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Arquiteturas para Sistemas Embutidos

Aula1

What are embedded Systems?

Embedded systems are computacional devices designed to perform a dedicated function. They may function as standalone devices or as part of larger systems.

Comparison with general purpose systems

General-purpose computers are designed so that users or devices can interact with them in a variety of ways to meet a broad range of needs. Embedded systems are more limited in terms of hardware and software than a general purpose system (fewer applications, scaled-down applications, no operating system (OS) or a limited OS, or less abstraction-level code). They are cheap to produce, easy to design, compact in size and low in terms of power consumption when compared to general purpose systems.

What are …

CPUs - Processors themselves are commonly referred to as CPUs, but it is actually the processing unit within a processor that is the CPU. The CPU is responsible for executing the cycle of fetching, decoding, and executing instructions. Currently CPU's are pipelined with many stages but there are 5 fundamental stages. Those are Instruction Fetch (IF), Instruction Decode(ID), Execution(EXE), Memory Access(MEM), Write back(WB).

Microcontrollers - Processors that have most of the system memory and peripherals integrated on the chip. They contain one or more CPUs along with memory and programmable input/output peripherals. They operate at low frequencies (< 200 MHz). Low power consumption. Used and programmed for specific tasks (that are not computational demanding).

GPUs - GPU is a processor unit designed to perform parallel processing on multiple sets of data. Typically, they act as coprocessors of the CPU in computer systems. They are used in image rendering, graphic manipulation and computationally intensive algorithms.

DSPs - A Digital Signal Processor, is a type of processor that implements a datapath Instruction Set Architecture and is typically used for repeatedly performing fixed

computations on different sets of data, in other words, DSPs are processors optimized for digital signal processing.

FPGAs - Field Programmable Gate Array, are semiconductor devices that are based around a matrix of configurable logic blocks (CLBs) connected via programmable interconnects. FPGAs can be reprogrammed to desired application or functionality requirements after manufacturing. Is commonly associated with FSM.

SoCs - A system-on-chip (SoC), is essentially an integrated circuit that takes a single platform and integrates an entire electronic or computer system onto it. The components that an SoC generally looks to incorporate within itself include a CPU, I/O ports, internal memory, analog I/O blocks, etc.

PSoCs - PSoCs are programmable SoCs that integrate configurable analog and digital peripheral functions, memory and a microcontroller on single chips.