

STRUCTURE OF A REAL-TIME SYSTEM

Introduction

Real Time System:

Real-time system is a system which is used for performing some specific tasks. It is a computational system which is used for various hard and soft real-time tasks. These specific tasks are mainly related with time constraints. The tasks assigned to real-time systems need to be completed in a given time interval.

Embedded Systems are integrated systems which are formed by the combination of computer hardware and software for a specific function.

The embedded systems which are designed to perform real-time tasks are known as Embedded Real-time Systems or Real-time Embedded Systems.

Types of Embedded Real-time System

There are two types of embedded real-time systems:

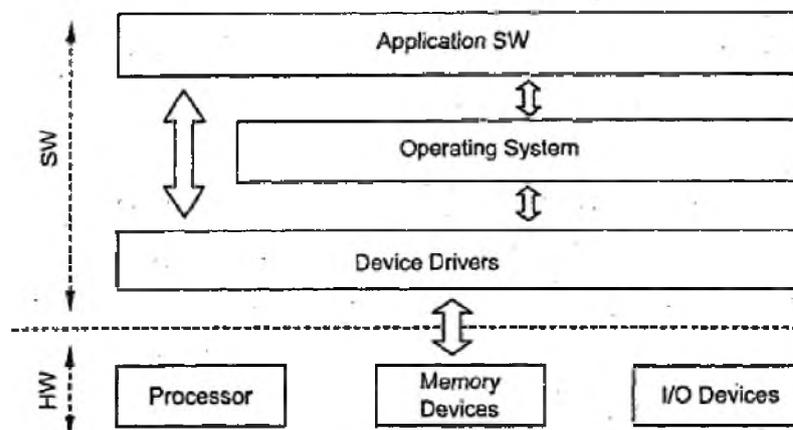
(i) Hard Embedded Real-time System:

The embedded real-time systems that are used to perform hard real-time tasks are called as Hard embedded real-time system. These systems are designed in a very complicated way and are accurate systems.

(ii) Soft Embedded Real-time System:

These are embedded real-time systems that are used to perform soft real-time tasks. These are simple designed systems and there are chances of inaccuracy.

