

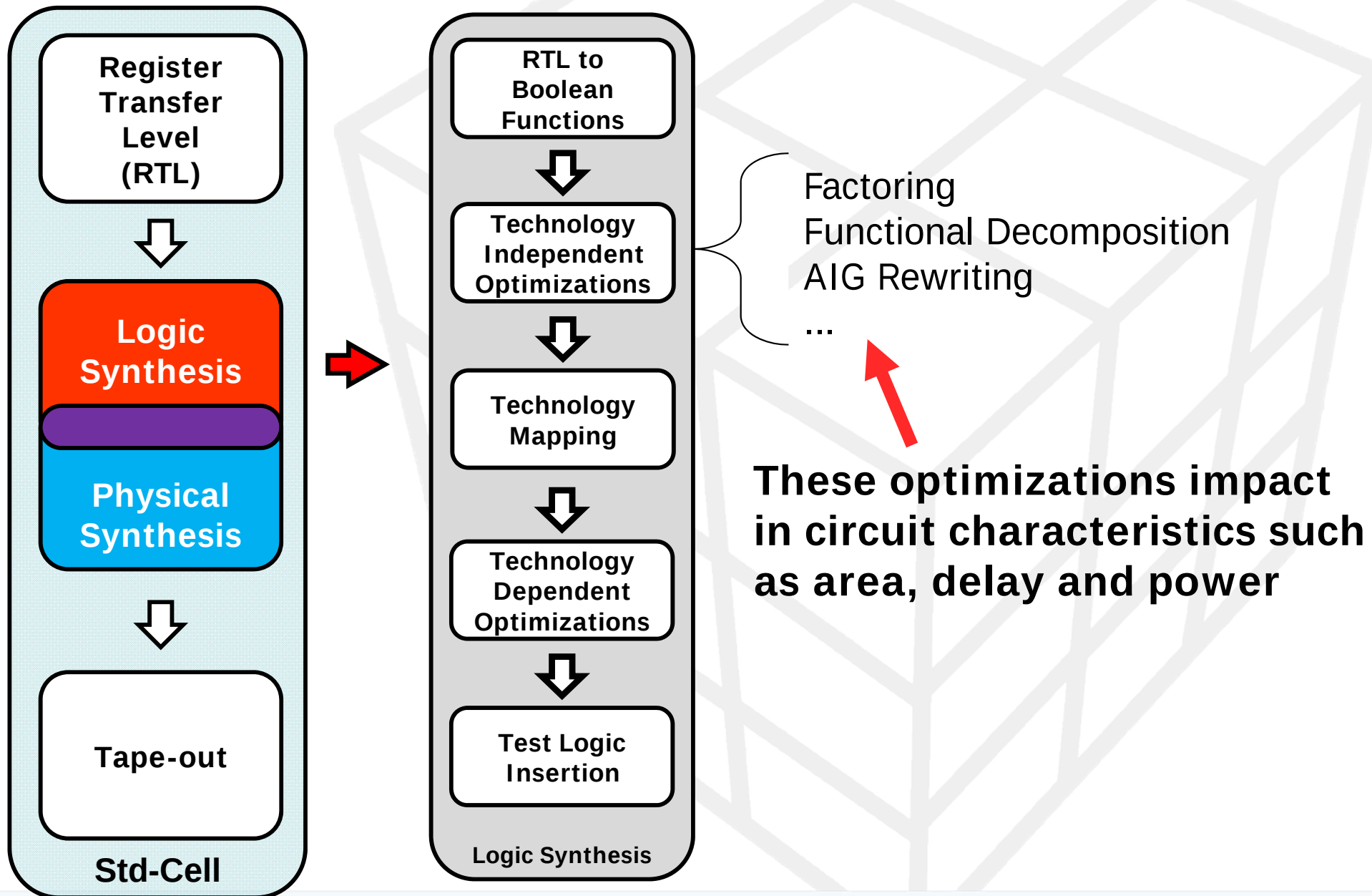
Majority-based Library Generation for Nanometric Technologies

