Abstract:
The use of the discrete wavelet transform (DWT) for the JPEG2000 image compression standard has sparked interest in the design of fast, efficient hardware implementations of the perfect reconstruction filter bank used for computing the DWT. The novelty in this approach is the implementation with aid of the lifting scheme realization of the biorthogonal filter pair. This lifting scheme minimizes the number of computations to done, its fast and efficient architecture. The main aim in taking this, as project is the ASIC implementation for the lifting based 2-level 2-Dimensional DWT has not been implemented so far. Bit rate (number of bits transfer per second) will increase by implementing the ASIC flow for the design.

Architecture for the lifting-based two-dimensional discrete wavelet transform is presented. The architecture has regular data flow and low control complexity, and achieves 100% hardware utilization. It is easily adapted to arbitrary image sizes, multiple levels of transform, and different numbers of lifting steps. Symmetric extension of the image to be transformed is handled in a way that does not require additional computations or clock cycles.

Test bench was written and it had been proved on FPGA SPARTAN-2E. 19 clock cycles had been taken for the first output then onwards one Approximation and one detail coefficient had come in each clock cycle. ASIC implementation was done the results were drawn. This design was operated at clock frequency of 200MHz. Form the Synopsys tolls total cell area of DWT was found as 441018.437500µm, Total Dynamic Power was found as 317.0864 mW and leakage Power was found as 337.3188 µW. This design achieves throughput of 180 mega pixels per second.

High lights:
- The architecture has regular data flow
- This design has low control complexity.
- This design achieves 100% hardware utilization
- This design is easily adopted for arbitrary image sizes.
- It is adopted for multiple levels of transformation and different number of lifting steps
- Symmetric extension of the image to be transformed is handled in a way that does not require additional computations or clock cycles
- Discrete wavelet transform achieves a throughput of 180 mega pixels per second