

Supervisory control of real-time systems

$K \subseteq T_m(G)$ timed-language specification

- ① condition for existence of timed supervisor — control action function of timed trace (supervisor represented as timed automata):

controllability of K :

$$\text{pr}(K) [\Sigma_u \times \mathbb{R}_+] \cap T(G) \subseteq \text{pr}(K)$$

relative-closed of K :

$$\text{pr}(K) \cap T_m(G) = K$$

- ② Additional condition for existence of untimed supervisor — control action function of untimed trace (supervisor represented as untimed automata)

normality of K wrt "untime" operation:

$$\text{untime}^{-1} [\text{untime}(\text{pr}(K))] \cap T(G) \subseteq \text{pr}(K)$$

- These conditions are polynomially testable
- Similarly, conditions for control under partial observation can be obtained
- Supervisor synthesis: these conditions preserved under union \Rightarrow supremal sublang. satisfying conditions exist.
- * off-line synthesis : requires construction of region automata
- * on-line synthesis : ?