

Plan merging within the asprilo framework

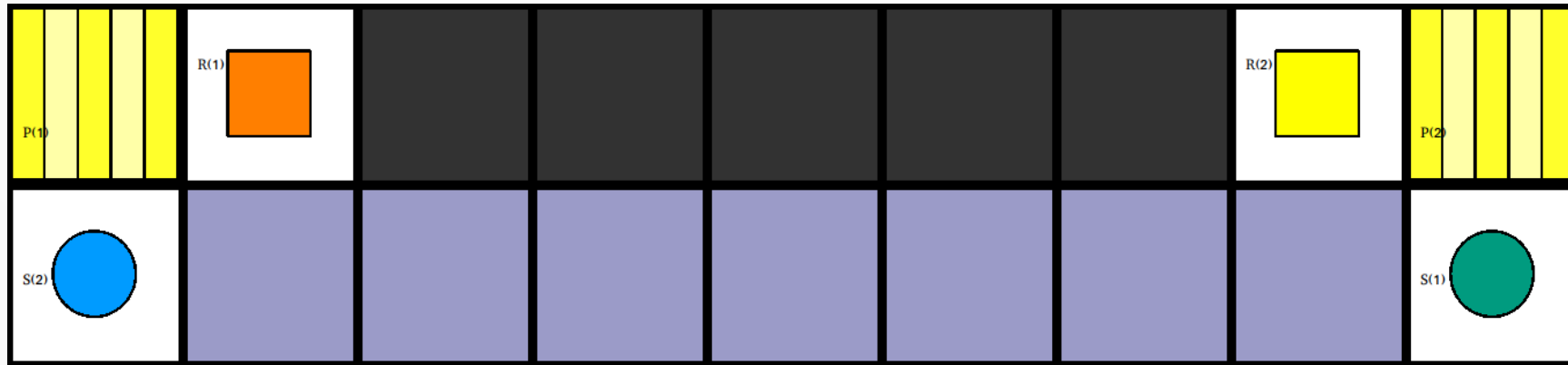
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Introduction

- Multi-Agent Path Finding
- asprilo framework

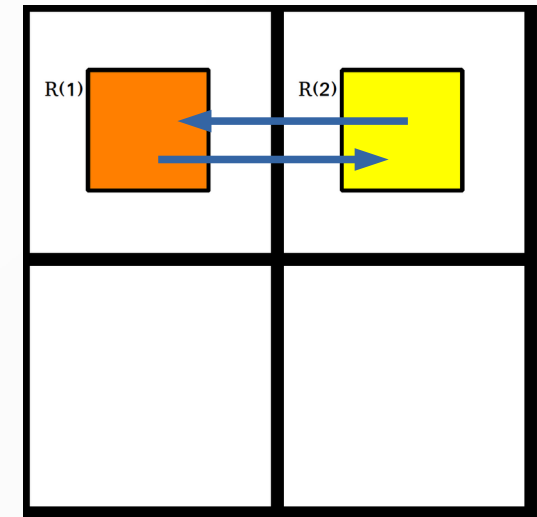
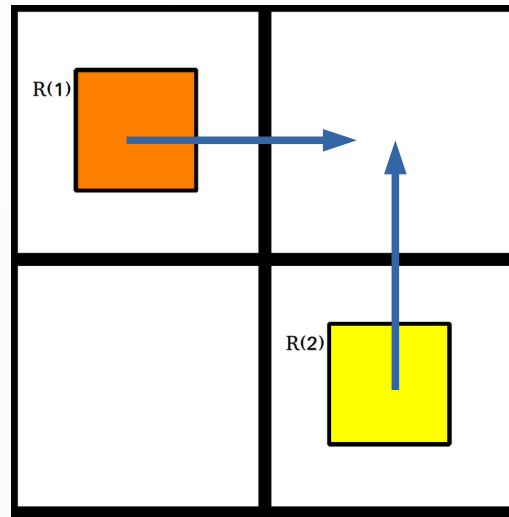
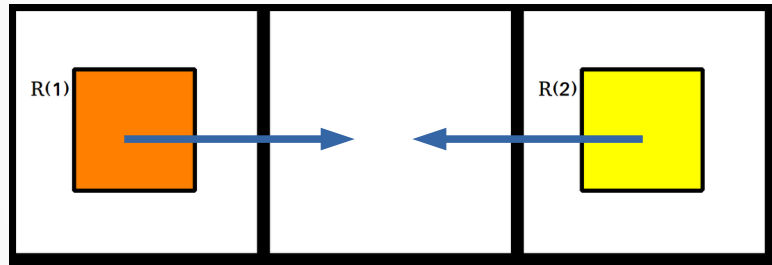


