



ITERATIVE JUDGMENT AGGREGATION

MARIJA SLAVKOVİK & WOJCIECH JAMROGA

University of Bergen, Norway & Polish Academy of Sciences

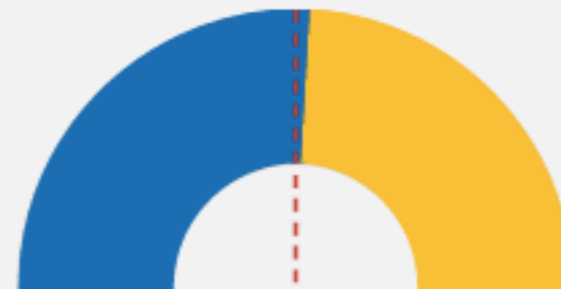
Voting

Voting



Results in full >

Leave
51.9%
17,410,742 VOTES



Remain
48.1%
16,141,241 VOTES

LATEST

Pound drops to lowest levels since 1985.

|| < 2/2 >

Judgment aggregation

$$(\varphi_1 \wedge \varphi_2 \wedge \varphi_3) \leftrightarrow r$$

free movement (φ_1) subsidies (φ_2) benefits (φ_3) | remain (r)

Judgment aggregation

$$(\varphi_1 \wedge \varphi_2 \wedge \varphi_3) \leftrightarrow r$$

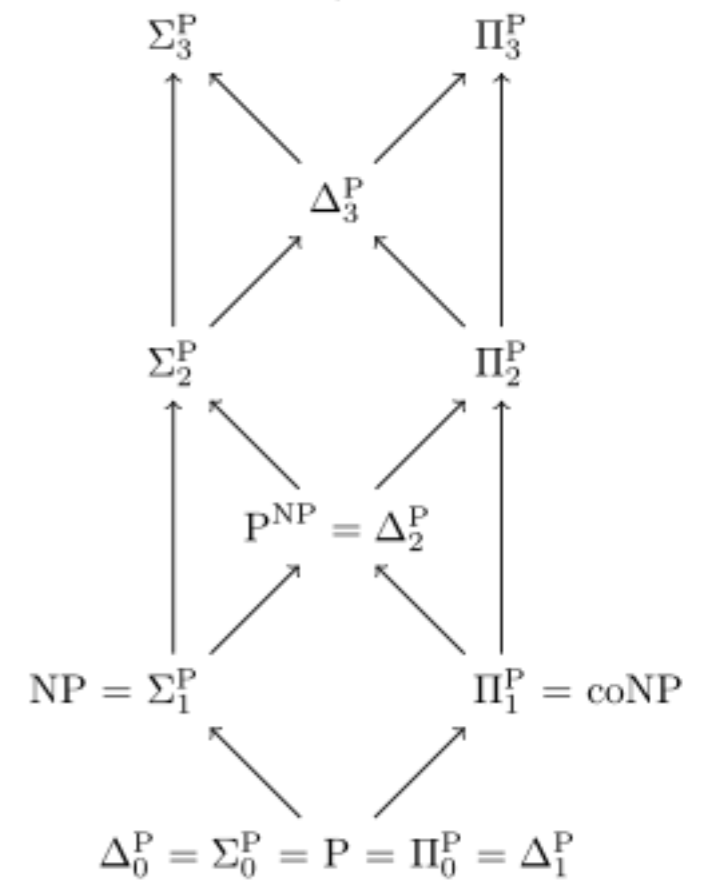
Voters	free movement (φ_1)	subsidies (φ_2)	benefits (φ_3)	remain (r)
32%	yes	yes	no	no
39%	yes	no	yes	no
10%	no	no	no	no
19%	no	yes	yes	no
Majority	yes	yes	yes	no

Judgment aggregation

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winner 1	yes	no	yes	no
winner 2	yes	yes	yes	yes

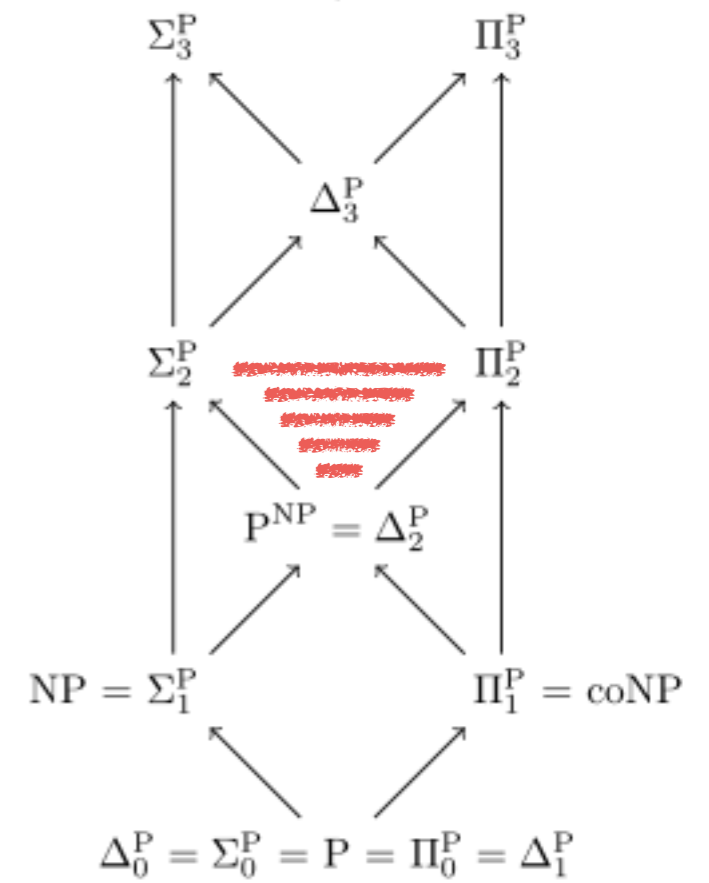
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Judgment aggregation

