

Computing Opportunities to Augment Plans for Novel Replanning during Execution

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Motivation

Planning:

- takes domain and problem and generates plan (“executable” actions)
- does not consider static facts not present in initial state

Execution/monitoring:

- checks if preconditions hold in state
- otherwise, replans if failure

Contributions of this paper

- Introduction and computation of **opportunities**
- Execution monitoring including opportunities
- Replanning when opportunities are detected

Opportunities

- Static facts
- Not true in initial state
- Preconditions of not-considered actions
- If they became true during execution, they could yield to a better plan

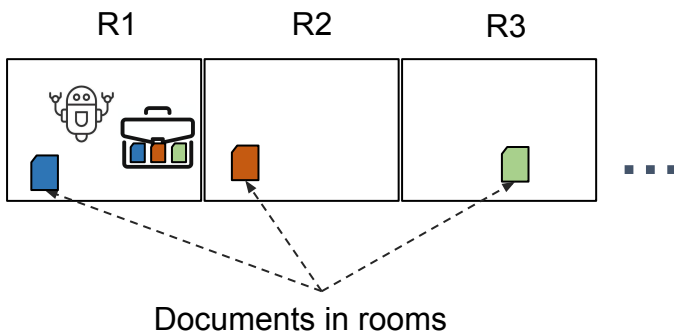
Documents domain

Goal: Collect a set of documents

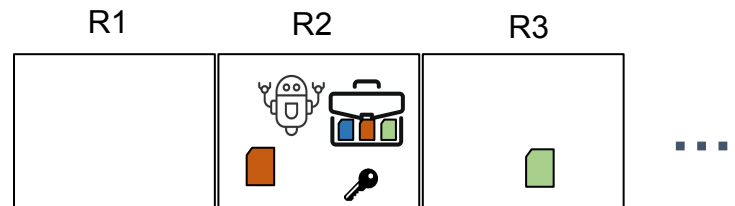
Initial state:

- . Documents are inside the briefcase
- . The briefcase is locked, and there is **no key**
- . **Documents are also spread through multiple rooms**

Plan: grab documents and move across rooms



Opportunity arises



Briefcase key found!

Replanning – resulting shorter plan:
no need to visit all other rooms

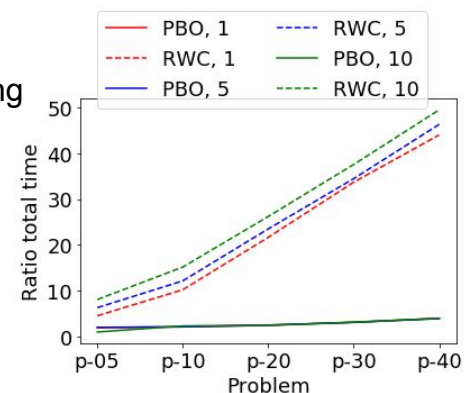
Algorithm for computing opportunities

- Start from the end of plan
- Compute goal regression
- For each literal E that is in goal regression so far
 - For each static precondition P of an action not in plan that achieves E
 - If P not in I, define P as an opportunity
- Update goal regression
- Repeat until start of plan

Experiments. Time fixed schedule

(opportunity appears at times 1, 5, 10)

Ratio total planning
time vs initial
planning time



PBO: Plan Based Opportunities
RWC: Replan When Change

Results

- Improved overall planning time with respect to replanning when any change perceived
- Improved cost of plans with respect to no replanning
- Focused perception

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