Characteristics

1. Reactive System:

```c
#include <stdio.h>

int main(int fun){
    int x;
    do{
        printf("Do you want a loop\n1 for yes\n");
        scanf("%d", &fun);

        if(fun == 1)
        {
            x = 1;
        }
        else
        {
            x=2;
        }
    }while(x == 1);
}
```

The programm reacts if the operator types in a "1" or any other number. If "1" the program creates a loop back to the beginning.

2. Real - time system:

The operator wants every second a random generated number with 8 digits which was not created before

⇒ Deadline: One second

task: - generate a random number with 8 digits

- only unique numbers

⇒ Hard real - time

3. Continuous, Discrete, Hybrid System

The random generated numbers are first pictured in a graph sorted by the first digits, the graph expand every second as an number comes.

4. Embedded System

The program gives the random generated numbers to a pinter which prints the numbers on a piece of paper.

Attributes of Dependability

1. Reliability

Reliability is probability of a component, or system, functioning correctly over a given period of time under a given set of operating conditions.

2. Availability

The availability of a system is the probability that the system will be functioning correctly at any given time.

- a system which is available could be not used because of its low reliability
- a system which has a good reliability could be not available at a specific moment
- a system with a bad reliability could be used because it is available

- a reliable and available system can be unsafe

3. Safety

Safety is property of a system that it will not endanger human life or the environment.

4. Security

Prevention of or protection against (a) access to information by unauthorized recipients or (b) intentional but unauthorized destruction or alteration of that information.

- safety requires some security
  - ↳ blocking unauthorized use makes a system safer

Main elements of a microcontroller

Processor core (CPU): Performs arithmetic operations, manages data flow, creates control signals

Memory (RAM): Temporary data storage (read-/write memory)

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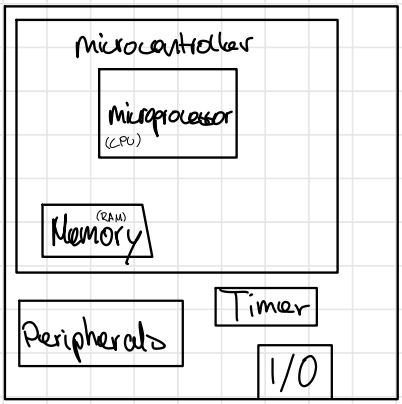
I/O channels: Channels for communication and power with external devices

Timer: Core clock for the CPU

Peripherals: Hardware modules for the microcontroller which help with external systems



Which processors are typically used for microcontrollers?

A lot of processors have a 8-bit structure, 12 Mhz clock and 128 bytes of RAM. An example for that is the famous Intel 8051 (Intel MCS-51).

But there are a lot of different processors. They can also have a 4-bit, 16-bit and a 32-bit structure. Also the amount of RAM is different from processor to processor.