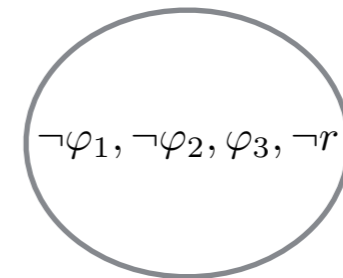
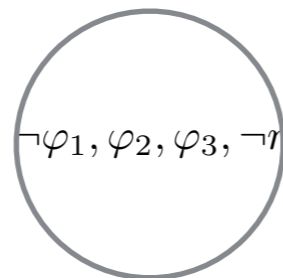
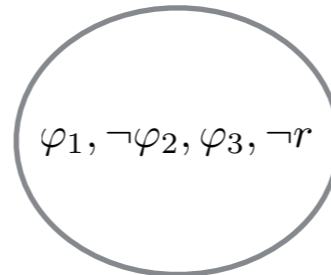
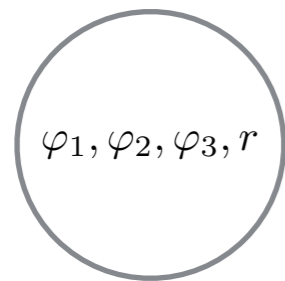


$$(\varphi_1 \wedge \varphi_2 \wedge \varphi_3) \leftrightarrow r$$

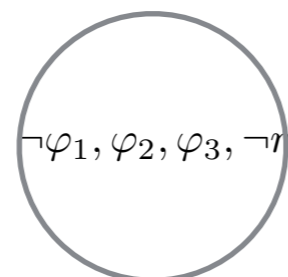
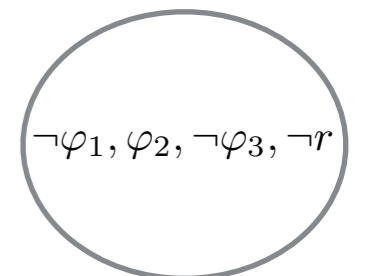
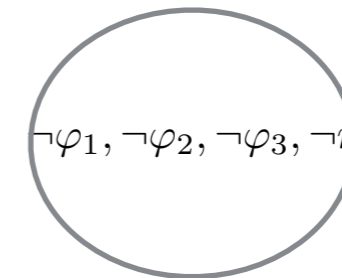
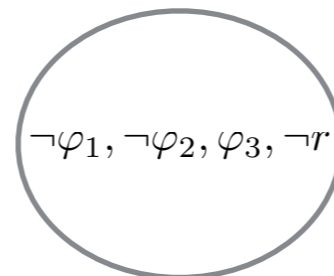
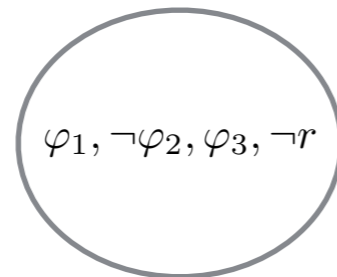
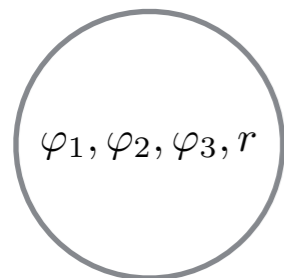
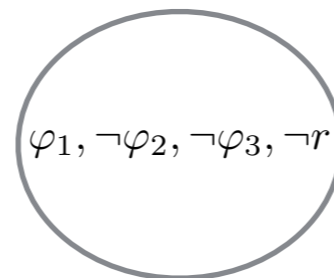
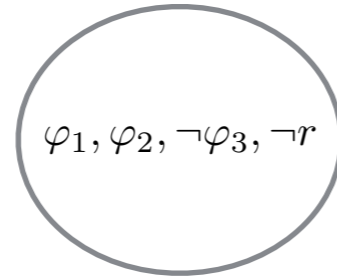
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Creating room for compromise

