
Quantitative Reductions and Vertex-Ranked Games

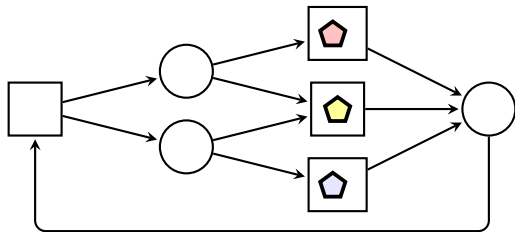
Alexander Weinert




Saarland University

September 13th, 2017

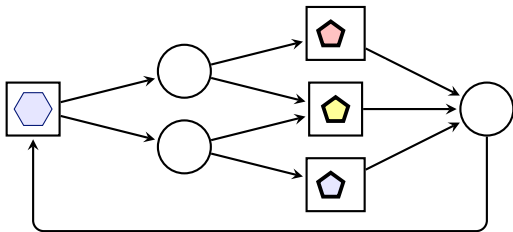
Highlights 2017 - London




Reachability Games



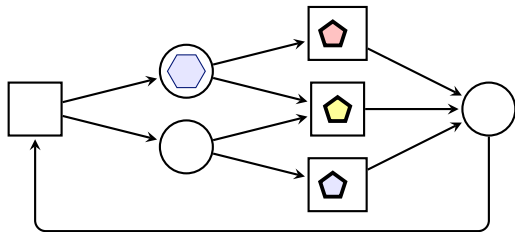
Winning condition: Play reaches either  or  or 




Reachability Games



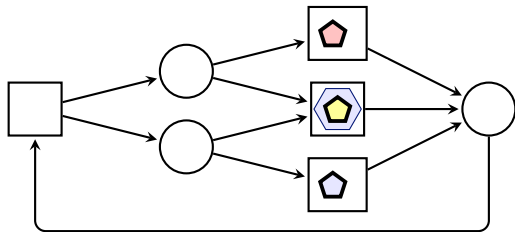
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Reachability Games



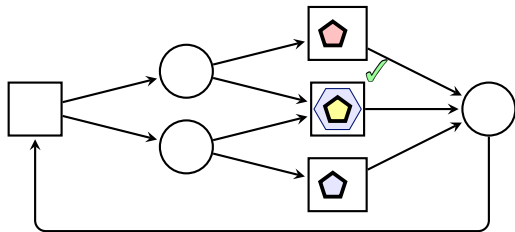
Winning condition: Play reaches either  or  or 




Reachability Games



Winning condition: Play reaches either  or  or 

Reachability Games



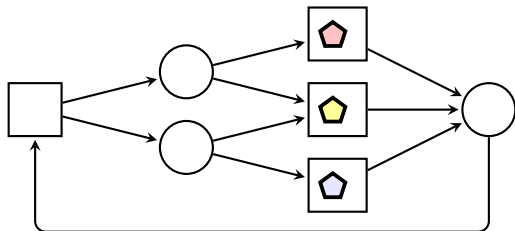
Winning condition: Play reaches either  or  or 

The Big Picture

Reachability

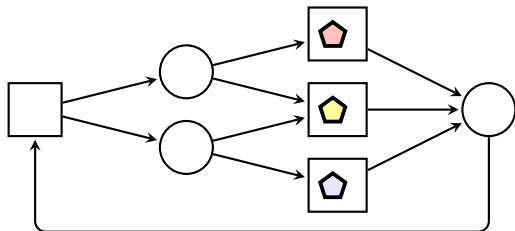


Generalized Reachability: The Problem



Winning condition:

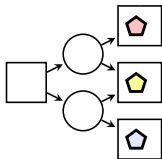
Generalized Reachability: The Problem



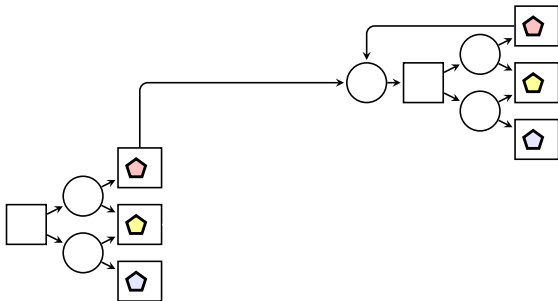
Winning condition:

Reach one from $\{\text{red pentagon}, \text{yellow pentagon}\}$ and one from $\{\text{yellow pentagon}, \text{blue pentagon}\}$.

