EPILEPTIC SEIZURE DETECTION USING MODERN CLP AND DWT-RRCA DESIGN

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Abstract

Epileptic seizure detection with modern designs are becoming more popular in EEG signals because it consumes low power and area. Reducing power consumption and area in these modern design for the development of better, cheaper products and also minimizes failure in power related chip.CLP with Fourier Transform based seizure detection consumed more power and area. To overcome these drawbacks and in order to improve the application performance of these designs, various advanced blocks are needed for reducing the area which will be occupied by the whole epileptic seizure detection design. The CLP and DWT-RRCA design is necessary for the accurate low power epileptic seizure detection application. The low power and smaller area occupied in the coastline parameter and DWT-RRCA Design was estimated using the Xilinx ISE tool, that preferable for designing modern epileptic seizure devices.

Key Words**:** *Low power, CLP, DWT-RRCA, Minimum size architectural design*

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1. INTRODUCTION

In recent years,Low power and area are mainly concentrated in Epileptic seizure detection devices which are fabricated using VLSI Technology and over 45 million people in the worldwide suffer from epilepsy,that is a chronical disorder of thebrain.There are two treatments for epileptic seizure,namely anti epileptic drugs and surgery.
A Various type of Previously proposed seizure detection algorithms leads to consume different power and area in architectural designs.Advanced Technologies are expecting portable electronic detection devices with low power consumption.

Studies have shown that,CLP with Different tranformation designs utilise large area and consume more power.These designs are not giving more accurate seizure detection in EEG signals.In this work,we proposed two architectural algorthmic designs such as coastline parameter algorithm and DWT-RRCA algorithm utilise low power and less area occupied by the whole design that gives accurate seizure detection in EEG signals.

2. EPILEPTIC SEIZURE

Epilepsy is refered to as 'fit' occur during the chronic disorder of the brain.The epileptic seizure occur at any time,characterised by gradual surge in amplitude of the EEG signals.Uncontrollable movements are produced in an Individual affected by epileptic seizure.

2.1. Characteristics of Seizures

The Peak level in the seizure EEG Signal is increased at different frequency ranges leads to high power of the signal. A low value random signal has large autocorrelation values in the slopes and peak level.

Epileptic Seizure starts from the brain because of more usage of drugs, That produces rapid blinking of eyes,protruding tongue and smacking.

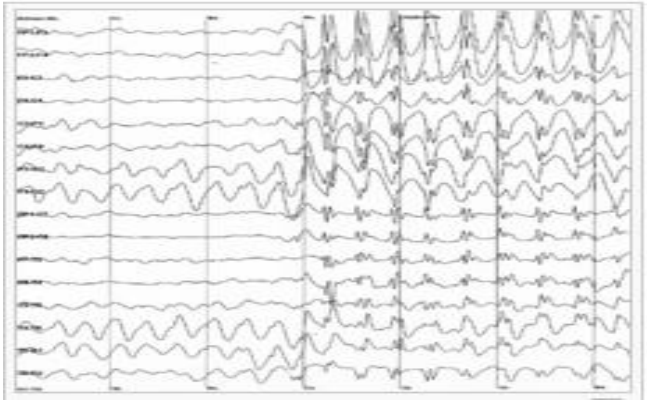


Fig-1: Epileptic spike in the EEG Signal

3. PROPOSED CLP AND DWT-RRCA DESIGN

CLP method is detecting epileptic seizure based on sudden increase level in the amplitude of Input EEG Signal. Expression for calculating coastline parameter value is,

$$CL=\sum ABS(X_i-X_{i-1}) \quad (1)$$

The input Digital EEG Data taken from www.physionet.org is serially sent to the coastline parameter architectural design. The subractor block is used to calculate the difference between the X_i and X_{i-1} values. Counter counts the 8 bit input data with the threshold value and compares with normal EEG signal threshold value, if there is a variation that represents seizure is in the digital input EEG data which turn on the enable signal given to the DWT-RRCA design.