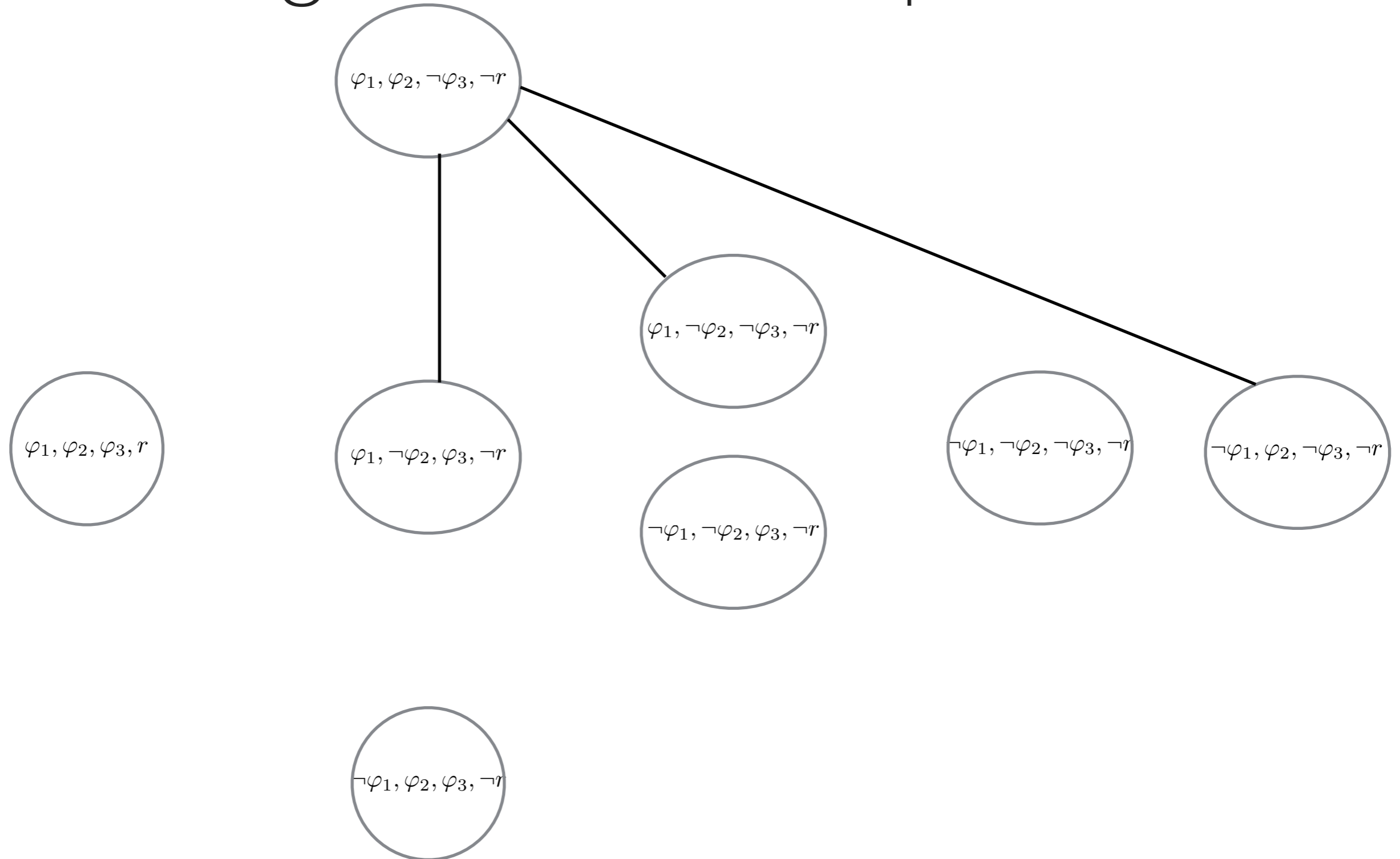
Creating room for compromise



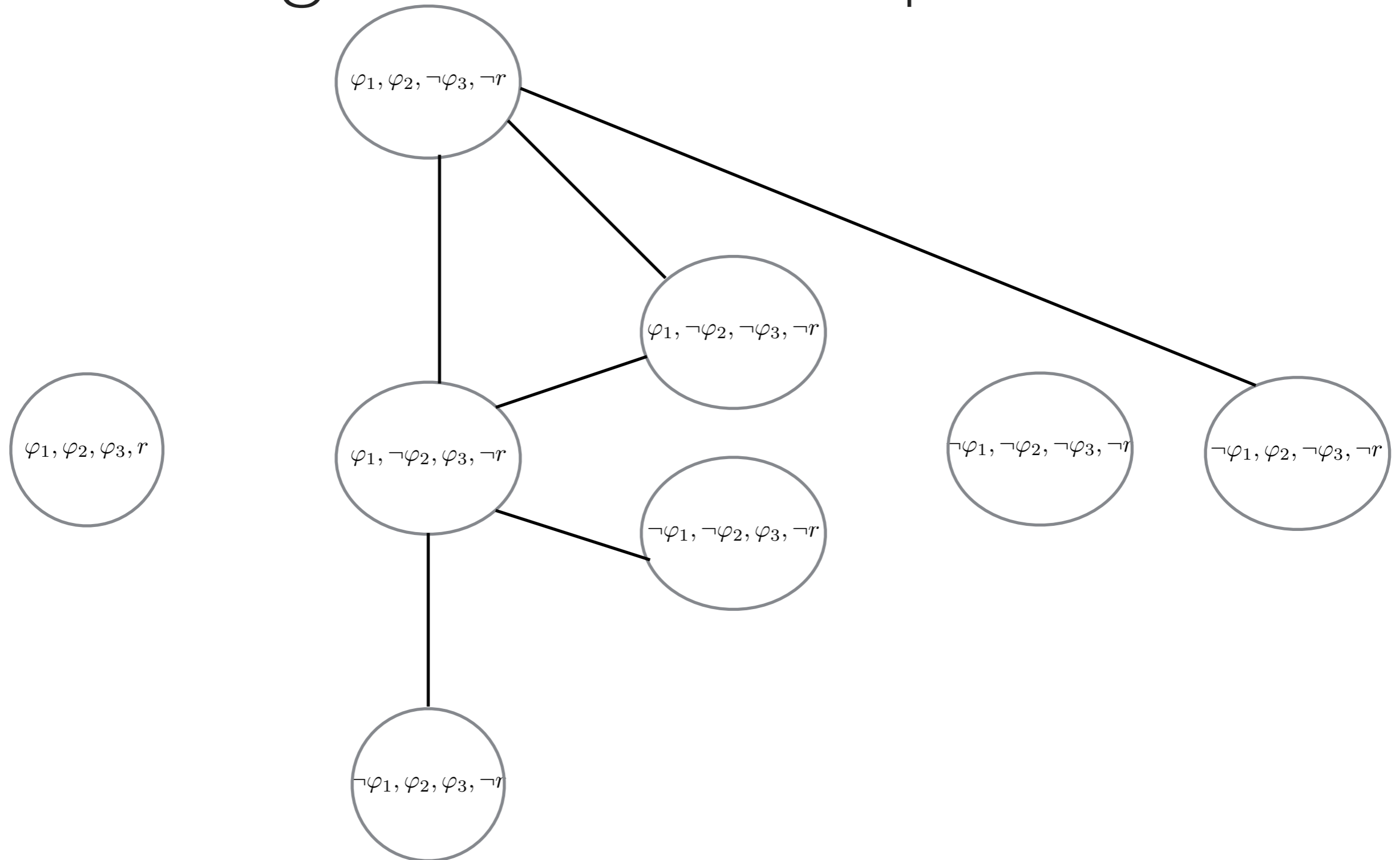
Creating room for compromise



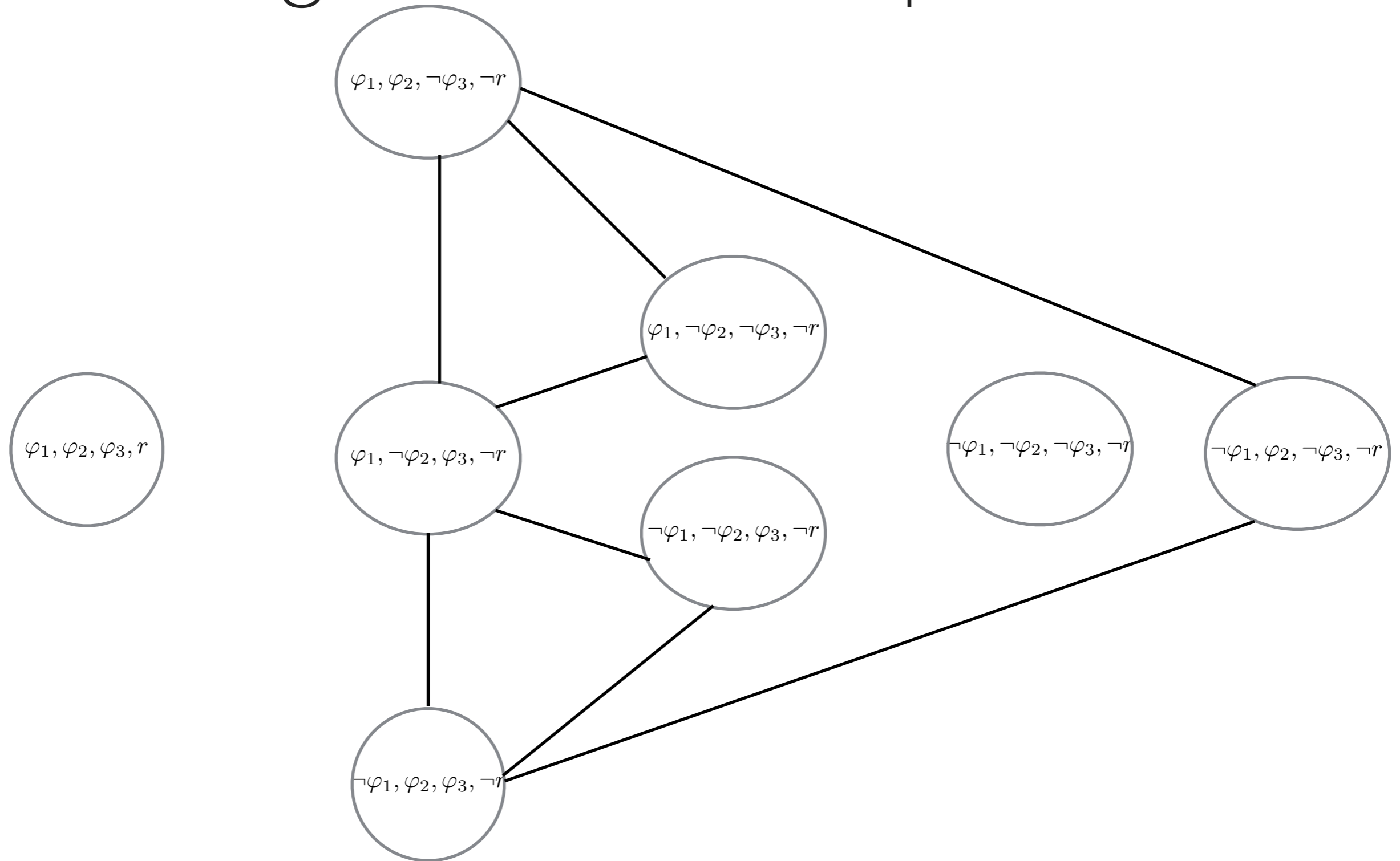
