# REVIEW PAPER ON MODIFIED FAST FFT ALGORITHM FOR OFDM BASED FUTURE WIRELESS COMMUNICATION SYSTEMS

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**Abstract** – The availability of spectrum and its efficient usage is of prime importance for any communication system. In this paper we are going to discuss the possibility and scope of future wireless communication system based on improved techniques by using FFT and IFFT rather than the conventional radix based butterfly algorithms. The Fast Fourier Transform (FFT) and its inverse (IFFT) are very important algorithms in signal processing, software-defined radio, and the most promising modulation technique i.e. Orthogonal Frequency Division Multiplexing (OFDM). From the standard structure of OFDM we can find that IFFT/FFT modules play the vital role for any OFDM based transceiver. So when zero valued inputs/outputs outnumber nonzero inputs/outputs, then general IFFT/FFT algorithm for OFDM is no longer efficient in term of execution time. It is possible to reduce the execution time by "pruning" the FFT. By using pruning FFT we are going to reduce the no of complex calculations ie no of complex multiplications are going to be reduced . So it takes lesser amount of time and makes system much more faster .

**Keywords** - OFDM, FFT, Pruning Techniques, Execution time .

## 1. INTRODUCTION

FFT is an efficient tool in the fields of signal processing and linear system analysis. DFT isn't generalized and utilized widely until FFT was proposed. But the inherent contradiction between FFT's spectrum resolution and computational time consumption limits its application. To match with the order or requirement of a system ,the common method is to extend the input data sequence x(n) by padding number of zeros at the end of it and which is responsible for a increased value of computational time. But calculation on undesired frequency is unnecessary. As the OFDM based cognitive radio [1] has the capability to nullify individual sub carriers to avoid interference with the licensed user. So, that there could be a large number of zero valued inputs/outputs compare to non-zero terms. This is the most important thing in the orthogonal frequency division multiplexing (OFDM), which is used as baseband transmission in spectrum pooling technique. Though large bandwidth supports high data rates but practically it is impossible to find contiguous empty bandwidth. So much efficient data rates are achieved by using non-contiguous vacant subcarriers of a targeted spectrum pool. This type of OFDM is known as non-contiguous OFDM or NC-OFDM [2-3], which helps to avoid the harmful interference by deactivating those subcarriers, which are acquired by different licensed users. That means the input values of the IFFT"s of those particular subcarriers is zero. As NC-OFDM consists of large number of de-activated or null subcarrier i.e. numbers of zero valued inputs/outputs outnumber non-zero inputs/outputs. So the conventional FFT is no longer efficient in terms of complexity, execution time and hardware architecture. Several researchers have proposed different way to make FFT faster by "pruning" the conventional one [4].

## 2. PROPOSED PURNING TECHNIQUE

To increase the efficiency of the FFT technique several pruning and different other techniques have been proposed by many researchers. In this paper, we have reviewed a new pruning technique i.e. IZTFFTP by simple modification and some changes in the conventional flowchart of FFT [9] and also includes some tricky mathematical techniques to reduce the total execution time.

- ***Zero tracing-*** as in wide band communication system a large portion of frequency channel may be unoccupied by

the licensed user, so no. of zero valued inputs are much greater than the non-zero valued inputs in a FFT/IFFT operation at the transceiver. Then this algorithm will give best response in terms of reduced execution time by

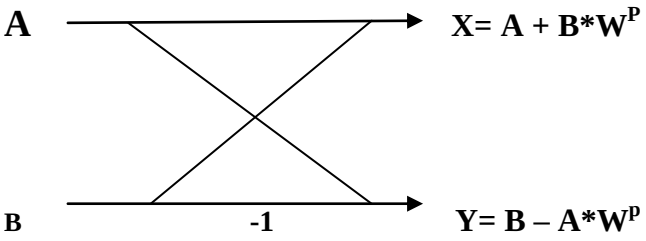



Fig. 1

reducing the no. of complex computation required for twiddle factor calculation. IZTFFTP have a strong searching condition, which have a 2-D array for storing the input & output values after every iteration of butterfly calculation. In a input searching result whenever it found „zero" at any input, simply omit that calculation by considering following two useful condition:

 ***Half Butterfly computation or partial pruning***-The basic computation part of FFT is the butterfly calculation. From fig.1 we pick a single part of a standard butterfly unit. In the fig.2 A & B two complex inputs are dual node to each other .A full butterfly calculation requires 4 complex multiplications and 6 complex additions/subtractions [4].

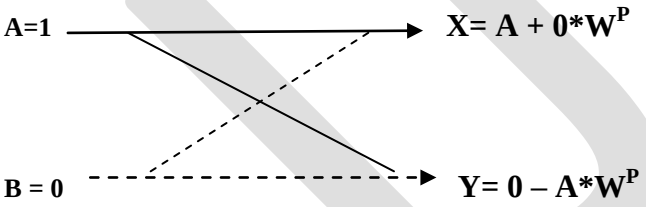



Fig. 2

But in fig.2 we find that when any of the input value is zero of a dual node pair, then the output of that particular node is the simple copied version of the input .So for a partial pruning calculation 4 complex multiplication and 2 addition is required which is the basic requirement for a single twidle factor calculation also.

 ***"0" operation or complete pruning-*** Fig.3 shows the part where both the input of the dual node pair is zero.then outputs obtained from the mathematical calculation of equation 6-7 is also zero.

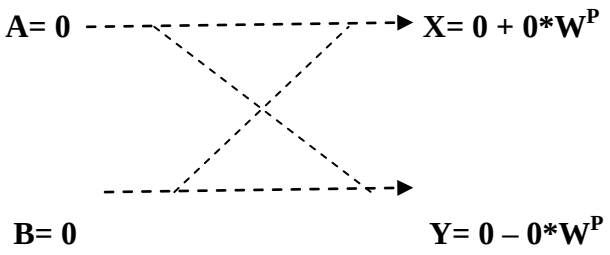
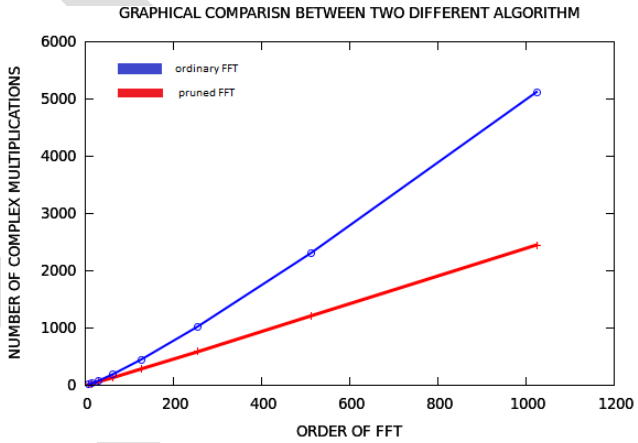



Fig. 3

## 3. CONCLUSION

By using this pruning algorithm the no of complex multiplications decreases drastically. Hence this system is much more faster than the other existing systems .

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