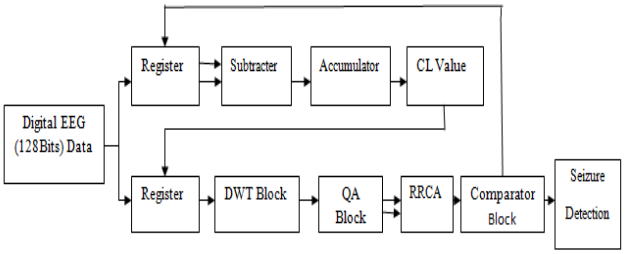


Fig-2: General Block diagram for Coastline parameter and DWT-RRCA Design

DWT-RRCA Design performs seizure detection very accurately with the help of using quasi-average blocks and consumes less power. The Digital input EEG data is given to the DWT-RRCA design. Three different quasi average blocks perform the operation of input data averaging with different clock values that can be provided with the help of clock divider.

In order to obtain the accuracy in the quasi-averaging, three quasi-averaging blocks were used. The adder must be used to perform summation operation and comparator is used to compare the threshold value with the output of detected signal. The variation in EEG signal with epileptic seizure was finally detected.

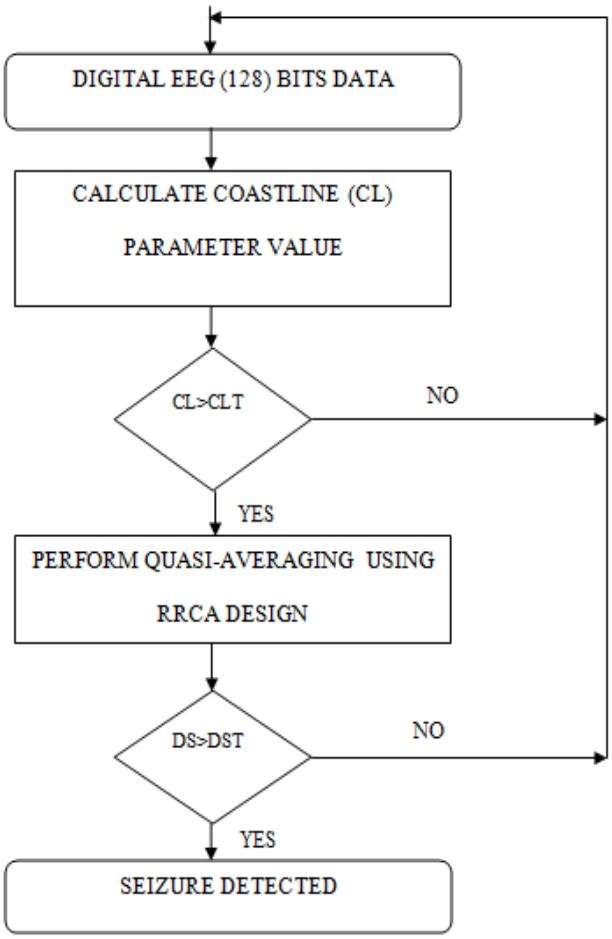


Chart-1: Proposed CLP and DWT-RRCA Design

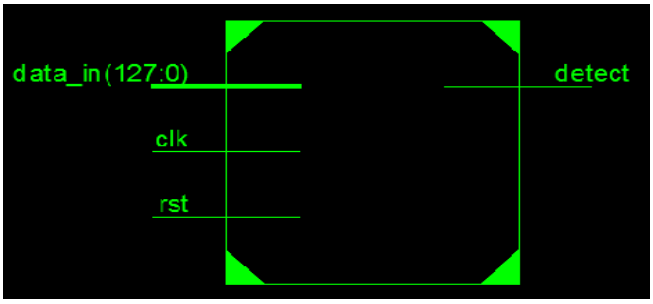


Fig-3: Simplified RTL Schematic view for the proposed CLP and DWT-RRCA Design

The DWT-RRCA Design works only the enable signal is logic one given by the coastline parameter design such that low power utilized in the whole architectural design and less area occupied by the proposed RTL schematic CLP and DWT-RRCA design.