Creating room for compromise



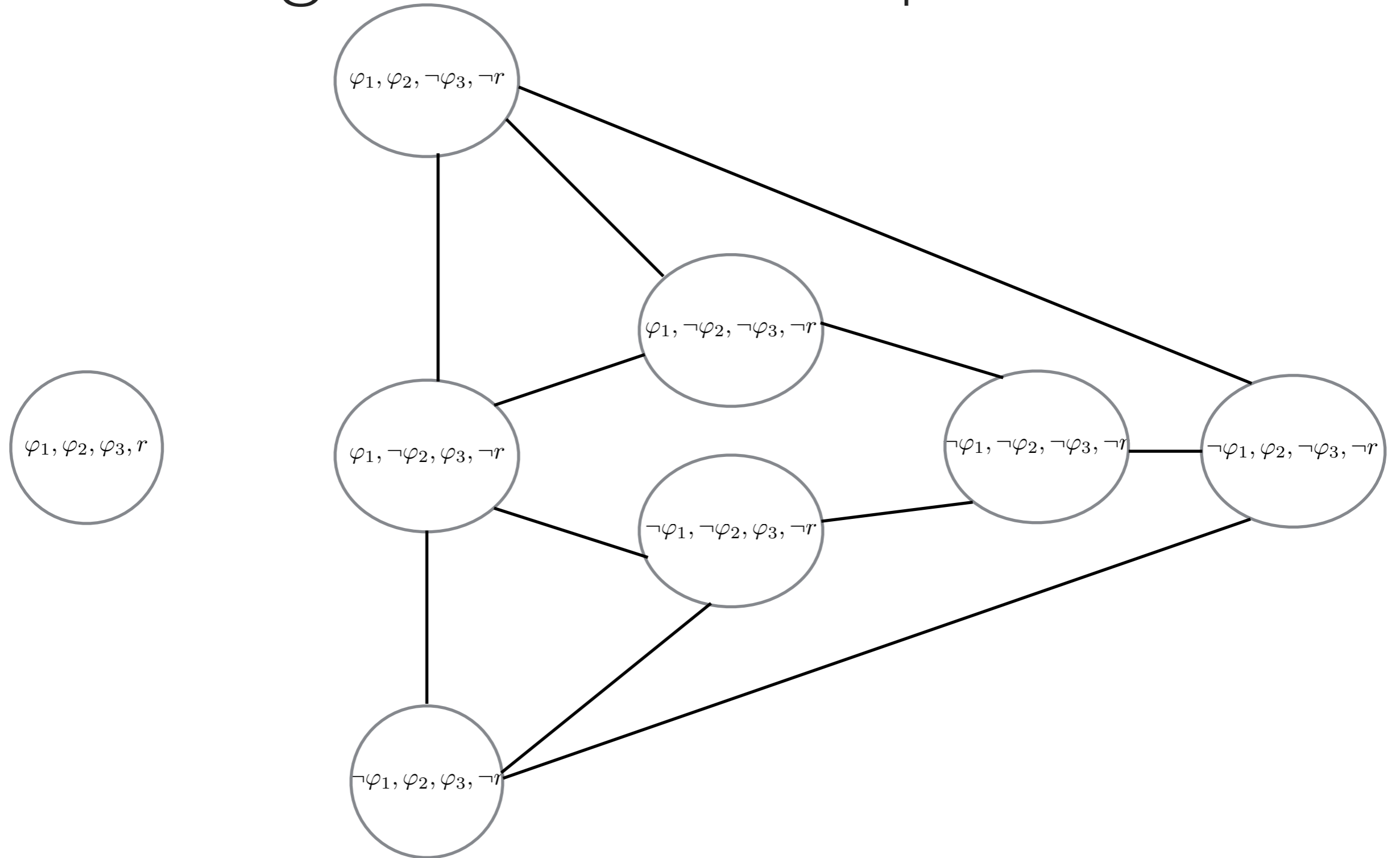
Creating room for compromise



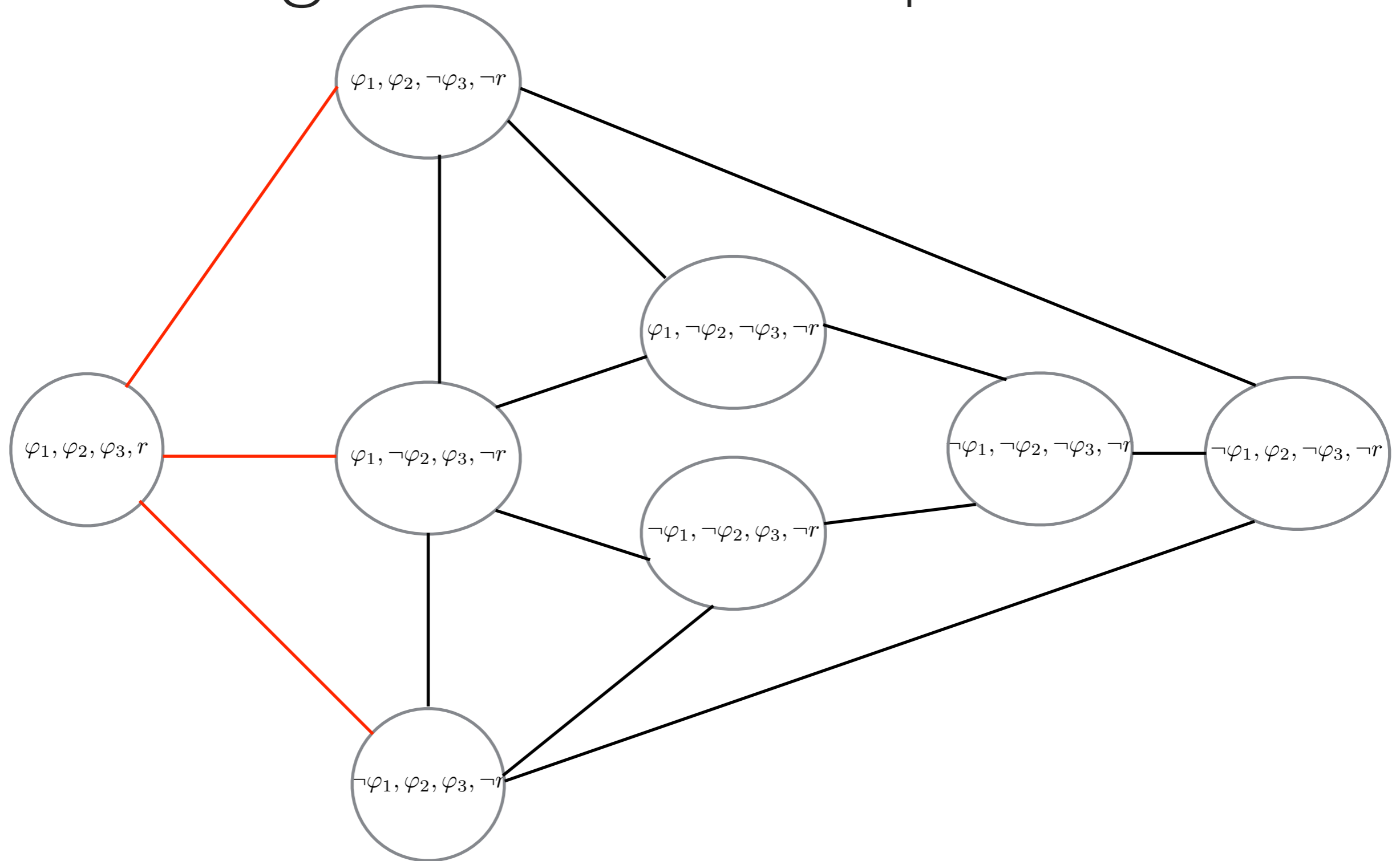
Creating room for compromise



Creating room for compromise

