Interpreting Robot Commands using MRS

SemEval 2014 Task 6

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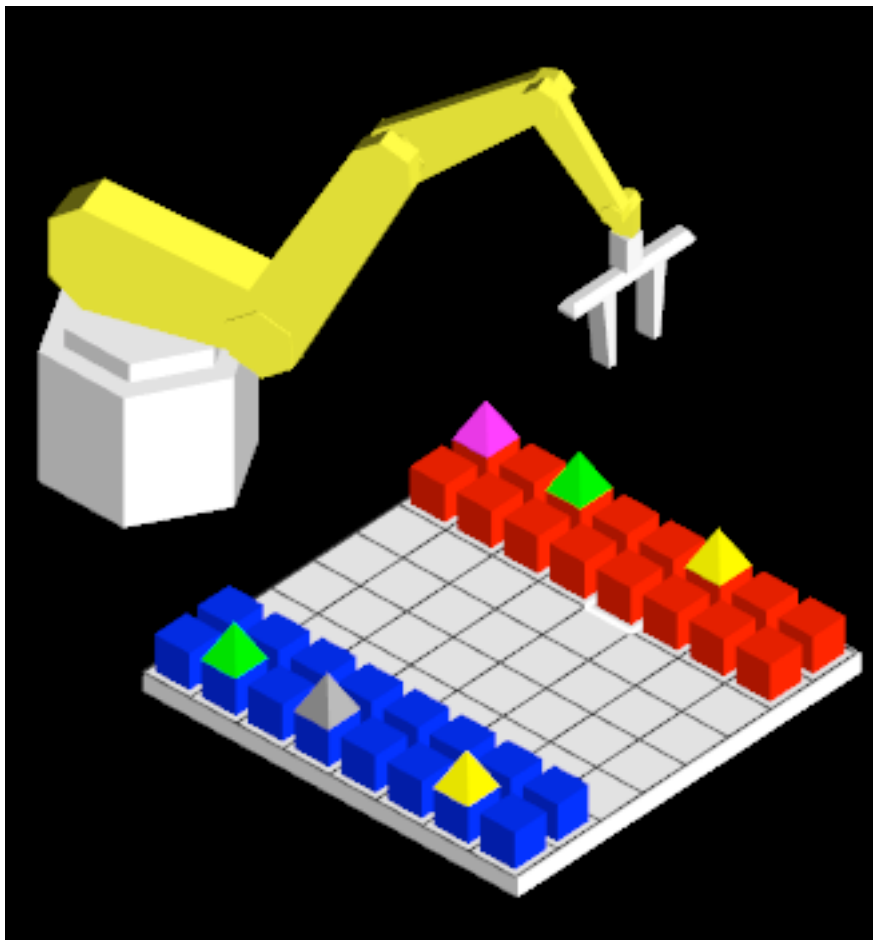
SemEval 2014 Task 6



Take the pink piece and put it on the blue block to the left of the grey piece.