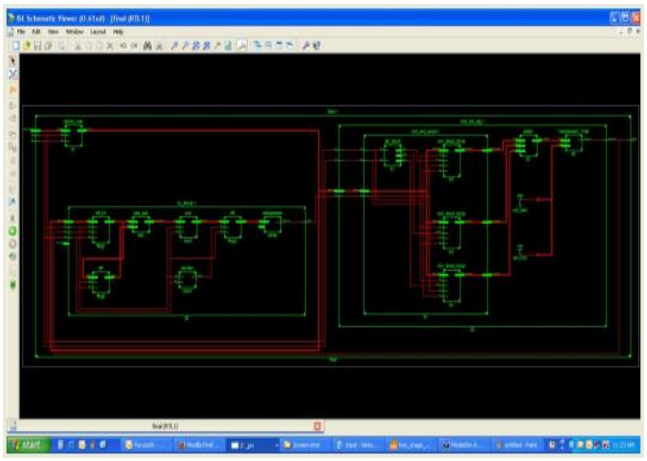


Fig-4: RTL Schematic Diagram for the Proposed CLP and DWT-RRCA Design

4. RESULTS AND DISCUSSION

4.1. Simulation Result Of Epileptic Seizure Detection

Simulated results of Xilinx ISE tool showed the Epileptic seizure detection in the proposed Coast Line parameter(CLP) and DWT-RRCA Design by applying 128 bits of EEG input data .Accurate seizure detection can be obtained in this design because of detecting seizure in two architectural level of the proposed design that consumes low power and utilize less area .

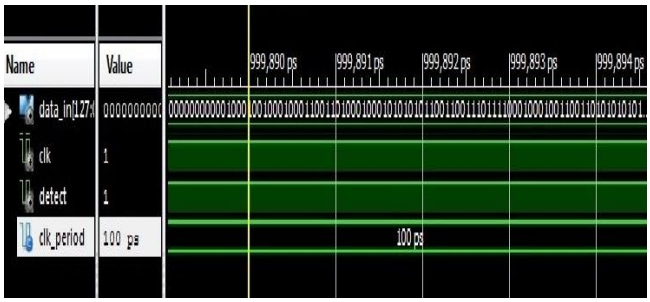


Fig-5: Xilinx ISE Epileptic Seizure Detection waveform for

the proposed CLP and DWT-RRCA Design

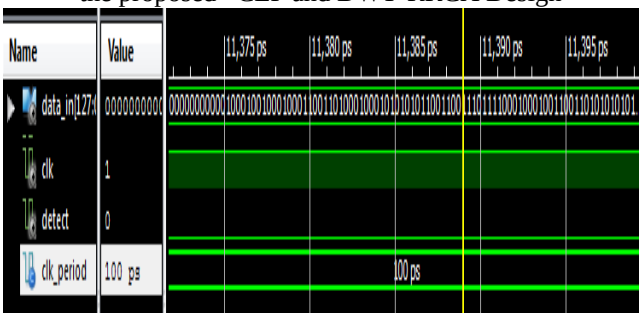
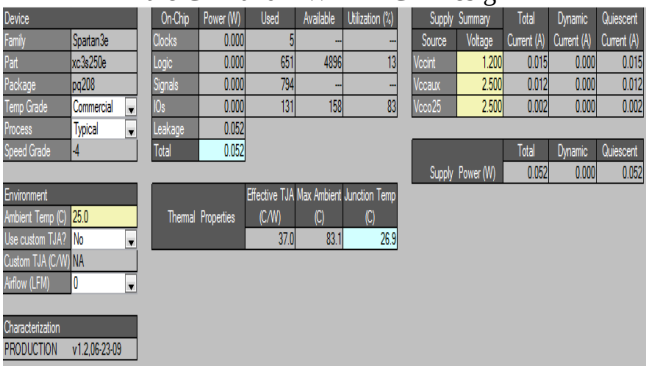


Fig-6:. Xilinx ISE Result no Epileptic Seizure Detection waveform for the proposed CLP and DWT-RRCA Design

4.2. Simulation Result of Power

Table -1: Xilinx ISE Simulation result for power utilized in the CLP and DWT-RRCA Design



The power used for detecting epileptic seizure in two architectural level algorithms are determined with the help of Xilinx ISE simulation tool. A special command "XPower Analyser" can be used to find the power for proposed coastline parameter (CLP) and DWT-RRCA Design and estimated as 0.052 watt

4.3. Simulation Result for Area

The coastline parameter and DWT-RRCA design occupied particular range of area that can be estimated using the Xilinx ISE Simulation tool. Minimum area used by the proposed design showed that preferable for designing modern epileptic seizure devices.

