Discussion Points from Session 1

Session 2

PH435

Discussion points came up in moodle post Session 1

1. Analog memory [H. Rathore]

2. Running programs in parallel

…both as a result of my chance remarks in Session 1
I should be careful about what I say in the future!

Analog memory

Key points:

- **quantization:**

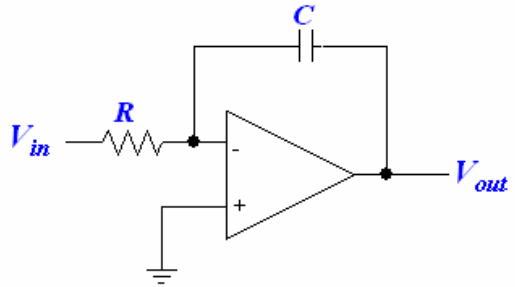
  digital logic only allows 0/1

  analog voltage has a continuous range

- **enumeration:**
- any computational memory system must have a 'finite' range'
- Why?
- In case of opamp feedback integrator example,
- Range is determined by +/- V_{CC} [M.Gattu]

What is the use of an analog computer?

Can solve Integral equations



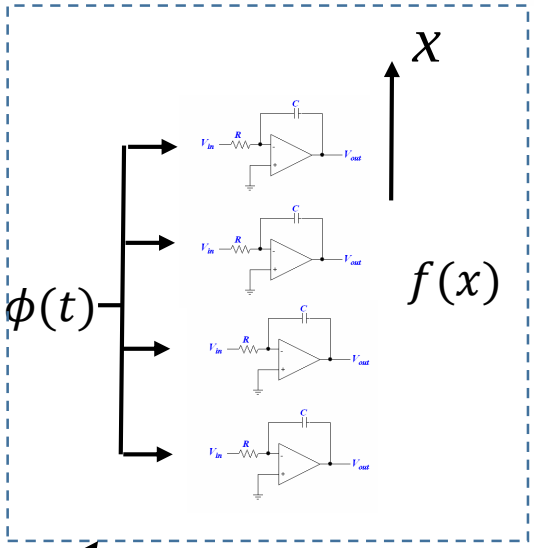
$$V_{out} = \frac{1}{RC}\int_{t_a}^{t_b} V_{in}(t)dt$$

$$f(x) = \int_a^b K(x,t)\phi(t)dt$$

known

Known
"Kernel fn"

Unknown
solve for $\phi(t)$



"Integral" calculus

Math keywords:
Green's functions, Eigenvalue equation
Maxwell's equation (integral form), EFIE

Just a quick sketch! See analog project report for a detailed analog computer design:
https://www.clear.rice.edu/elec301/Projects99/anlgcomp/

Running programs in parallel

Buzzwords that came up in discussion:

- Multithread [S.T.]
- Multicore [M.M]
- Multiprogram[S.G.] - *no such thing*

Running programs in parallel

- Multithread [S.T.]

Single CPU (core) – this is a software level concept
Operating system multiplexes different programs*
'time sharing' the same resource: computation and memory access
Each sequence of computations is called a 'thread'

Requires complex communication & coordination between threads (two programs should not thrash each other's memory storage)

General software framework (part of OS) that enables this is called MPI (Message Passing Interface).
C language has an easy to understand MPI library : https://tinyurl.com/C-MPI-example

Running programs in parallel

- MultiCore[M.M.]

This is a hardware concept

On the IC that contains the CPU, there are multiple copies of the CPU (cores)

A program, or a set of programs are sequenced for computation on multiple CPU cores

OS does the sequencing, but the ‘cores’ are hardware copies

Running programs in parallel

- MultiCore
- Is required to push the limit of a Turing machine

NOT Moore's Law
Physics concept called **'Dennard Scaling'**

Restricts clock speed to < 5 GHz for any physically realizable CPU IC