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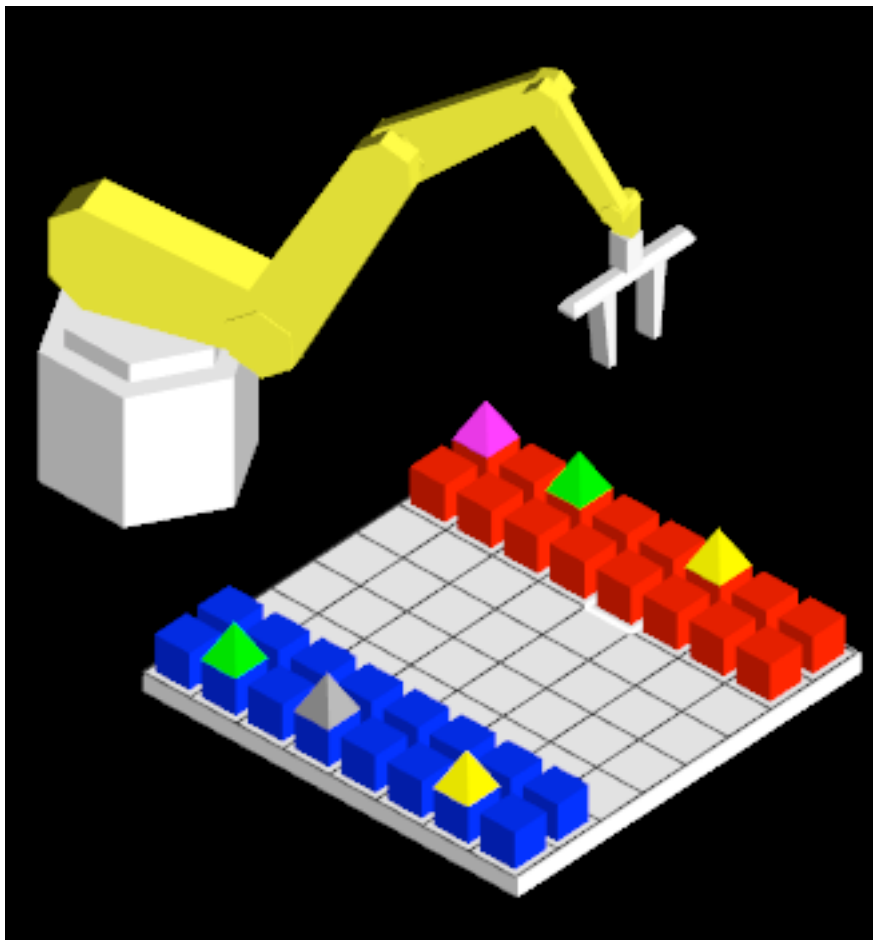

Place purple prism on blue block left to the gray prism.

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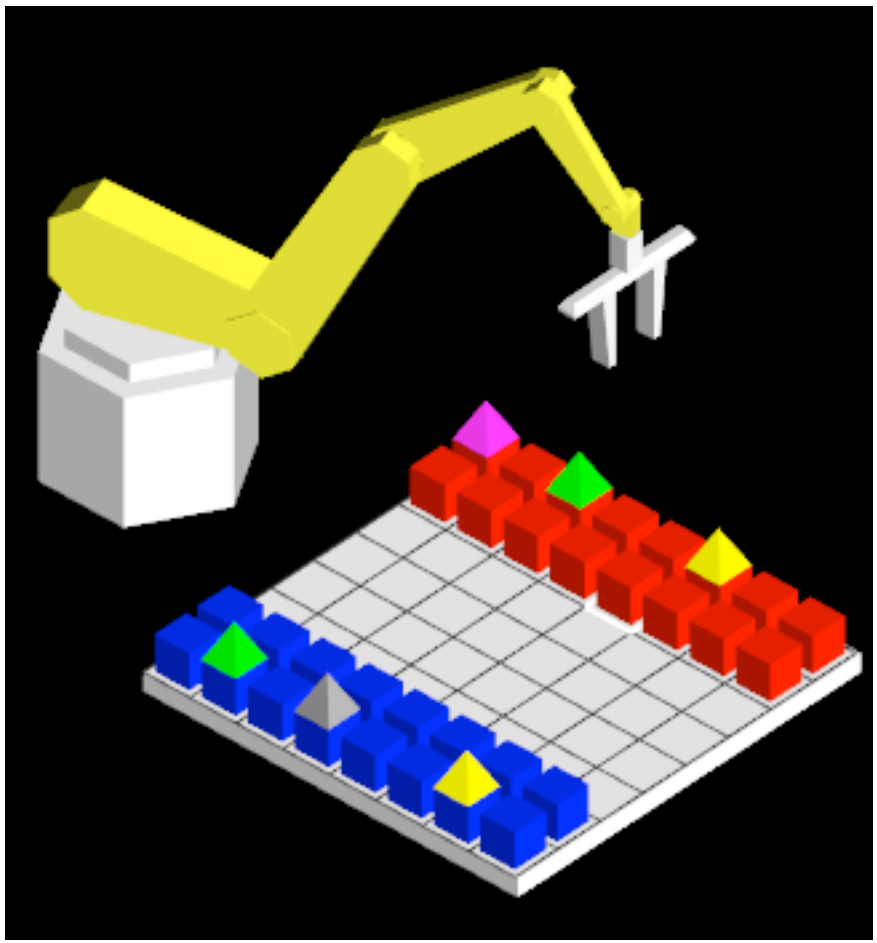

