Robustness Computation of Dynamic Controllability in Probabilistic Temporal Networks with Ordinary Distributions

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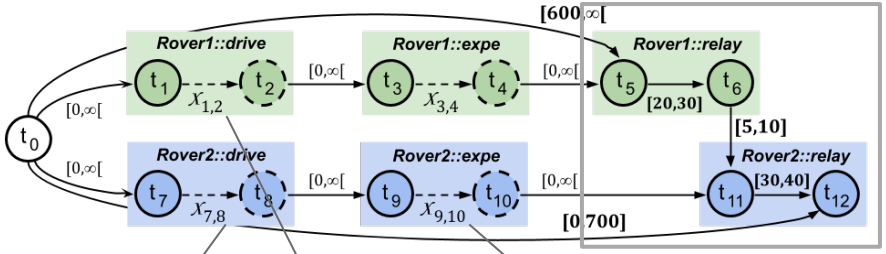
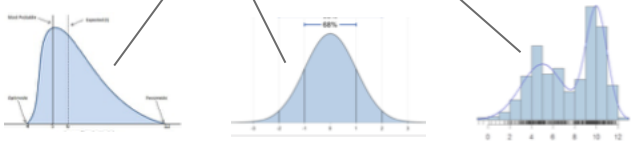
Input: Probabilistic Simple Temporal Network (PSTN) — *A* PSTN *describes an operational project as a set of activities under time constraints and temporal uncertainty (activity durations)*

Goal: Compute a lower bound on the success probability of a PSTN, under dynamic control → *Dynamic control: decisions can be adapted online*



Time window for comm. tasks: [600, 700]



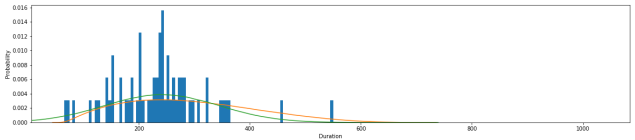
Stochastic task durations

Probability that the rovers meet the communication window?

Our method deals with any possible (discrete) prob. distribution

previous methods assume classical parametric distributions (uniform, normal)

Benefit: use full stochastic knowledge through historical observations



Lower bound: first method to actually guaranty not to overestimate the probability of success

***Assumption**: failing at executing any activity → overall network execution failure*

Application to Mars2020 task networks

Structural brittleness analysis: how does the uncertainty of one activity impacts other acticities through the network?

→ Identify structural bottlenecks