Note Title 1/10/2009

Marco Valtorta
mgv@cse.sc.edu
valtorta@sc.edu
777-4641

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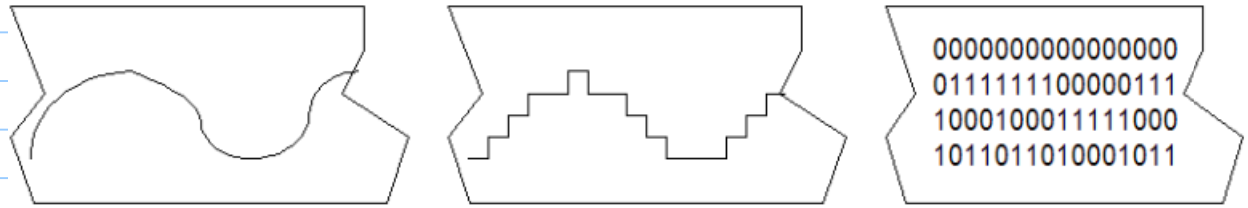
CSCE 211-002
Digital Logic Design

Digital Systems - Analog vs. Digital

- Analog vs. Digital: Continuous vs. discrete.

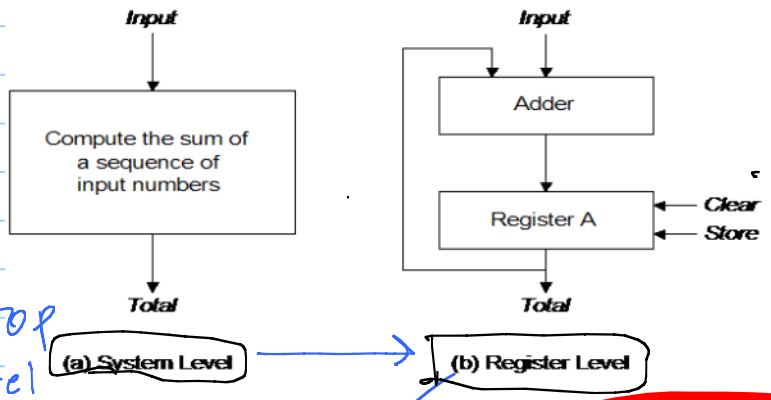


(a) Analog form (b) Sampled analog form (c) Digital form

Magnetic tape contaning analog and digital forms of a signal.

- Digital computers replaced analog computers:
  - More flexible (easy to program), faster, more precise.
  - Storage devices are easier to implement.
  - Built-in error detection and correction.
  - Easier to minimize.

[Nelson, Auburn U.]



Models of a digital system that adds lists of

top level

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Gate level

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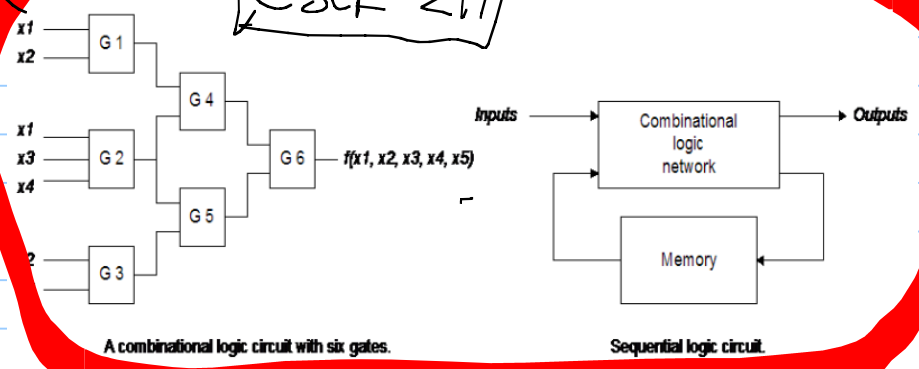

combinational sequential

ELCT221 (circuits & Systems)

Technology (Device Type)	Power Consumption	Speed	Packaging
RTL (Bipolar junction)	High	Low	Discrete
DTL (Bipolar junction)	High	Low	Discrete, SSI
TTL (Bipolar junction)	Medium	Medium	SSI, MSI
ECL (Bipolar junction)	High	High	SSI, MSI, LSI
pMOS (MOSFET)	Medium	Low	MSI, LSI
nMOS (MOSFET)	Medium	Medium	MSI, LSI, VLSI
CMOS (MOSFET)	Low	Medium	SSI, MSI, LSI, VLSI
GaAs (MOSFET)	High	High	SSI, MSI, LSI

Physical design & transistor level

bottom level

(& more generally digital systems)

Computers represent information using binary digits (bits).

We use decimal digits

Prof. Mariagiovanna Sami

A choice:

(1) We can Represent decimal digits using bits

This requires an encoding of decimal digits, e.g.

(for example)

0	⟶	1111
1	⟶	1110
2	⟶	1101
⋮		
8	⟶	0000

Then, all operations on numbers would involve their representation.
It is difficult to design digital systems that operate on this representation. So, most digital systems (almost all digital computers) are not designed this way. Instead,

(2) The computer works.
Binary numbers are used. Arithmetic is done directly in binary.

So, we need to learn binary arithmetic