move the pink prism on the left side on the gray prism

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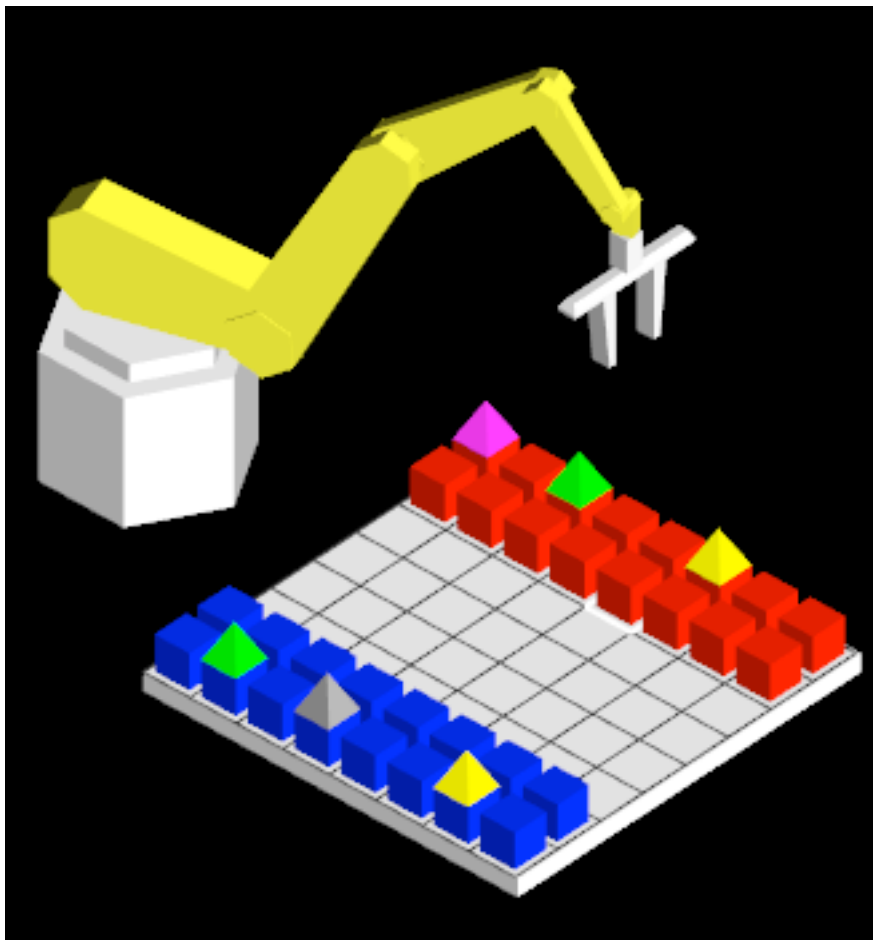
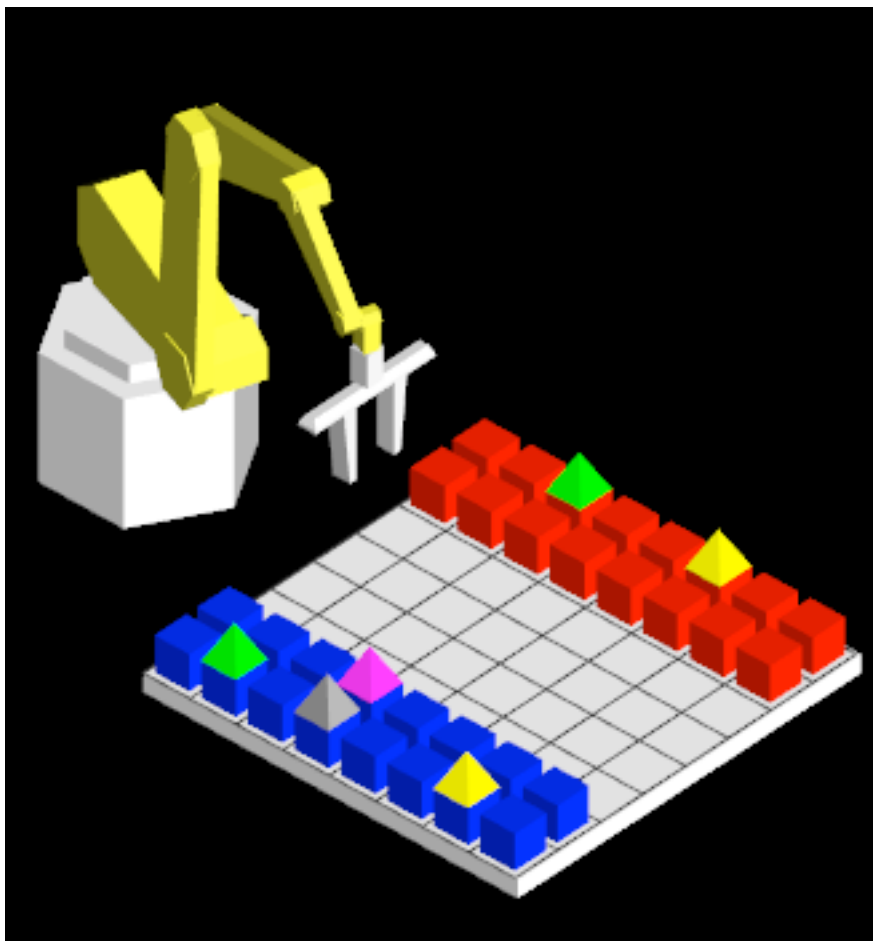


