SNS COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT301 COMPUTER ORGANIZATION AND ARCHITECTURE

II YEAR /III SEMESTER

Unit 1- BASIC STRUCTURE OF COMPUTERS

Topic 2 : Basic Operational concepts

Basic operational concepts

1. To perform a given task an appropriate program consisting of a list of instructions is stored in the memory.

2. An Instruction consists of 2 parts,
   i) Operation code (Opcode) and
   ii) Operands.
   Ex: Add R1, R2, R3   R3 ←[R1]+[R2]

- The data/operands are stored in memory.
- The individual instruction are brought from the memory to the processor.
- Then, the processor performs the specified operation.

Basic Operational concepts/Computer organization and architecture/Dr.K.Periyakaruppan/CSE/SNSCE

Basic operational concepts

Let us see a typical instruction

ADD LOCA, R0

This instruction is an addition operation. The following are the steps to execute the instruction:

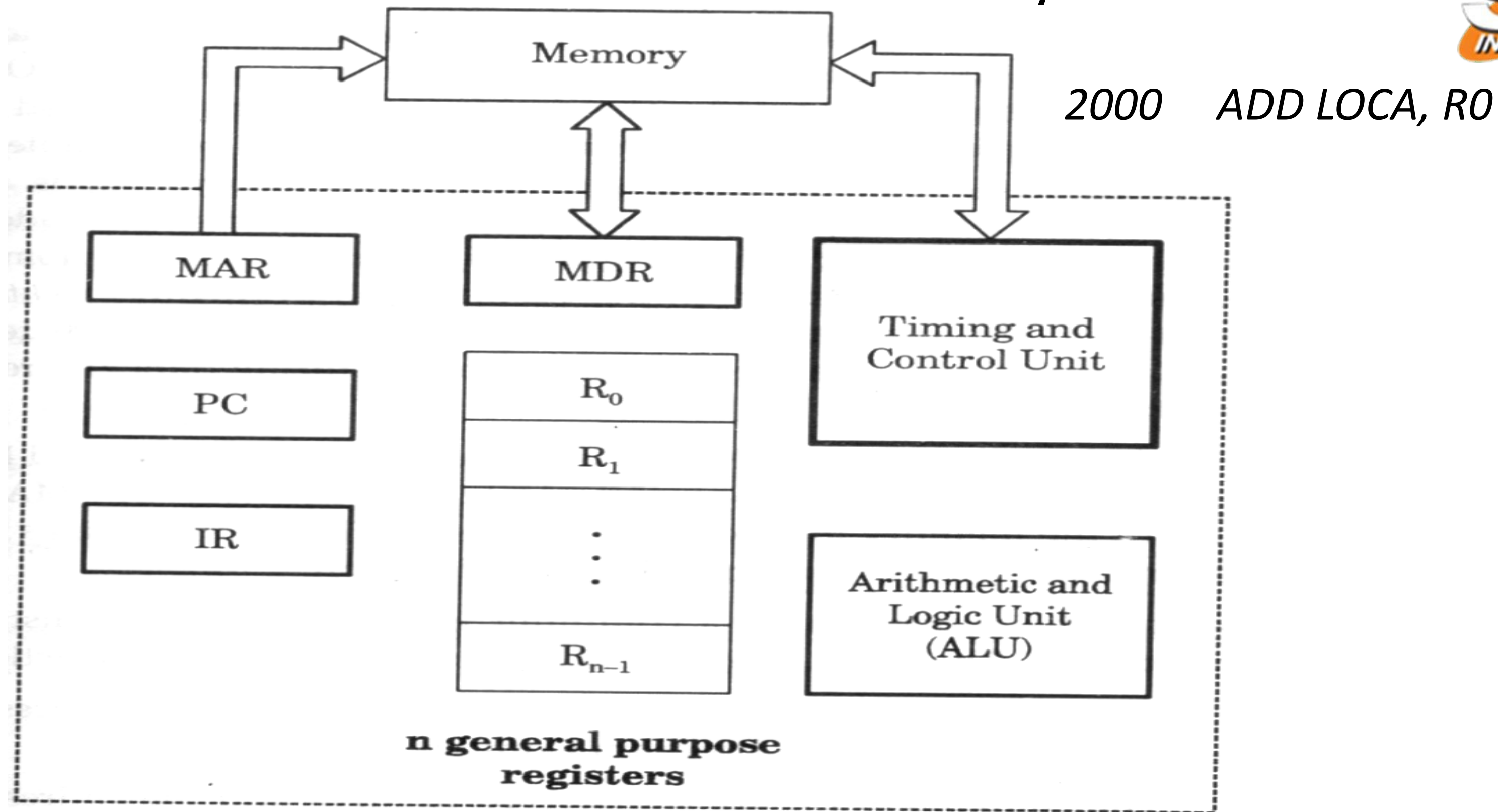Step 1: Fetch the instruction from main-memory into the processor.
Step 2: Fetch the operand at location LOCA from main-memory into the processor.
Step 3: Add the memory operand (i.e. fetched contents of LOCA) to the contents of register R0.
Step 4: Store the result (sum) in R0.

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Interconnection between Processor and Memory

2000   ADD LOCA, R0

Diagram components: Memory, MAR, MDR, Timing and Control Unit, PC, IR, R_0, R_1, R_{n-1}, Arithmetic and Logic Unit (ALU), n general purpose registers.

Basic operational concepts

The same instruction can be realized using 2 instructions as:

Load LOCA, R1
 Add R1, R0

The following are the steps to execute the instruction:

Step 1: Fetch the instruction from main-memory into the processor.
Step 2: Fetch the operand at location LOCA from main-memory into the register R1.
 Step 3: Add the content of Register R1 and the contents of register R0.
Step 4: Store the result (sum) in R0.

Basic operational concepts

Operating steps are

1. Programs reside in the memory & usually get these through the I/P unit.

2. Execution of the program starts when the PC is set to point at the first instruction of the program.

3. Contents of PC are transferred to MAR and a Read Control Signal is sent to the memory.

4. After the time required to access the memory elapses, the address word is read out of the memory and loaded into the MDR.

5. Now contents of MDR are transferred to the IR & now the instruction is ready to be decoded and executed.

6. If the instruction involves an operation by the ALU, it is necessary to obtain the required operands.

7. An operand in the memory is fetched by sending its address to MAR & Initiating a read cycle.

8. When the operand has been read from the memory to the MDR, it is transferred from MDR to the ALU.

9. After one or two such repeated cycles, the ALU can perform the desired operation.

10. If the result of this operation is to be stored in the memory, the result is sent to MDR.

11. Address of location where the result is stored is sent to MAR & a write cycle is initiated.

12. The contents of PC are incremented so that PC points to the next instruction that is to be executed.

Assessment

a). What is operand?

_____

_____

_____

b) Mention the purpose of

1.Instruction_____

2. opcode _____

3.Program counter _____

4.MAR _____

5. MDR _____

Reference

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", McGraw-Hill, 6th Edition 2012.