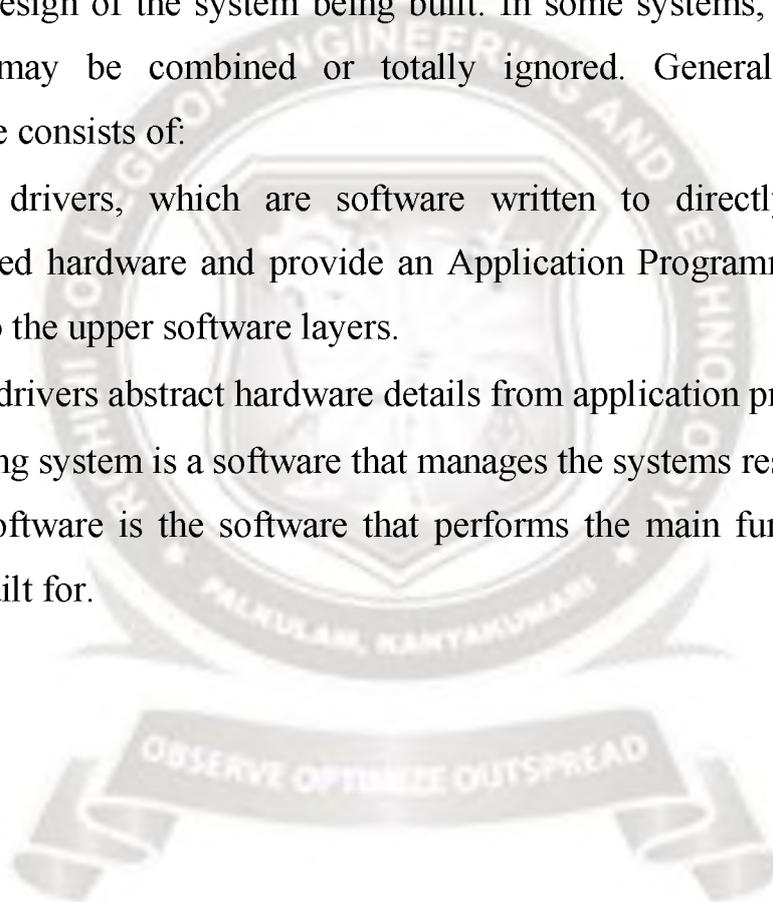
Structure of Embedded System

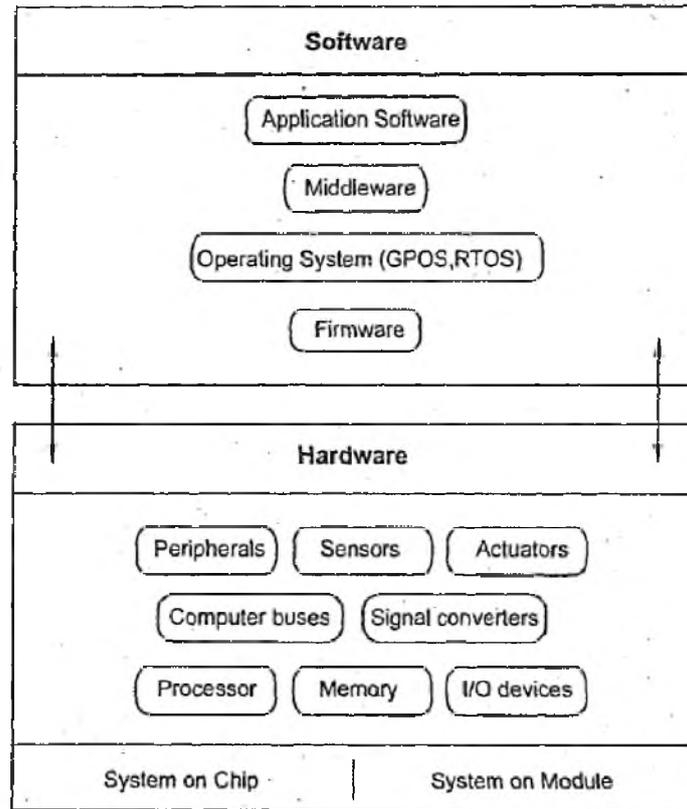


The different layers of an embedded system. The lower layer is the embedded hardware which consists of,

- The processor, which is the main system controller.
- The memory devices, where instructions and datas are stored.
- I/O devices through which communication between the processor and the external world is enabled.
- The upper layer is the embedded software. This layer changes according to the design of the system being built. In some systems, some of these layers may be combined or totally ignored. Generally, embedded software consists of:
 - Device drivers, which are software written to directly control the embedded hardware and provide an Application Programming Interface (API) to the upper software layers.
 - Device drivers abstract hardware details from application programmers.
 - Operating system is a software that manages the systems resources.

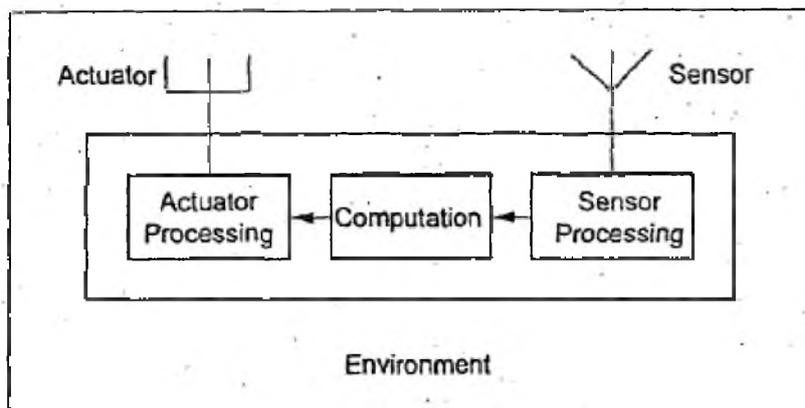
Application software is the software that performs the main function that the system was built for.





Structure of Embedded Real-time System

The structure of a real-time system includes various hardware and software devices embedded in such a way that specific tasks can be performed in allowed constraints.



(i) Sensor

Sensor is used to sense the environment periodically. It is used for conversion of some physical events or characteristics into electrical signals. This is a hardware

device that takes input from environment and gives output to the system. The sensed data from the environment is processed to determine the necessary corrective actions.

(ii) Sensor Processing

When data is sensed from environment via sensor, it makes data ready for computation process. It involves both conditioning and other processes. This process is required to obtain data in compatible form for computation in system.

(iii) Computation

Computation is a process of calculation and operations needed for task to be completed. This is main process that happens inside real-time system. It takes data input from sensor and gives output to actuator of real-time system.

(iv) Actuator Processing

It is just like sensor processing but does reverse work. It takes input from system and gives this to an actuator of system. This is basically used to make output compatible with environment so that the user can easily understand an obtained output.

(v) Actuator

Actuator is a reverse device of sensor. It is used to convert electrical signals into physical events or characteristics. It takes input from the system and gives output to an environment. The output obtained from actuator may be in any form of physical action. Motors and heaters are some of the commonly used actuators.