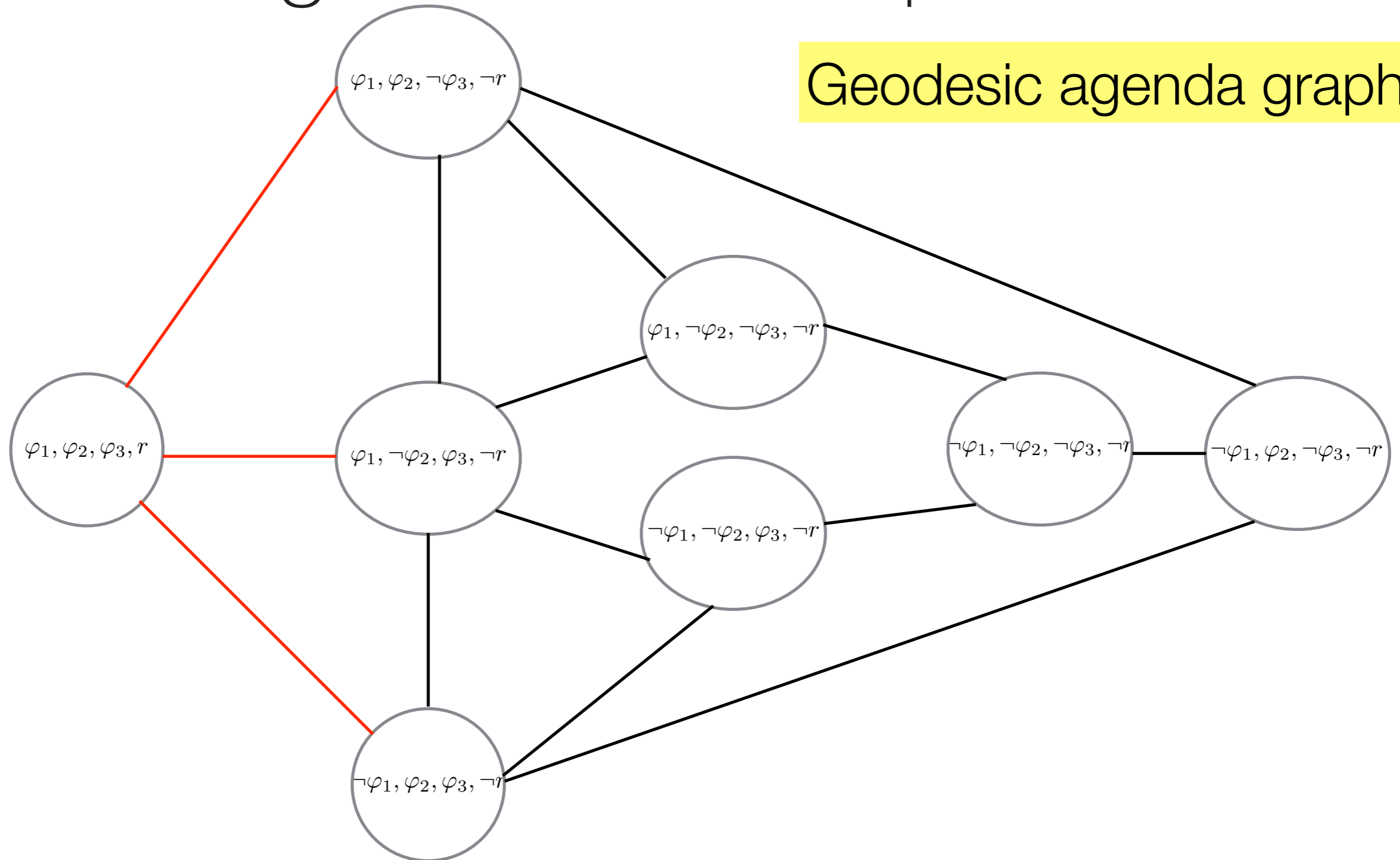


Creating room for compromise

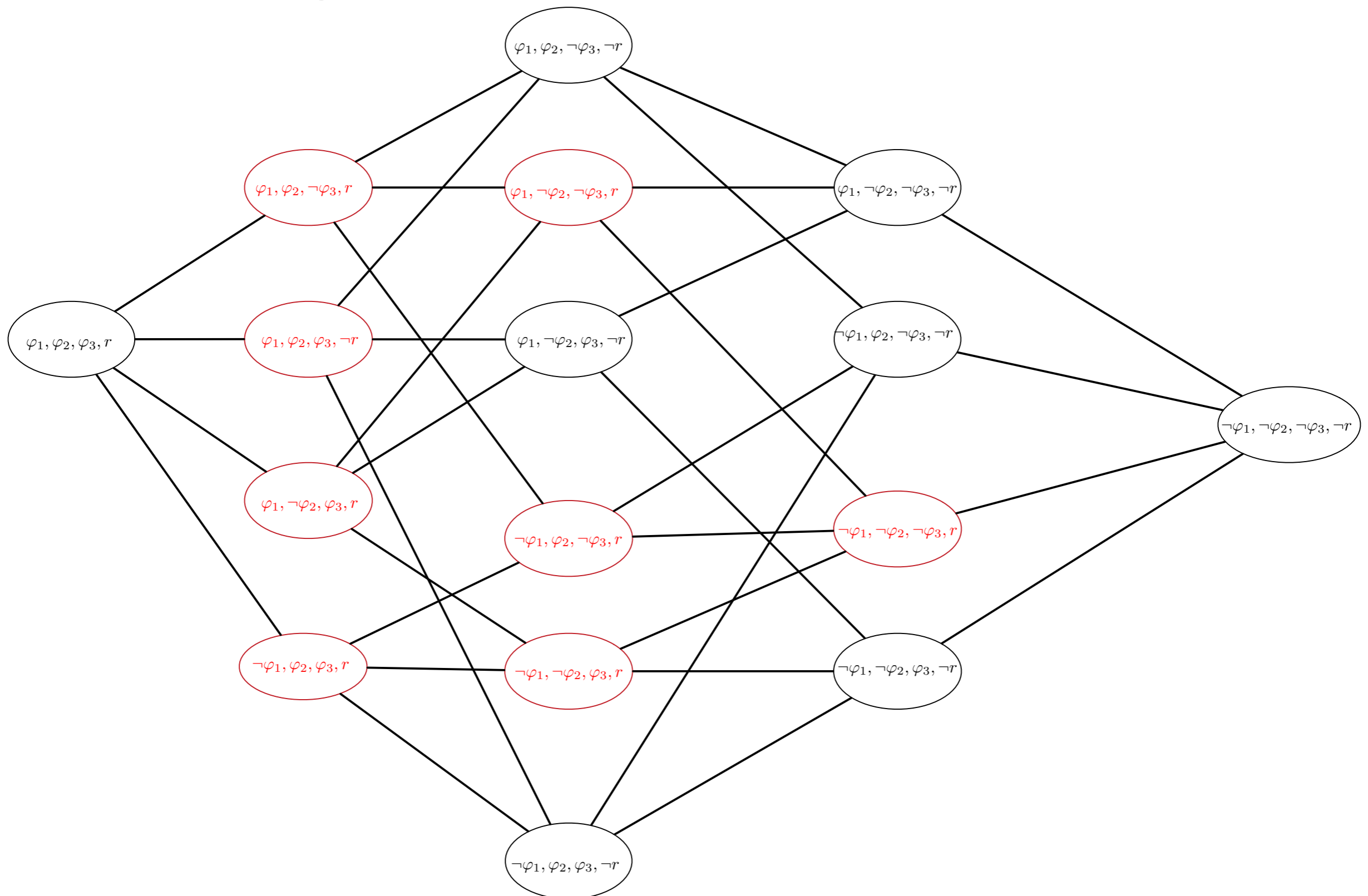


Creating room for compromise

Geodesic agenda graph

