Radix-6, and Radix-12 FHT algorithms and brought out neatly the advantages of these algorithms over Radix-2 algorithms. He has carried out pruning analysis for non-radix samples and brought out the computational savings in its implementation.

The author has carried out exceptionally good research work in the Computation of DFTs using FHT. He has in all seven research publications out of his M.S. Thesis work in international reputed technical journals. The thesis is well written and well presented. Hence, the author Sri Nagesh Anupindi may be awarded the degree of M.S. in Electrical Engineering of IIT, Madras.

The present thesis mainly concerns about economic computation of DHT under special input situations such as symmetric real data, data samples equals or closer to power of radix 3, 6 and 12, non-zero input data smaller than the desired output samples and vice versa and prefolded data.

In recent past, lot of research papers have appeared extending the work done on DFT to DHT. Even though the ideas are not new, such publications are quite helpful. The present thesis has made such an attempt.

The contribution of the student has been incorporated in Chapters 3 through 7. In general, the presentation of the thesis is lucid, convincing and systematic. For use in practice, the algorithms pertaining to real-symmetric input (Ch. 3), input and output prunings (Ch. 5 and 6) and prefolding procedure (Ch. 7) should have been outlined in the thesis in step-by-step manner. The computational savings, as expected, is quite remarkable in each case. Thanks to the student who has made commendable effort to achieve this. This work presented is
sufficient for awarding M.S. degree. The publications made out of the thesis work supports my view.

Extra Sheet by Committee:

After M.S. program, the investigators may carry out some more work in the field of DHT.

1. Error Analysis (Fixed & floating points) on DIT & DIF DHTs.
2. Development of transform domain (circular & linear) adaptive filters using DHT. It will produce encouraging results.

Some more work in this field either as stated above or as pointed out in his conclusions together would have led to a Ph.D. degree.

I congratulate the student and the supervisor for the remarkable piece of work presented in this thesis.

Acknowledgements by Nagesh Anupindi:

The development of Fast Algorithms as a specific part of Signal Processing is the result of the contributions of many individuals and organizations. The cited references were often chosen for clarity of presentation. I might have overlooked some references which would have made the thesis more worthier, and my apologies to the authors.

Dr. K. M. M. Prabhu's concern for perfection and meticulous attention to the detail has contributed immeasurably to the contents and the quality of this thesis.

IIT has provided me with a stimulating environment for the study of the research throughout, and has provided significant encouragement and support for this work.
On a more personal note, no part of my research would have been prospered without the complete reassurance of my entire family and patience of my sweetheart who allowed me the time necessary to pursue this work.