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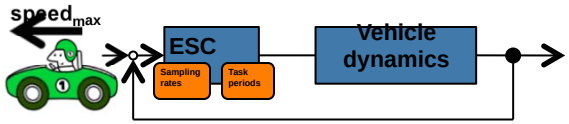
Berkeley, CA

Ptolemy Miniconference

Towards flexible and robust cyber-physical systems through self-organization

Systems run in worst case mode determined at design time

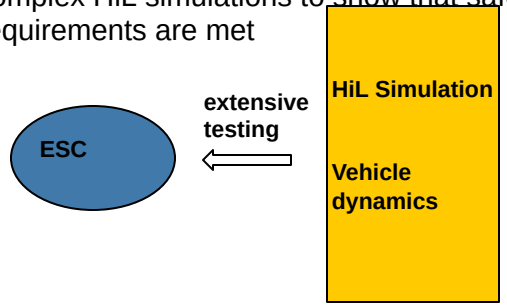
Timing constraints are given by the worst case scenario



Sensor sampling rates and ESC control task periods run at a speed to avoid oversteering of the car at max. speed

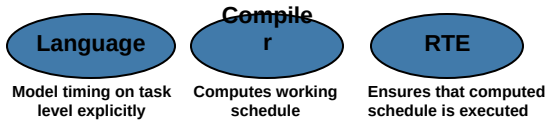
At best, there are different modes of operation available

System is given no information to react in an aware manner => Timing is tested in complex HiL simulations to show that safety requirements are met



Reasoning about timing as the key

Giotto language allows to reason about timing explicitly



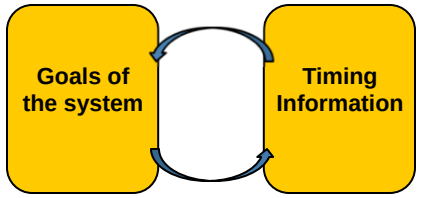
However, once the schedule is computed, it is static and not ought to be changed during run-time

From the timing properties, such as task periods and deadlines, used for describing the timing behavior of the system it is not possible to derive the reasons for the timing constraints, the information is missing

Recent results from Prof. Tabuada have shown that control tasks show stable behavior while **self-triggering**

This is especially interesting because timing is derived from the physics of the system => there is a meaning, it is not just a property of the worst case analysis

To be really able to adapt timing to changing conditions, timing information must be coupled to the goals of the system



In the ESC example, sensor sampling rates and task periods could be adjusted to the current speed of the car

Goal of this ongoing work: Equip run-time models with needed information to adapt their timing behavior at run-time

In the case of control applications, stability must be guaranteed when changing timing settings.

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