Plan merging approach

- Classification approach
 - Detect collisions
 - Classify collisions by recognizing patterns
 - Solve collisions
 - Adopt plans of robot accordingly

Plan merging approach

- Classification approach



Plan merging approach

- Random movement approach
 - Detect collisions
 - Generate robot movement to solve collision
 - Minimize generated movement
 - Adopt plans of robots accordingly

Random movement approach

- Checkpointing

checkpoint(C,robot(R),2) :- position_im(robot(R),C,T'), first_collision(T),
max_range(T',robot(R)), $T'-T < 4$.

checkpoint(C,robot(R),1) :- position_im(robot(R),C,T+1), first_collision(T),
max_range(T',robot(R)), $T'-T \geq 4$.

Random movement approach

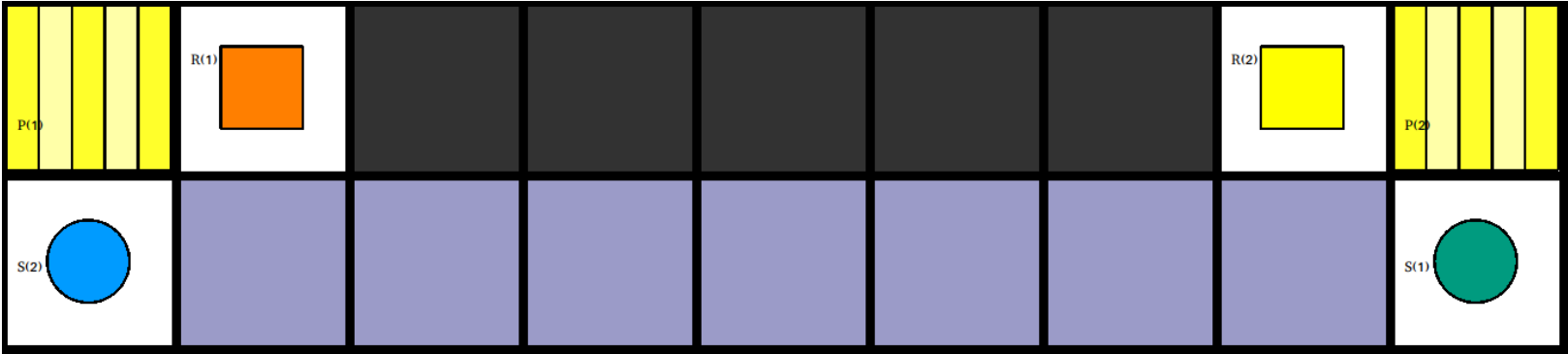
- Movement generation and minimization

```
{ random_move(robot(R),D,T) : direction(D) } :-  
    random_time(T), isRobot(robot(R)),  
    first_collision(T'), T >= T'.
```

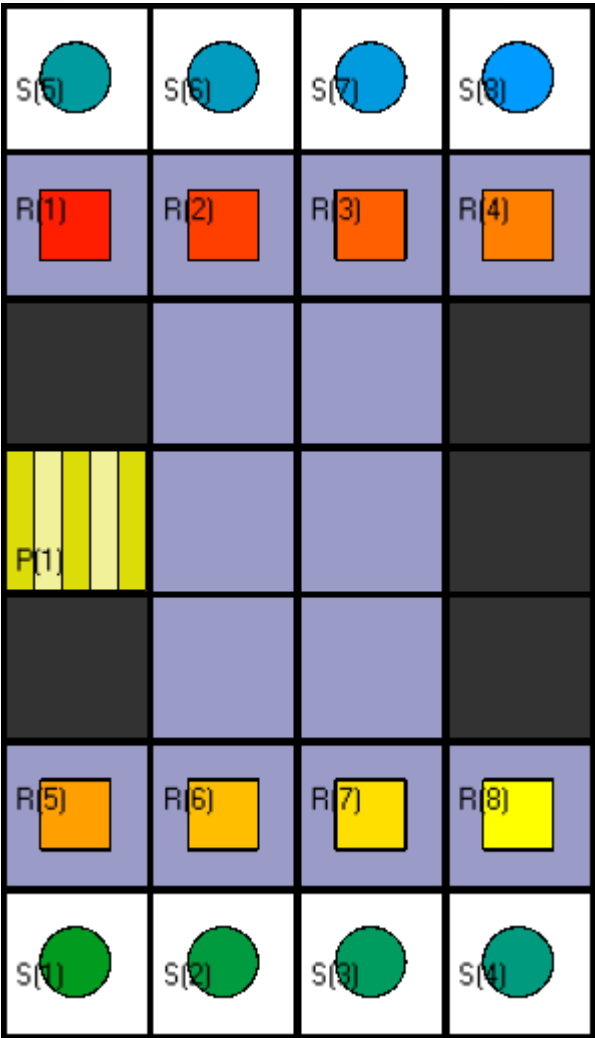
```
steps(S,robot(R)) :- random_position(robot(R),C,T), checkpoint(C,robot(R),_),  
    first_collision(T'), S=T-(T'-1).  
#minimize {S: steps(S,_) }.
```