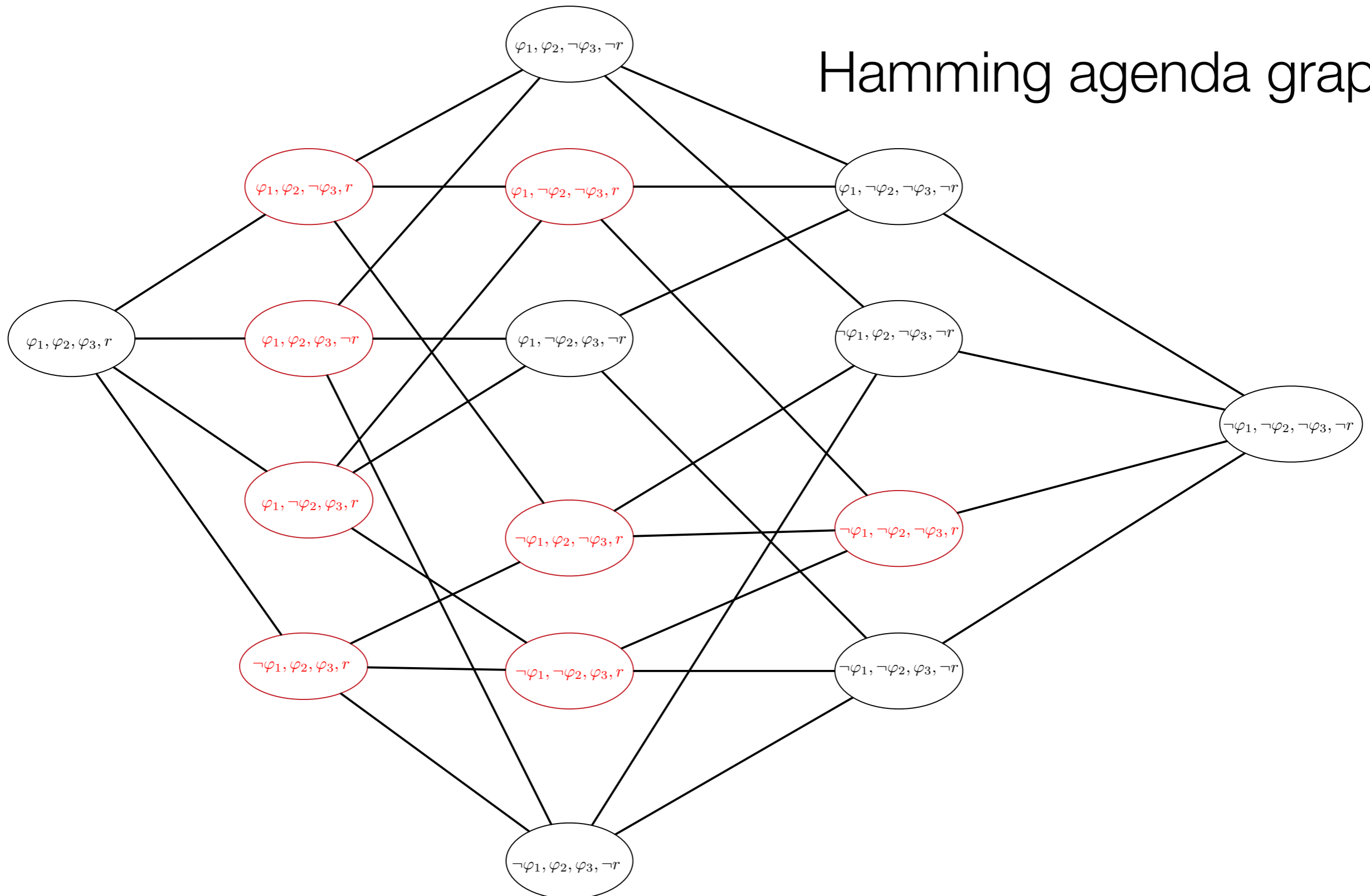


Creating room for compromise

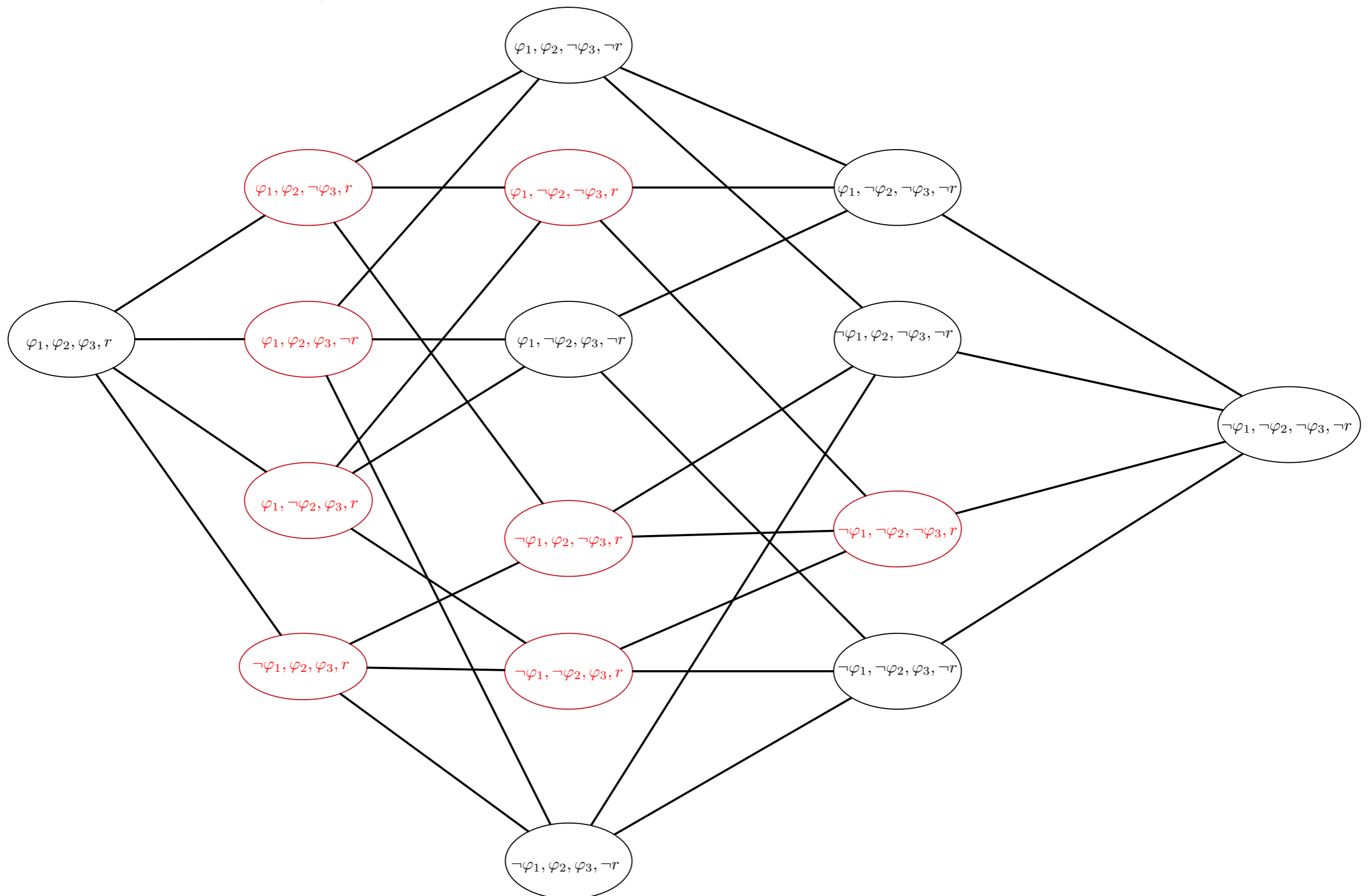


Creating room for compromise

Hamming agenda graph



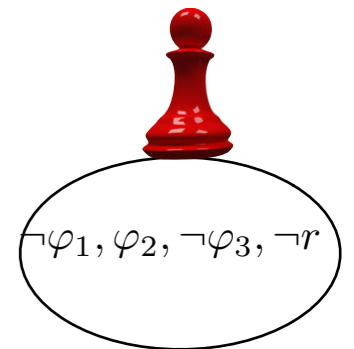
