Faculty of Engineering of University of Porto

Status Reports

Adaptive Equalization of Interchip Communication

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Week1 10/02-14/02

Performed work

- Adaptation to the workstation and Working environment.
- Matlab simulation off the LMS algorithm using channels represented by their impulse response.
- Development of Matlab scripts for data analysis and representation.
- Simulation of other Equalization methods such as zero forcing,and MMSE.

Comments

Although the simulations presented good behaviour of the LMS algorithm further study must be made under more realistic conditions.
The ZF and MMSE presented good results but for now they will not be subject of further research.

Week2 17/02-21/02

Performed work

- Matlab Simulation of the LMS algorithm for the adaptation of transversal and feedback equalizers
- Matlab Simulations of Continuous time Linear equalizers represented by a 2 pole and a zero transfer function.
- Matlab simulations to establish relation between inter Symbol Interference, and channel + equalizer frequency response.
- Performance analysis of the LMS algorithm with various channels and different adaptation steps.
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Comments

The LMS sign sign algorithm presented some problems of convergence speed compared to the regular LMS.
The convergence speed is greatly decreased if only the sign of the error function is used.
The convergence speed is not affected if the sign operator is applied to the sequence entrance of the filter.
The LMS algorithm will not converge if the channel Distortion is above a certain threshold.

Week3 24/02-27/02

Performed work

- Study of the Scattering Parameters for channel characterization
- Matlab Script created for the parsing extraction of information of an S4P file.
- Representation and Analysis of a HDMI reference channel using the created script.
- Review of MPHY and DPHY equalization techniques.

Comments

The simulation of equalization techniques with S Parameter Files would be hard in Matlab.
The simulations will continue in Agilent ADS.

Week4 03/02-07/02

Performed work

- ADS Simulation of the LMS algorithm using the Data Flow controller
- Channel Simulation of MIPI reference channels.
- Transient Simulation for the extraction of the channel transfer function.
- Channel + Packages simulation and eye diagram analyses for different bit rates.
- Simulation of Continuous time linear equalizers

Comments

The reference channels presents a notch below 4 Ghz that will make equalization harder for Bit Rates above 8Gbits/s
Continuous time linear equalizers dont seem to perform very well in eye diagram analyses despite performing channel equalization .

Week5 10/02-14/02

Performed work

- Channel Simulation and eye diagram analyses for the extraction of optimum settings for the CTLE
- Optimization of the CTLE setting that perform best for each channel at each bit rate.
- Setting simulation using statistical analyses
- Channel Simulation to establish relation between eye opening and asynchronous under sampling histograms.

Comments

The CTLE settings were encountered and they all improve overall eye diagram. Decision feedback equalizers also improve eye opening,showing significant results even with only one tap.

Week6 17/02-21/02

Performed work

- Creation of blocks Verilog A for the receiver and the tuned CTLE.
- Test of both blocks using channel simulation.

Comments

The implementation of Verilog A blocks was a little complicated because the simulation wasn't connecting the symbol ports with the netlist ports.