Reactive Switching Protocols for Multi-Robot High-Level Tasks

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IROS

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# Context

- cooperative, homogeneous team of robots

- nondeterministic environment

- Linear Temporal Logic (LTL)* task specification of task φ

- specific task assignment is unimportant

*GR(1)

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Kiva Systems
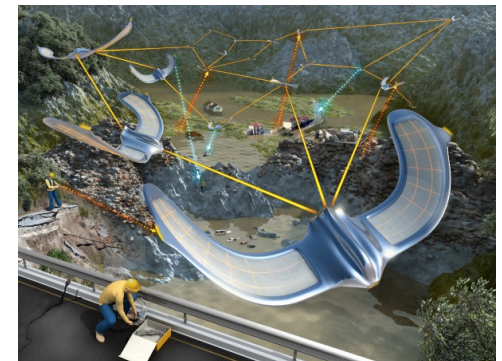
Disaster-Response UAVs (EPFL)

*GR(1)

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Approach

- model robot team as a switched system

$$\dot{x}(t) = f_{\sigma(t)}(x(t)),$$

mode = task assignment

- construct motion controllers for each mode

- synthesize switching protocol to realize φ

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Key Contributions

- ***Novelty***: concurrent task reassignment and planning via reactive synthesis

- ***Computation***: switched system representation yields exponential improvement during synthesis

- ***Virtualization***: explicit separation between motion controllers and robots
  - allows solution of otherwise infeasible tasks

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Example (simulation)

Thanks!

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