Real Time Operating systems (RTOS) concepts

Abu Bakr Mohamed Ramadan
Eng.abubakr88@gmail.com

Content:

- What is The an Operating system (OS).
- What is a Real-Time OS?
- Hard vs. Soft real-time.
- Examples of RTOS applications.
- Examples of RTOS in the market.
- References and Read more.

What is an Operating System (OS)

- **Operating system** is a layer between the hardware and the application, which:
  - Has direct access to HW.
  - Manage the HW according to a predefined rules and polices.
  - Hide hardware complexity from the application prospective.
  - Enable a lot of features like multitasking.
  - **Examples:**
    - Linux.
    - Unix.
    - Mac OS.
    - Microsoft Windows.
    - Android.
    - IOS.
    - Embedded OSs.

What is a Real-Time OS?

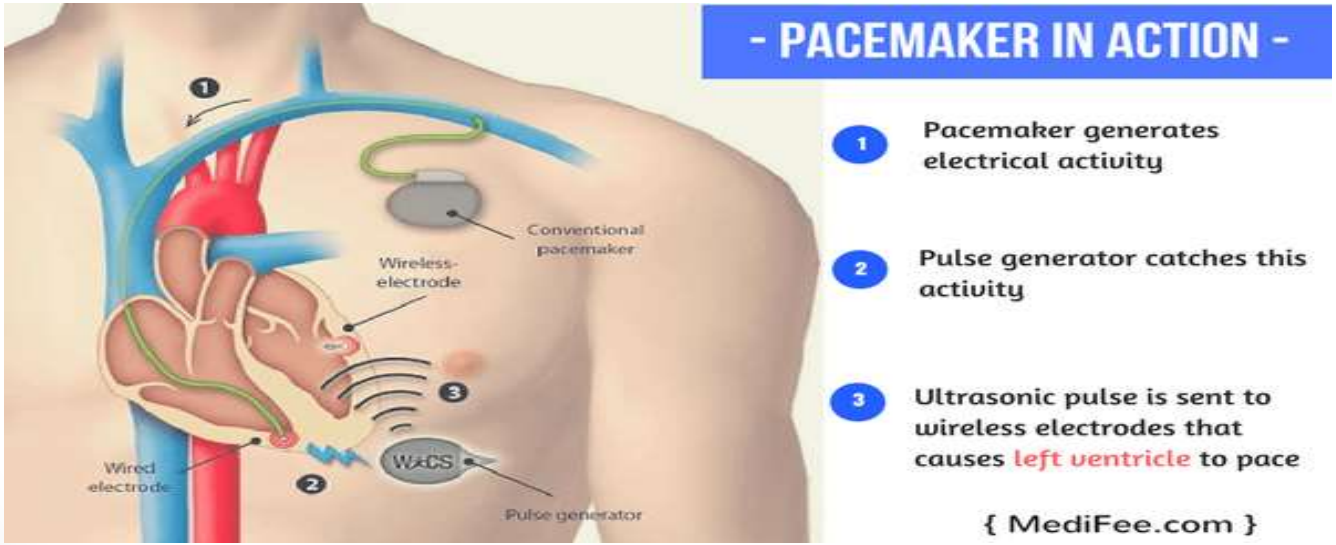
- Real Time Systems is like GPOS in functionality but it's specially designed to run applications with very precise timing and a high degree of reliability.
- In the simplest form, real-time systems can be defined as those systems that respond to external events in a timely fashion,
- A real-time system does not mean faster performance.

Hard vs. Soft real-time

- **Hard real-time:**
  - A system that can meet the desired deadlines at all times (100 percent), even under a worst-case system load. In hard real-time systems, missing a deadline, even a single time, can have fatal consequences.
  - Hard real-time systems are used in cases where a particular task, usually involving life safety issues, needs to be performed within a particular time frame, otherwise a catastrophic event will occur.
- **Soft real-time:**
  - A system that can meet the desired deadlines on average.
  - a soft real-time system will give reduced average latency but not a guaranteed maximum response time.
  - soft RTOS can miss a few deadlines (such as dropping a few frames in a video application) without failing the overall system

Examples of RTOS applications:

- **(1) A pacemaker.** This is a device that is inserted in someone's chest to provide electrical impulses at regular intervals to help their heart beat. If the device missed a beat, it may be fatal.

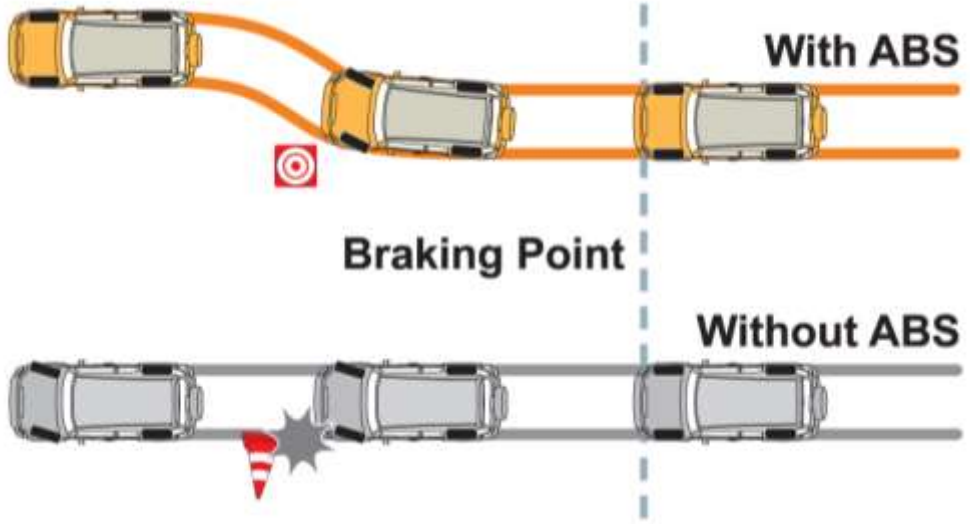


Examples of RTOS applications:

- **(2) Car airbag system**, one of the most critical systems in a modern car. An airbag should be deployed within a particular time interval (for example, within 1 second[1]) after the sensors in the car detect a collision.

Examples of RTOS applications:

- **(3) The Anti-lock Braking System (ABS)** controller in a car. When the driver of the car presses on the brake, this device controls the signals to the actual brake pads with the wheels. If the device does not correctly manage the timing of the brake pads, the car will not stop correctly.



Examples of RTOS applications:

- **(4) missile weapons defense system**.

Examples of RTOS in the market

- **VxWorks:** http://windriver.com/products/vxworks
- **QNX:** http://www.qnx.com
- **eCos:** http://ecos.sourceware.org
- **Free RTOS:** http://www.freertos.org
- **Symbian OS, Windows CE, MontaVista, RTLinux,**
- **Open Source RTOS List:** http://www.osrtos.com

References and Read more:

- http://www.versalogic.com/mediacenter/whitepapers/wp_linux_rt.asp
- http://www.enotes.com/homework-help/give-example-two-realtime-applications-operating-276796
- http://www.freertos.org/about-RTOS.html
- http://www.ni.com/white-paper/3938/en
- **Real-Time Concepts for Embedded Systems book** by Qing Li and Carolyn
  - http://www.e-reading.club/book.php?book=102147