FINAL PROJECT ENGLISH

Structure and function of the CPU, Elemen Central Processing Unit (CPU)

Conducted By :

Moh Muhlis (2021020100031)

Thufael Mirza Alavi (2021020100032)

THE INFORMATION OF TECHNOLOGY DEPARTMENT

THE FACULTY OF TECHNOLOGY

MADURA ISLAMIC UNIVERSITY

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INTRODUCTION

I. Background

A computer is a series or group of electronic machines consisting of thousands or even millions of components that can work together, and form a neat and meticulous work system**.**

On a computer, it consists of hardware (hardware on a computer), software (software on a computer) and brainware (human devices on a computer). On the computer there is a CPU (Central Processing Unit). CPU is one of the most needed hardware components on a computer. This is where all the data is processed on the CPU. Therefore, a CPU is needed for a CPU.

II. Problem Formulation

a. What is the meaning of central processing unit (CPU) ?
b. What are the functions of the CPU ?
c. What are the structures of the CPU ?

III. Purpose

a. To find out what a CPU means.
b. To know the functions of the CPU.
c. Untuk mengetahui struktur CPU.

METHOD

We took all the references of this paper from google

DISCUSSION

a. Understunding CPU

CPU stands for Central Processing Unit is a computer hardware that functions to receive and execute commands and data from software.

b. CPU Functions

The CPU works like a calculator, except that it is much more powerful in processing power. The main function of the CPU is to perform arithmetic and logical operations on data retrieved from memory or from information entered through some hardware, such as a keyboard, scanner, control lever, or mouse. The CPU is controlled using a set of computer software instructions. The software can be run by the CPU by reading it from storage media, such as hard disks, floppy disks, solid disks, or tape recorders. The instructions are then stored first on physical memory (RAM), where each instruction will be assigned a unique address called a memory address. Furthermore, the CPU can access the data on the RAM by specifying the desired data address.

When a program is executed, data flows from ram to a unit called a bus, which connects the CPU with RAM. The data is then decoded using a process unit referred to as an instruction sequence capable of translating instructions. The data then runs into the arithmetic and logic unit (ALU) that performs calculations and comparisons. Data may be temporarily stored by the ALU in a memory location called a register so that it can be retrieved quickly for processing. ALU can perform certain operations, including addition, multiplication, subtraction, condition testing of the data in the register, to sending the processing results back to physical memory, storage media, or registers if they are to process the processing results again. During this process, a unit in the CPU called a program counter will monitor the successfully executed instructions so that the instructions can be executed in the correct and appropriate order.

c. How cpus work

When data and/or instructions are entered into processing-devices, it is first placed in RAM (via Input-storage); if in the form of instructions, it is accommodated by the Control Unit in Program-storage, but if it is in the form of data, it is accommodated in Working-storage). If the register is ready to receive execution work, then the Control Unit will take instructions from the Program-storage to be accommodated to the Instruction Register, while the memory address containing the instruction is accommodated in the Program Counter. Meanwhile, the data is taken by the Control Unit of working-storage to be accommodated in the General-purpose register (in this case in the Operand-register). If based on the instructions the work done is arithmatics and logic, then the ALU will take over the operation to work on the basis of the instructions set. The results are accommodated in accumulator. When the processing results have been completed, the Control Unit will take the processing results in the Accumulator to be accommodated back to Working-storage. If the overall work has been completed, the Control Unit will pick up the processing results from the Working-storage to be accommodated to the Output-storage. Then next from Output-storage, the processing results will be displayed to output-devices.

d. CPU Structure

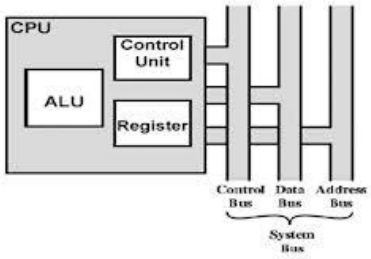


Image from Internal CPU

Here's the CPU structure:

i. Arithmetic and Logic Unit (ALU)

ALU is in charge of forming computer data processing functions. ALU is often called machine language because this part works on the machine language instructions given to it. As the term implies, the ALU consists of two parts, namely the arithmetic unit and the boolean logic unit, each of which has its own task specification.

ii. Control Unit

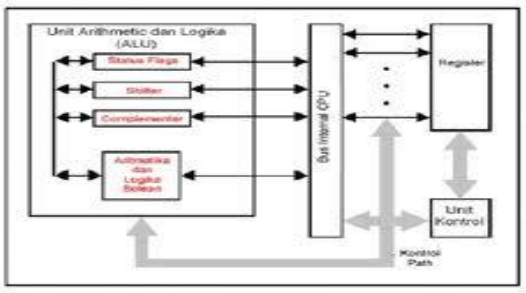
Cu which is in charge of controlling CPU operations and completely controlling the computer so that there is synchronization of work between components in carrying out their operating functions. Included in the responsibility of the control unit is to take instructions from the main memory and determine the type of instruction.