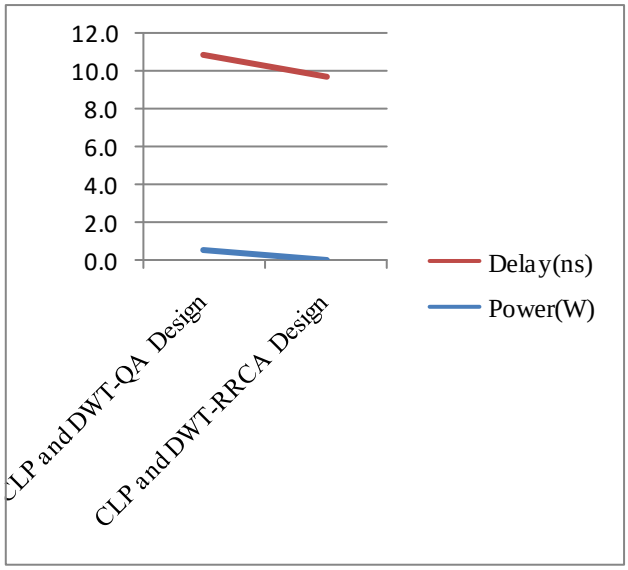
Table-2: Xilinx ISE Simulation Result for Area utilized by the coastline parameter(CLP) and DWT-RRCA Design

Project File:	sezire_modify.xise	**Parser Errors:**	No Errors
Module Name:	final	**Implementation State:**	Placed and Routed
Target Device:	xc3s250e-4pq208	**•Errors:**	No Errors
Product Version:	ISE 14.2	**•Warnings:**	33 Warnings (0 new)
Design Goal:	Balanced	**•Routing Results:**	All Signals Completely Routed
Design Strategy:	Xilinx Default (unlocked)	**•Timing Constraints:**	All Constraints Met
Environment:	System Settings	**•Final Timing Score:**	0 (Timing Report)

Device Utilization Summary [-]				
Logic Utilization	**Used**	**Available**	**Utilization**	**Note(s)**
Number of Slice Flip Flops	106	4,896	2%	
Number of 4 input LUTs	567	4,896	11%	
Number of occupied Slices	329	2,448	13%	
Number of Slices containing only related logic	329	329	100%	
Number of Slices containing unrelated logic	0	329	0%	
Total Number of 4 input LUTs	567	4,896	11%	
Number of bonded IOBs	131	158	82%	
Number of BUFGMUXs	1	24	4%	
Average Fanout of Non-Clock Nets	3.05			

Table-3: Comparison Of CLP And DWT-RRCA Design With CLP And DWT-QA Design

Parameters	CLP and DWT-QA Design	CLP and DWT-RRCA Design
Power(W)	0.567	0.052
Delay(ns)	10.310	9.634



5. CONCLUSION

Epileptic seizure detection in the CLP and DWT-RRCA design was proposed that consume low power and smaller area occupied for the whole design. The proposed design is based on two architectural algorithmic designs, namely CLP and DWT-RRCA that accurately detect seizure. The coast line parameter and DWT-RRCA algorithms have been written in the Very high speed Hardware Description Language and simulated In XILINX ISE software tool to show the accurate detection of seizure, measurement of power and area. In previous work, coast line parameter with FFT,STFT,DWT designs are not reliable, due to the more power and large area utilization. In order to prevent this, low power and reduced area used by the coast line parameter and DWT-RRCA Design was proposed, that preferable for designing modern epileptic seizure detection devices.

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