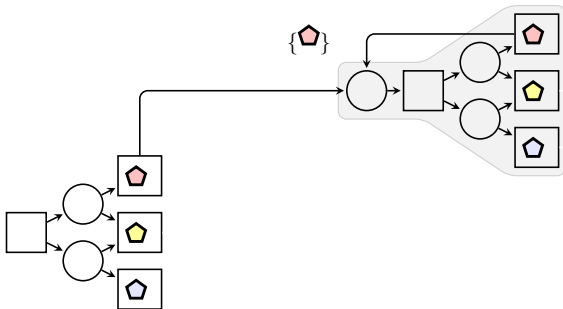
Generalized Reachability: One Solution



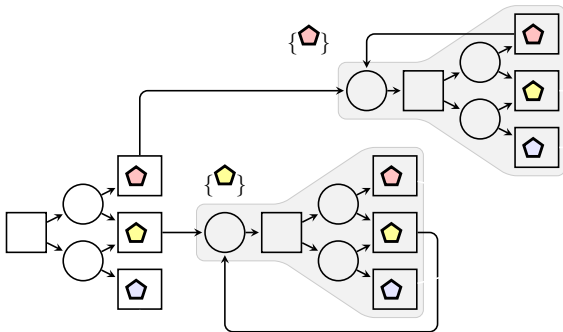
Generalized Reachability: One Solution



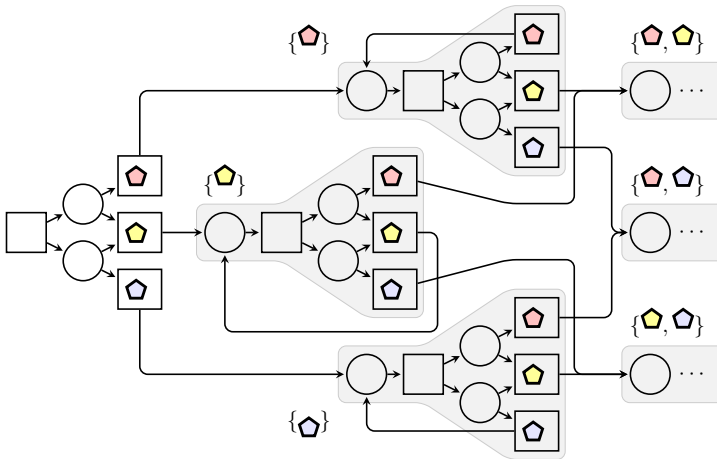
Generalized Reachability: One Solution



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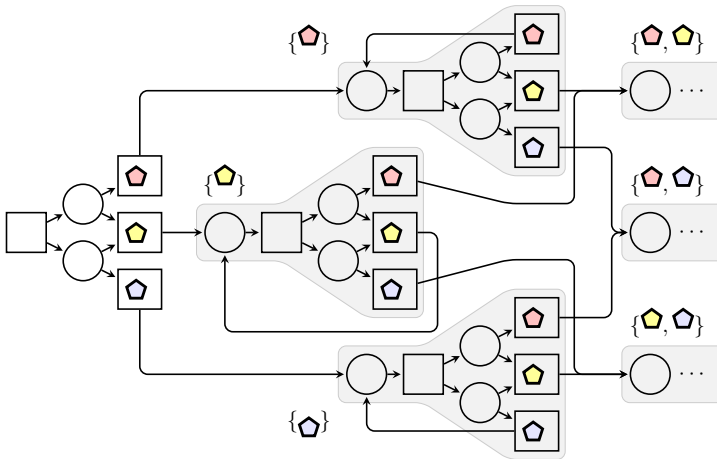


Generalized Reachability: One Solution



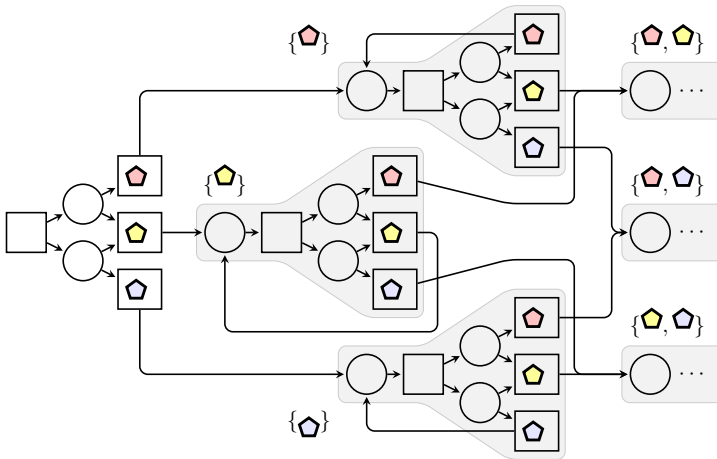
Winning condition:

Generalized Reachability: One Solution



Winning condition: Reach some memory state S with
 $S \cap \{\text{red pentagon}, \text{yellow pentagon}\} \neq \emptyset$ and with $S \cap \{\text{yellow pentagon}, \text{blue pentagon}\} \neq \emptyset$