move the pink prism on the left side of the gray prism

Robot Control Language

```
(event:
  (action: move)
  (entity:
    (color: magenta)
    (type: prism))
  (destination:
    (spatial-relation:
      (relation: left)
      (entity:
        (color: gray)
        (type: prism)))))
```



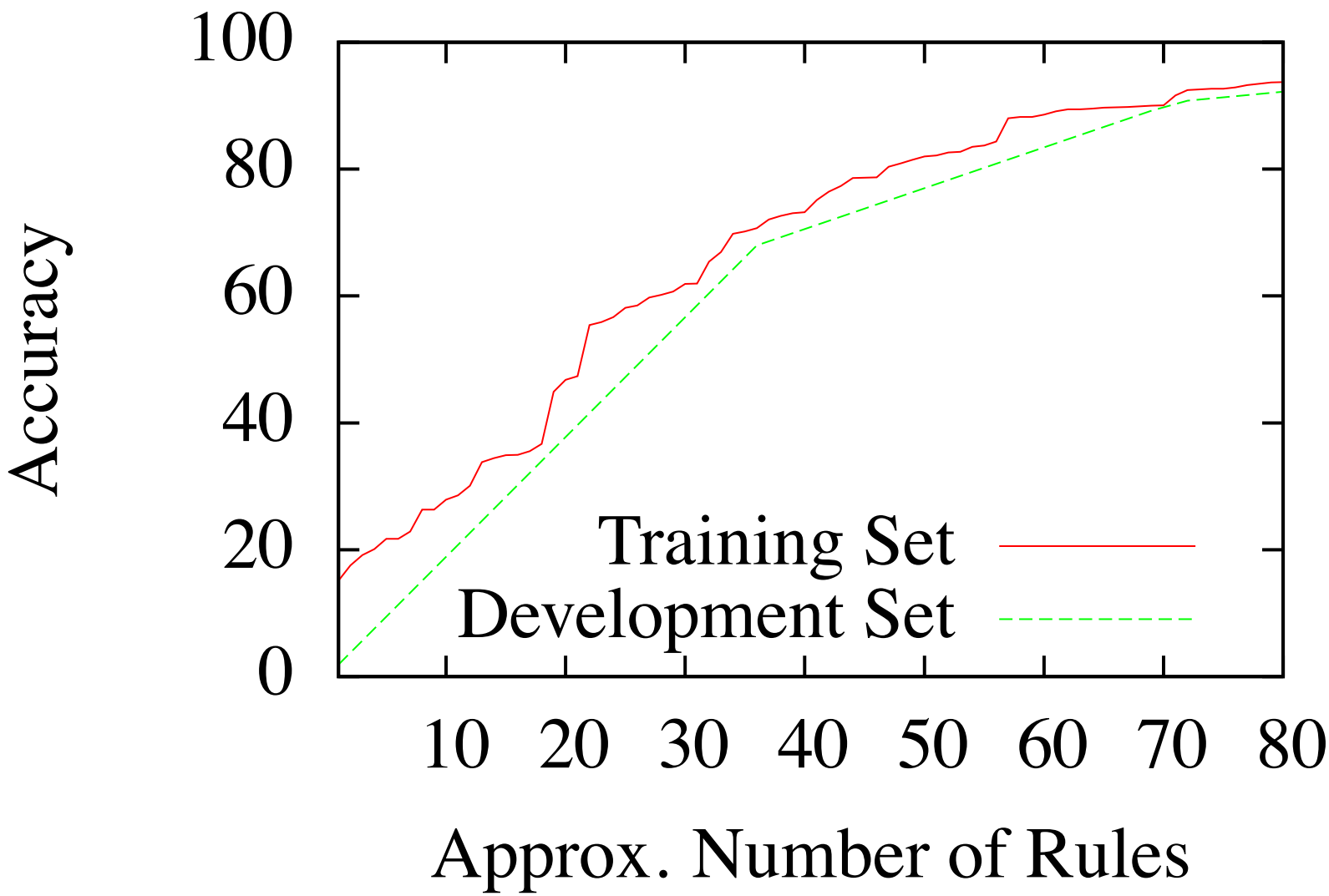
SemEval 2014 Task 6

- Translate NL commands into RCL
- Context-aware spatial planner for validation
- 2500 training examples, 909 held-out
- Tightly controlled problem domain
  - Uncontrolled NL vocabulary,
    but small in practice.
- 6 teams with various methods

UW-MRS entry

- Parse commands with the ERG (with robust bare NP rule and a few extra lexemes)
  - 99% coverage!
- Hand-written rules crawl the MRS, producing RCL
  - Reject some analyses (e.g. move/NN)
- Validate with the planner
- Highest ranked successful translation wins

Refining the rules



Robustness

- Dev data: around 3% no output
- Fall back to Berkeley parser (RCL is not quite PST, but with slight massaging…)
- Held-out data: ERG coverage only 91%!

Results

Exact match

System	Dev		Eval	
	P	R	P	R
MRS-only ($-\mathbf{SP}$)	90.7	88.0	92.1	80.3
MRS-only ($+\mathbf{SP}$)	95.4	92.2	96.1	82.4
Robust-only ($-\mathbf{SP}$)	88.2	88.2	81.5	81.5
Combined ($-\mathbf{SP}$)	90.8	90.8	90.5	90.5
Combined ($+\mathbf{SP}$)	95.0	95.0	92.5	92.5
ERG coverage		98.6		91.0

(P/R: MRS-only can produce no output sometimes)

Results

… and it won (by a lot)!

Team	Approach	Score
UW	Rule-based + Statistical back-off	92.50
AT&T	Statistical	87.35
Groningen	CCG	86.80
Gothenburg	Hand-built DCG	86.10
KU Leuven	CCG	71.29
UWM	Statistical	45.98

Thank you!