Institute of Informatics, UFRGS

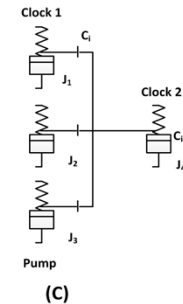
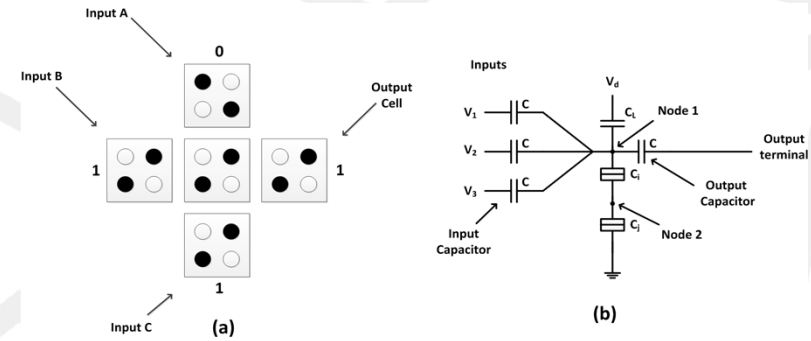
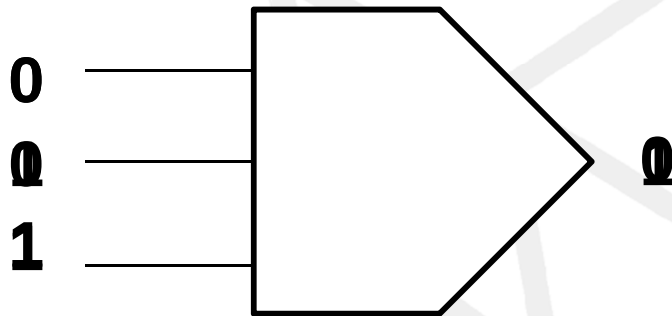
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What is a majority gate or majority voter?



Why synthesize circuits with majority gates as primitive elements?

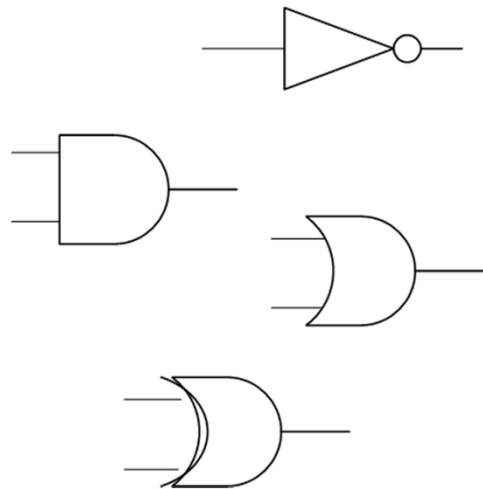
– New emerging technologies using majority gate, as:

- Quantum Cellular Automata
- Single Electron Tunnelling
- Tunneling Phase Logic
- ...

Synthesis in CMOS

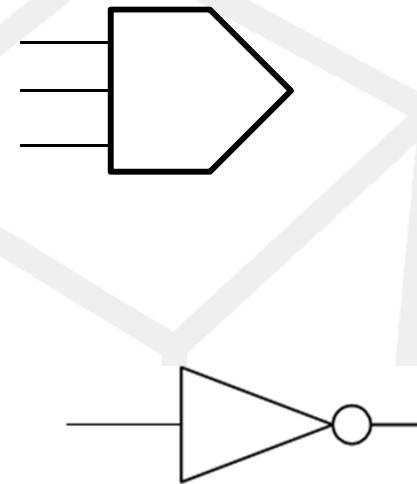
– Primitive gates :

- AND
- OR
- XOR
- INV



Synthesis in Newer Technologies:

- Majority (Minority)
- INV



There is no optimized conversion from CMOS synthesis algorithms to NT synthesis algorithms!

- ❏ Synthesize Boolean functions using only maj. gates and inverters
 - It is important the synthesized function have a minimal form
 - Criteria can be : majority gate count, logic depth, inverters, ...
- ❏ Using the Functional Composition Paradigm can be useful to synthesize functions using majority gates and inverters.

Majority Circuit Synthesis using FC

- Example using logic depth approach
 - All 2 variables functions (16).