Generalized Reachability: One Solution



Winning condition: Reach some memory state S with
 $S \cap \{\text{red}, \text{yellow}\} \neq \emptyset$ and with $S \cap \{\text{yellow}, \text{blue}\} \neq \emptyset$

Reachability Condition

The Big Picture

Reachability



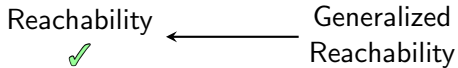
The Big Picture

Reachability



Generalized
Reachability

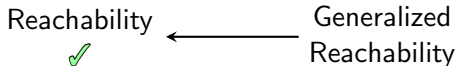
The Big Picture



The Big Picture

Quantitative

Qualitative

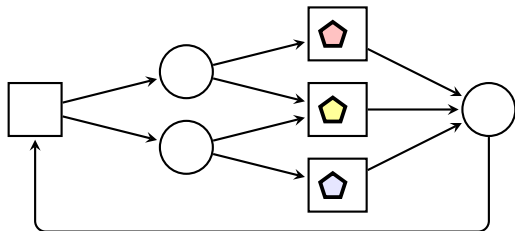


Quantitative Generalized Reachability

Assign cost to each play.

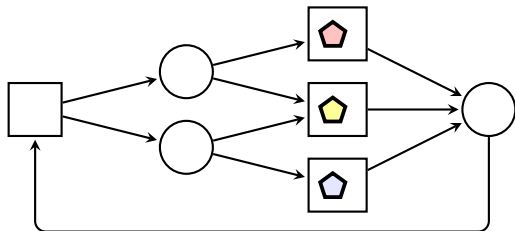
Quantitative Generalized Reachability

Assign cost to each play.



Quantitative Generalized Reachability

Assign cost to each play.



$$\text{Cst}(\rho) = \begin{cases} 0 & \text{if } \{\text{red pentagon}, \text{yellow pentagon}\} \text{ and } \{\text{yellow pentagon}, \text{purple pentagon}\} \text{ are visited} \\ 1 & \text{if one of them is visited} \\ 2 & \text{if neither is visited} \end{cases}$$

