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Homework set 1

1. Provide examples of real-time embedded systems you are familiar with and describe how these systems meet the common definition of real-time and embedded.

Ans) One of the examples of real-time embedded systems can be Autonomous Cars. The car can be considered as a collection of many embedded systems. For example, the Anti-Lock Braking is a real-time embedded system. It is a system which prevents the wheels from locking up during braking. It is an Hard real-time embedded system as even a slightest miss in timing can result into a crash. Another one can be the detection of another vehicle or an object while the autonomous car is in motion. If there is delay in calculation or the response, there will be a crash. Thus, this system should be a real-time system. The car uses a camera and a processor to make decisions which can be considered as an embedded system.

1. Find the Liu and Layland paper and read through Section 3. Why do they make the assumption that all requests for services are periodic? Why might this be a problem with a real application?

Ans) The assumption made in the Liu and Layland paper is that all requests for services are periodic. The assumption has been made in order to support the calculations made in that paper. It is assumed as periodic as severe implications on the utilization may occur if there is aperiodicity in the task. It is said to be the most important assumption and is one of the requirements for a guaranteed real time system.

This assumption might be a problem in a real world where there is aperiodic along with periodic services. This would lead to a problem as the calculations of the Liu and Layland paper does not consider the aperiodic tasks.

1. Define hard and soft real-time services and describe why and how they are different.

Ans) Real time services are divided into two types – Hard and Soft Real Time services. Hard real-time services are those which has a devastating effect on the service if there is a deadline missed, meanwhile in a Soft real-time service the effect is much moderate. The response time of Hard is in milliseconds or less while for a Soft it can be much more. Hard real-time services are used in applications where safety and rapid decisions must be made like a self-driven car. Soft real-time services are used in media players where there can be few deadlines missed which won’t affect the overall task.