iii. Register

Register is the cpu internal storage medium used during the data processing process. This memory is temporary, usually used to store data when processed or data for subsequent processing.

iv. CPU interconnection

A CPU interconnection is a connection system and bus that connects the internal components of the CPU, namely the ALU, control units and registers and also with the bus – the external bus of the CPU that connects with other systems, such as main memory, input/output devices.



Struktur Detail Internal CPU

e. Register

Processor registers, in computer architectures are a small amount of computer memory that works at a very high speed that is used to carry out the execution of computer programs by providing quick access to commonly used values.

- 4 Types of register groups as follows :

1. General Purpose Register

- Accuumulator Register AX

  Function : As an accumulator and relates to special types of operations such as Arithmetic, In/Out, Shift, Logic, Rotate, and binary-coded decimal operations.

- Base Register BX

Function : As a base register to reference memory addresses. The operations that can be performed are Rotate, Logic, Shift, and Arithmetic.

- Counter Register CX

Function : As an implicit enumeration with certain instructions, for example against Loop commands and string operations. The counter rises if the direction flag is valued at 0, and the counter goes down if the direction flag is worth 1.

- Data Register DX

Function : Stores the I/O port address during a specific I/O operation, both 8-bit and 16-bit port addresses. Used also in multiplication and division operations.

2. Pointer dan Index Register

- Register SP (Stack Pointer, 16 bit)

Function : Used for stack operations such as storing the return address when calling a subroutine. SP is a register implicitly used by the PUSH and POP commands i.e. storing and retrieving from the stack.

- Register BP (Base Pointer, 16 bit)

Function : As a base pointer in the stack provided for data storage. BP is also used si with programming languages e.g. Assembler and C.

- Register SI dan DI (Source Index dan Destination index, 16 bit)

Function: Stores offset values in the current memory data segment.

- Register IP (Instruction Pointer, 16 bit)

Function : A register paired with CS as the main register to indicate the command line of the program. When the program is run, the IP will directly point to the beginning of the program. Code Segment and Instruction Pointer serve as counter programs written in CS:IP format. In general, machine code is placed in Code Segment, all data is put in Data Segment, and PUSH and POP operations are performed in Stack Segment.

3. **Register Segment (16 Bit)**
    - Register CS (Code Segment)

    Function : Records a segment of the program code or instruction, the CS register is paired with the IP (Instruction Pointer) register in CS:IP format.

    - Register DS (Data Segment)

    Function : Stores the address of the segment where the data is located.

    - Register SS (Stack Segment)

    Function : Stores the address of the memory segment used as a stack.

    - Register ES (Extra Segment)

    Function : Stores the address of the memory segment used as a stack.

4. **Register Flag**

    The 8086/8088 Microprocessor has a 1 bit Flag Status and 4 Flag Controls configured in a 16 bit register. The Flag status consists of :

    - CF (Carry Flag)

    Task : Where is a carry out or borrow, if the result is the highest bit (value 1).

    - PF (Parity Flag)

    Task : Set (value 1), if the instruction returns an even number (even parity).

    - AF (Auxiliary Flag)

    Task : Used by decimal setting instructions.

    - ZF (Zero Flag)

    Task : Set (value 1), if the result of the instruction is 0.

    - SF (Sign Flag)

    Task : Set (value 1), if the result is negative and is worth 0 if positive.

- Flag control consists of :
  - OF (Overflow Flag)

  Task : Indicates an incorrect operation that changes the result from the bit mark.

  - IF (Interrupt Enable Flag)

  Task : If set (value 1) can perform interrupt operations and vice versa when it is valued at 0, then interrupts cannot be performed.

  - DF (Direction Flag)

  Task : Control the direction of string operations. If DF=1, then the SI and DI registers decrease in value (decrement); if DF=0, then the DI and SI registers increment values. This register is used for MOVS, MOVSB, MOVSW, CMPS, CMPSB, and CMPSW instructions.

  - TF (Trap Flag)

  Task: Placed in single step mode for debugging purposes.

CONSCLUSSION

Cpu upgrade from the Central Processing Unit is a computer hardware that functions to receive and execute commands and data from software.

The structure of the CPU consists of, namely:

1. ALU (Arithmetic Logic Unit).
2. CU (Control Unit).
3. Register.
4. CPU interconnection.

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