The Big Picture

Quantitative
Generalized
Reachability

Quantitative

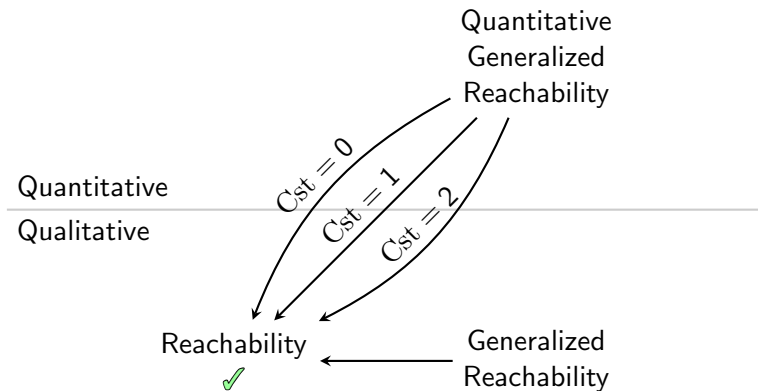
Qualitative

Reachability

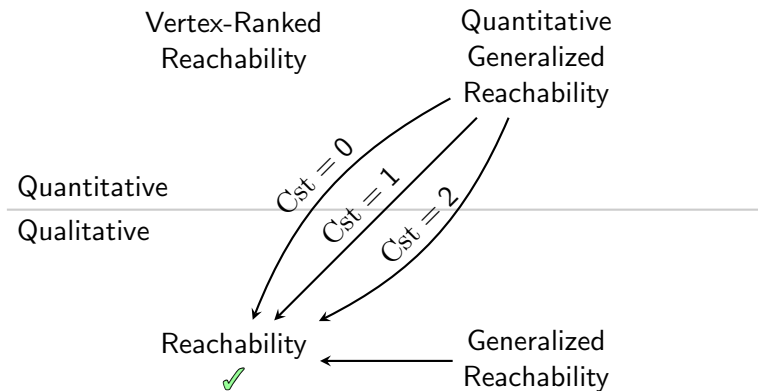


Generalized
Reachability

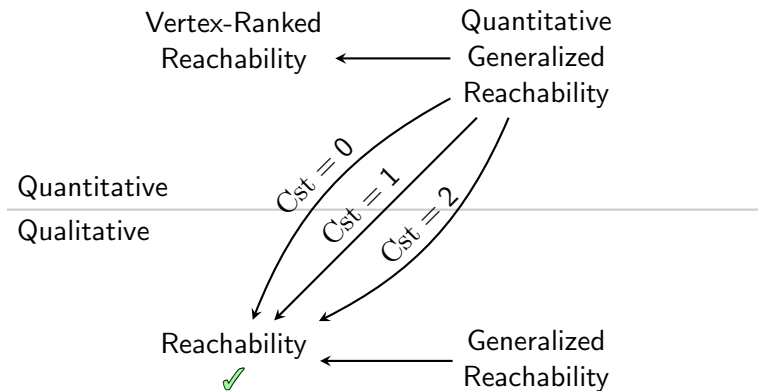
The Big Picture



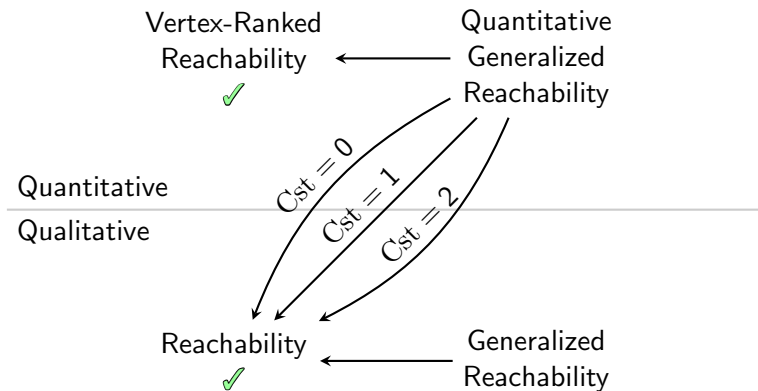
The Big Picture



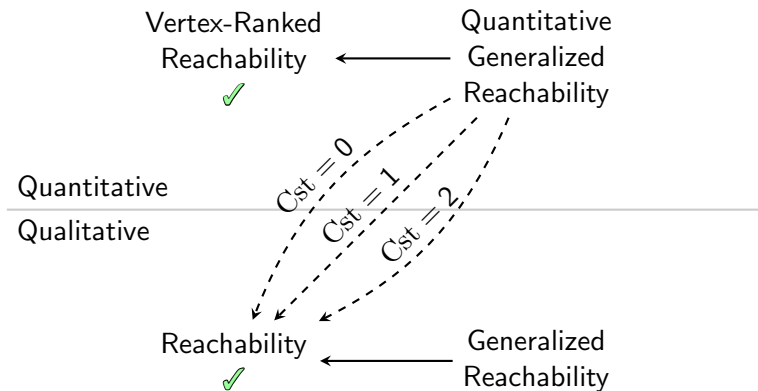
The Big Picture



The Big Picture



The Big Picture



Conclusion

Contribution

- Lifted reductions to quantitative games

Conclusion

Contribution

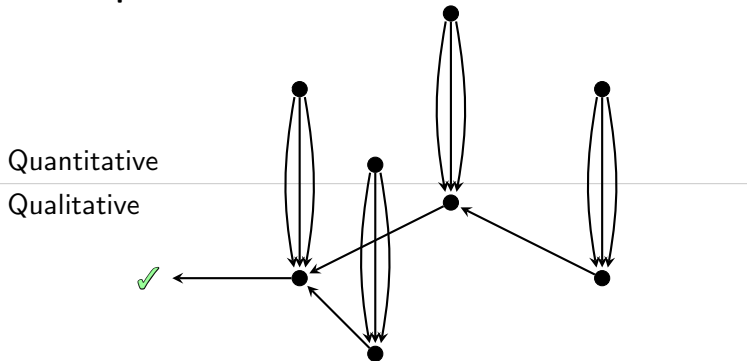
- Lifted reductions to quantitative games
- Solved wide range of general-purpose quantitative games

Conclusion

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Next Steps

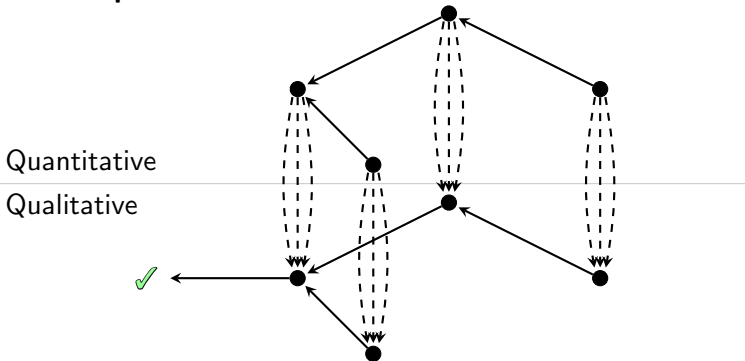


Conclusion

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Next Steps



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Next Steps

