Gate Level Event-Driven Simulation using GPGPUs with CUDA

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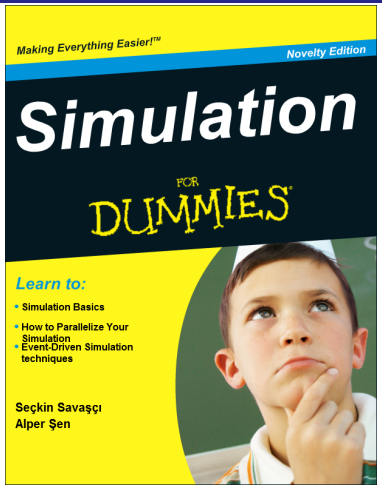
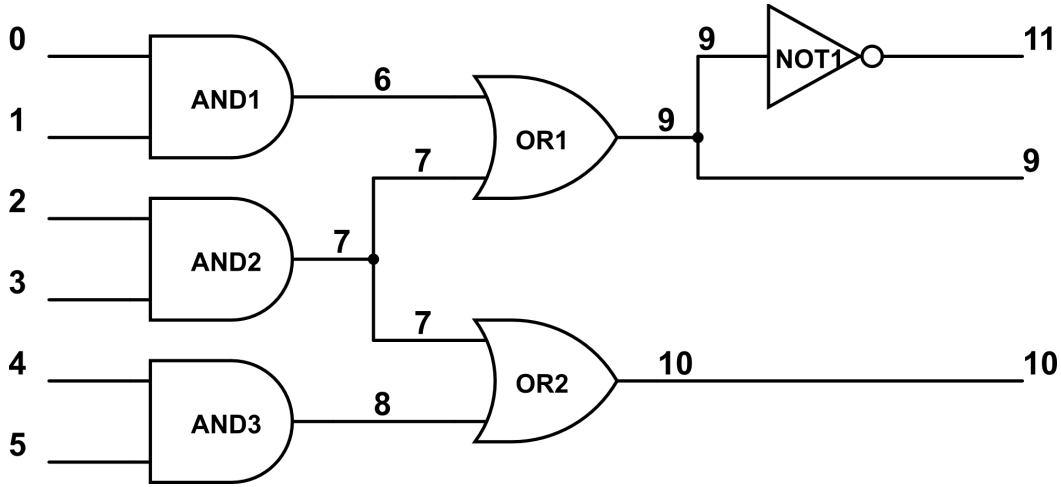
More than half of the effort in the design phase goes for verification and validation of the design!

Simulation at a glance

1. get the inputs
2. process the inputs
3. get the outputs



1. **Straightforward :** Simulate all sequentially!
2. **Parallel :** Simulate parallel if you can!
3. **Event-Driven :** Simulate parts if needed!


0
1
2
3
4
5
AND1
AND2
AND3
6
7
7
7
8
OR1
OR2
9
9
NOT1
11
9
10
10

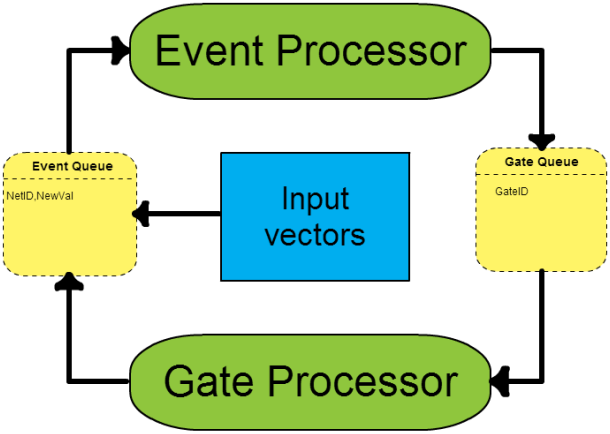
Why CUDA?

+ Easy to learn
+ C + some gpu related calls
+ Easily wrappable for C++
- Architecture dependent
- NVDIA only
- Host-Device distance

Contributions

- **Circuit Generator**
  A random circuit generator for our own circuit format
- **Run Generator**
  A random run generator that feeds the simulation with inputs in each timestep
- **Sequential Event-Driven Circuit Simulator(Enigma)**
  A sequential circuit simulator written in C++
- **Parallel Event-Driven Circuit Simulator(Meepo)**
  Our project goal, parallelized version of Enigma simulator, with the help of CUDA

Simulation Cycle



Both Enigma and Meepo works similarly.

Results

Gates	Enigma(sec)	Meepo(sec)	Speed-up
1000	2.08	0.943	2.206
2000	6.053	1.658	3.651
3000	12.438	2.915	4.267
5000	32.246	6.363	5.068
10000	118.059	20.907	5.647
20000	493.285	85	5.803
30000	1060.34	181.785	5.833

Up to 6x speed-up!

Thanks for watching...
Feel free to contact me via seckin.savasci@gmail.com