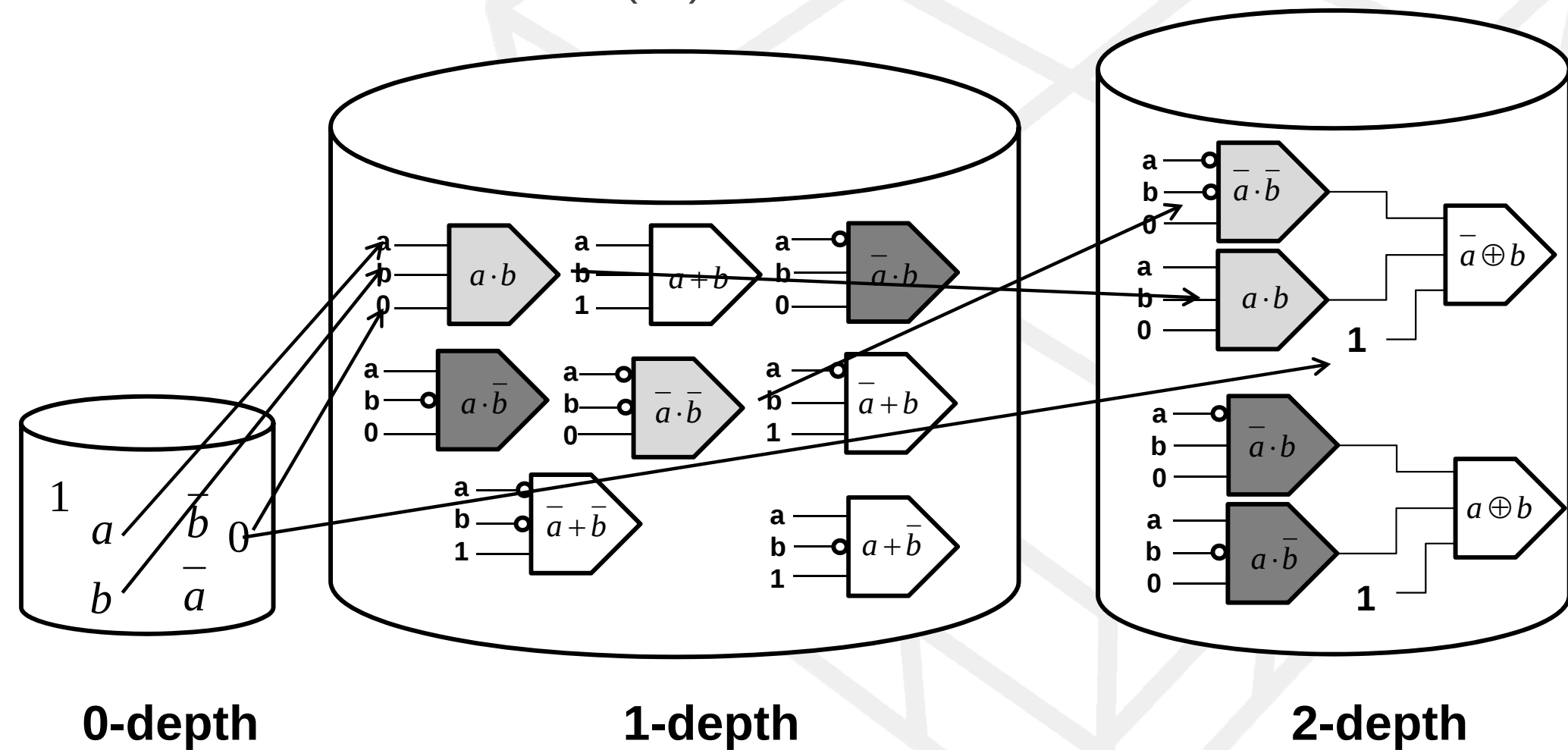


Table 1 : Results over MCNC benchmarks.

	Logic Depth	Maj. Count	Gate Inputs	Inverters
Avg. Reduction	15.1 %	-4.4%	-9.9%	-1.1%
Max. Reduction	41.7 %	19.6 %	16.2 %	79.6 %

- ❏ This is a novel method that synthesizes circuits with majority gates as primitive elements
- ❏ This method successfully synthesizes all functions of up to 4 inputs as majority gate circuits, considering minimal logic depth
 - Related work are only capable of manipulating up to 3-inputs
 - The proposed method allows further optimization in technologies that take advantage of majority gates
- ❏ The mapping flow shows improvements over previous methods.



**Do you have a question?
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