Benchmark results

Group 1	Group 2	Group 3	Group 4	Group 5
0.034s	0.268s	3.420s	0.048s	0.470s



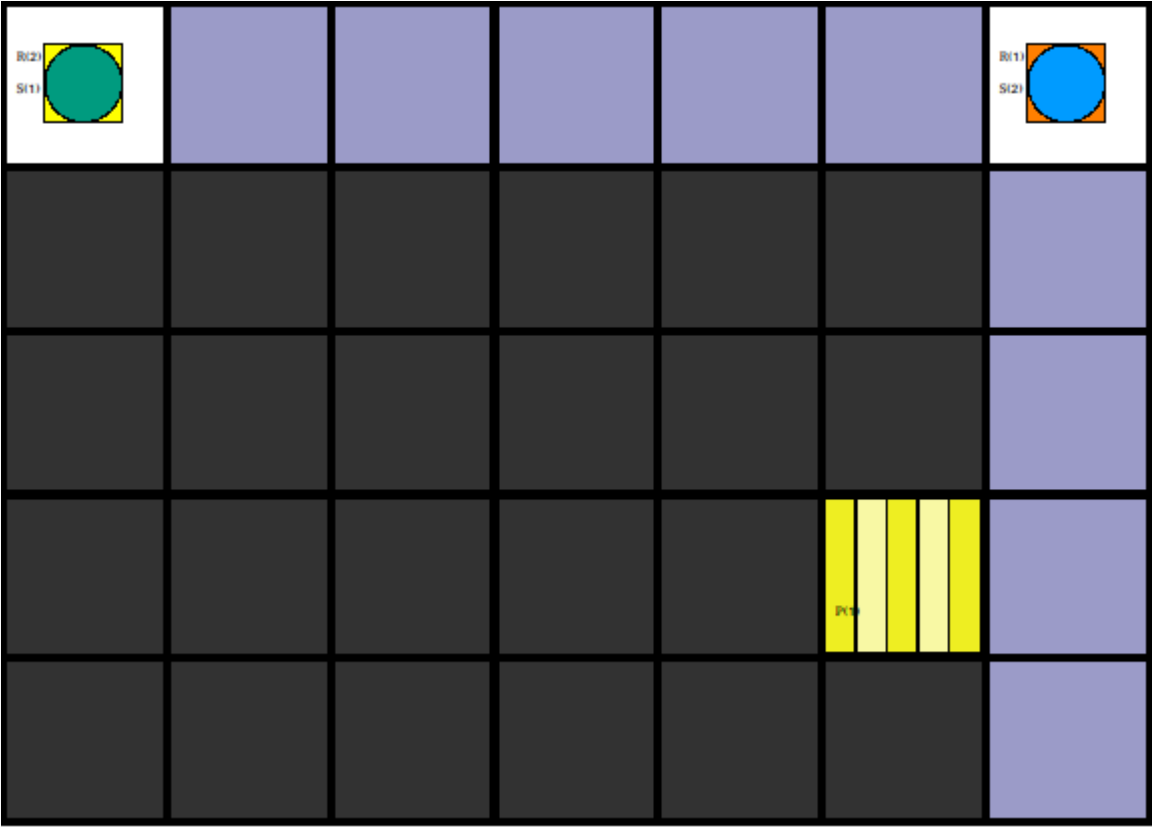
Benchmark results



Group 1	Group 2	Group 3	Group 4	Group 5
0.115s	1.530s	Killed	0.424s	303.478s

Benchmark results

Group 1	Group 2	Group 3	Group 4	Group 5
0.233s	Unsatisfiable	Unsatisfiable	0.256s	Unsatisfiable



Conclusion

- Shows clear potential with little optimization
- Competitive benchmark results
- Practical weaknesses
- Theoretical weaknesses
- Room for further improvement

References

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