universidade de aveiro

Grupo 1, Lab 3

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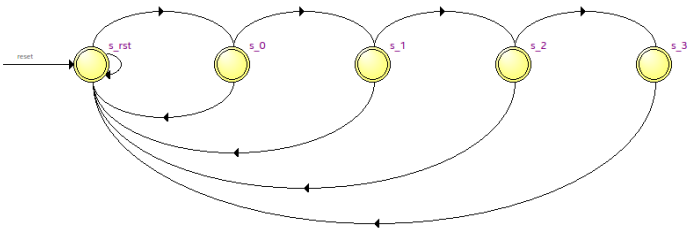
Assignment 1 – Hadamard codes

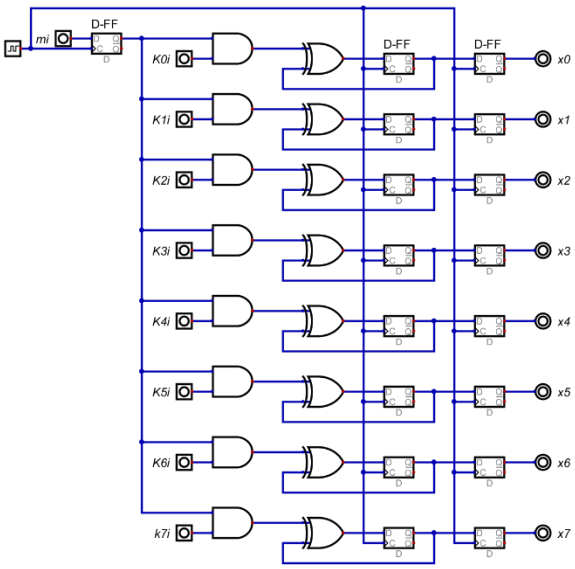
The challenge is to design a solution for an encoder and a decorder that implements a combinatorial algorithm for message transmission with the error correcting properties developed by Richard Hamming using Hadamard codes of class $[8, 4, 4]_2$, described as [n, k, d], were n=blocklength, k=message length and d=minimum distance, or $[2^k, K, 2^{k-1}]$.

An additional requirement stipulates that either one, the encoder or the decoder, should implement a serial(series) input, and the other one a parallel input, so our choice was to implement a serial input encoder and a parallel input decoder.

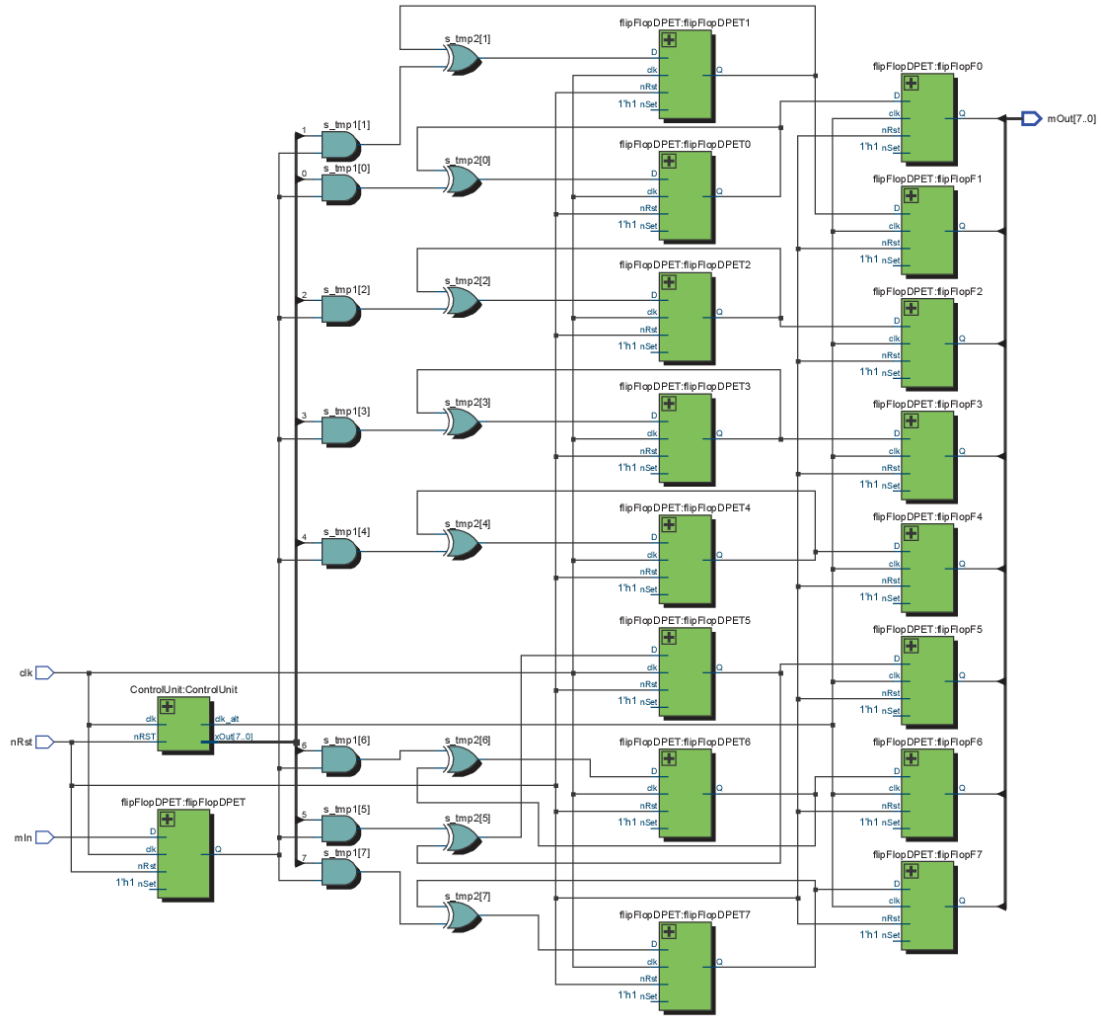
1. Serial input encoder:

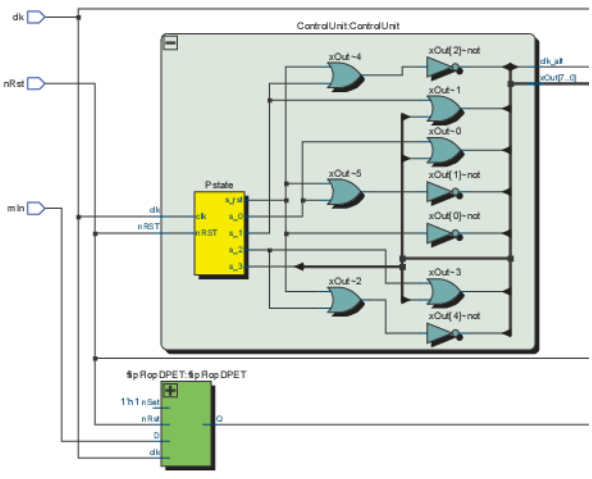
1.1. Data flow and serial-parallel control unit implementation

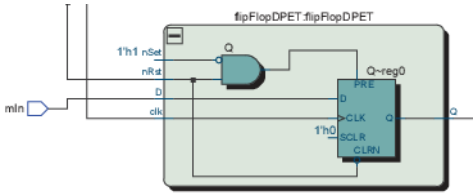




1.2. Circuit interface and schematics of the internal organization:



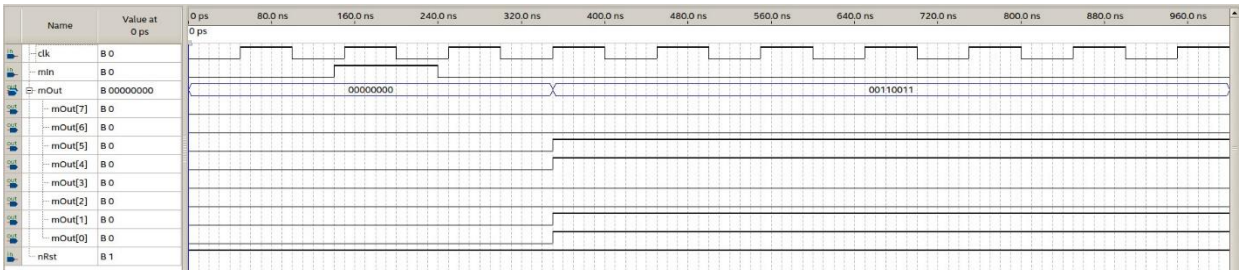




1.3. Implementation cost:

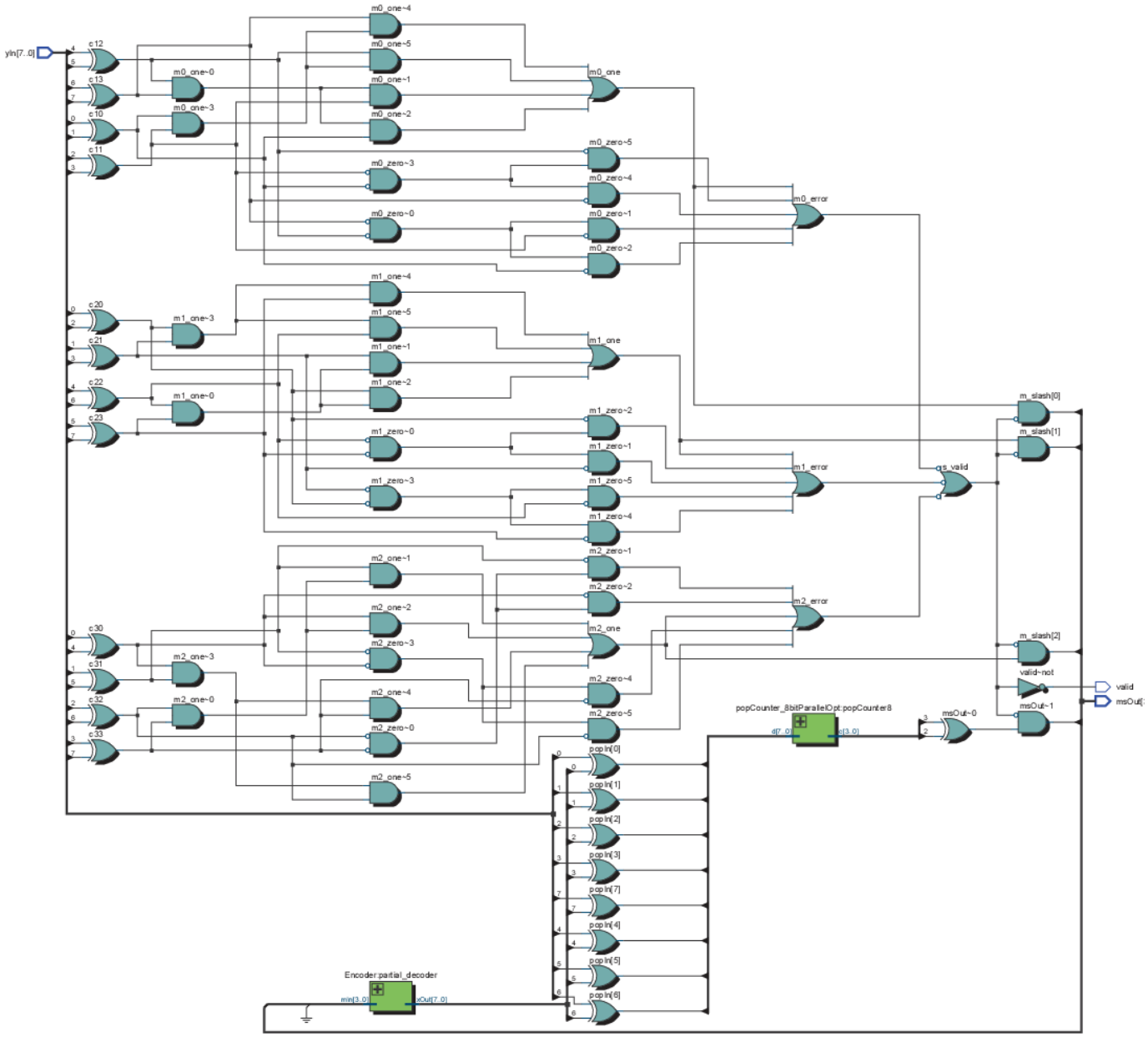
14 AND gates, 8 XOR gates, 4 NOT gates and 17 D Flip-Flop PET.

1.4. Quartus project and operation simulation:



2. Paralell input decoder:

2.1 Circuit interface and schematics of the internal organization:

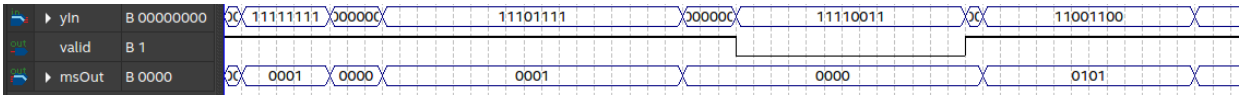


2.2. Implementation cost:

20 XOR, 40 AND, 23 OR, 29 NOT and 1 8-bit POPCounter.

2.3. Quartus project and operation simulation:

Simulation1



Simulation2