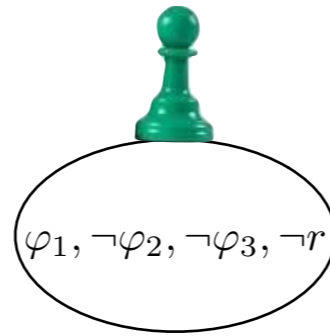
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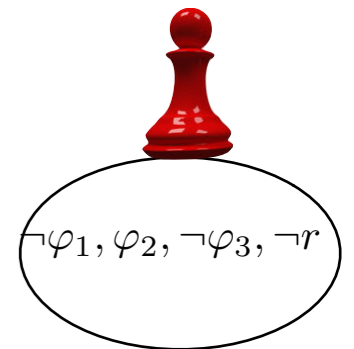
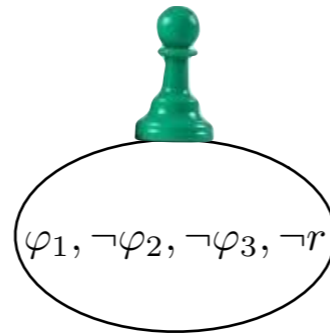
The algorithm



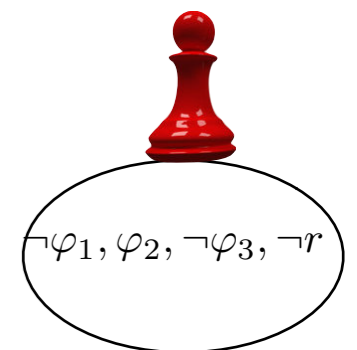
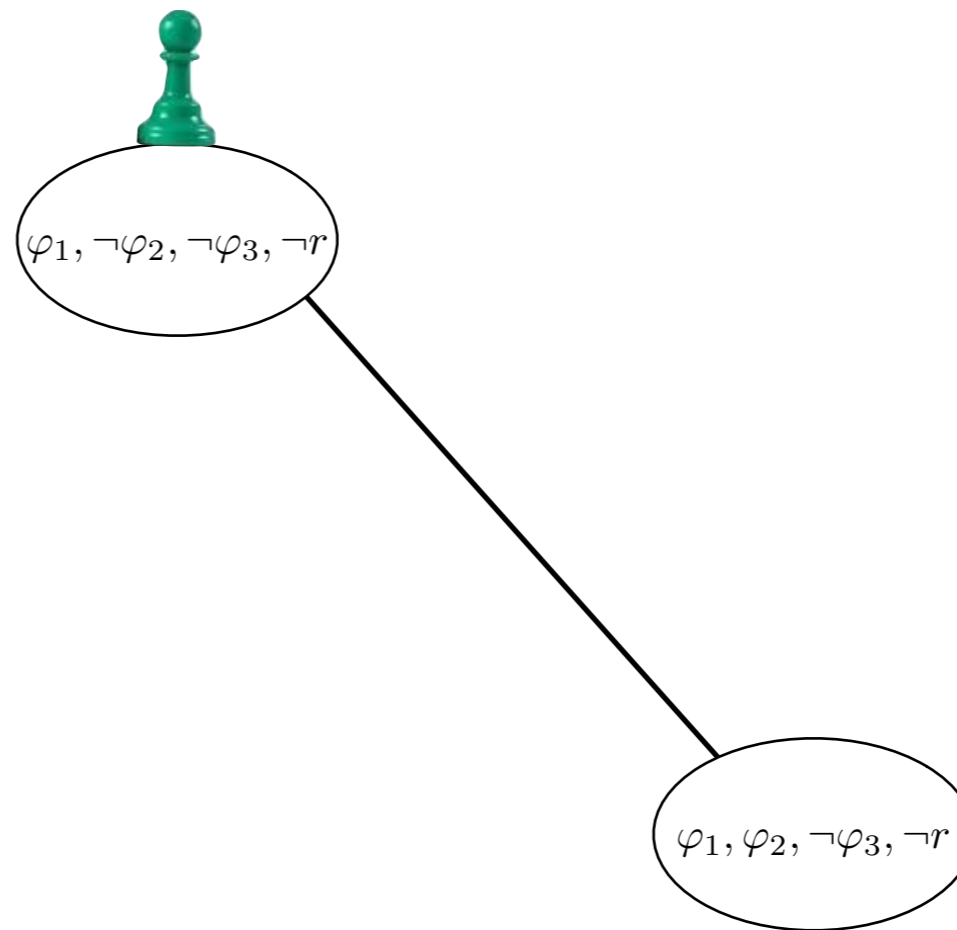
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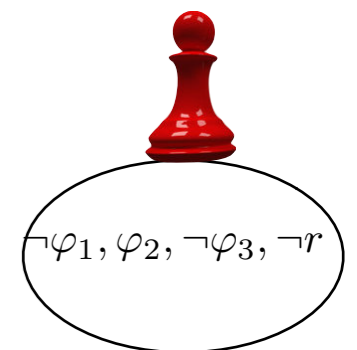
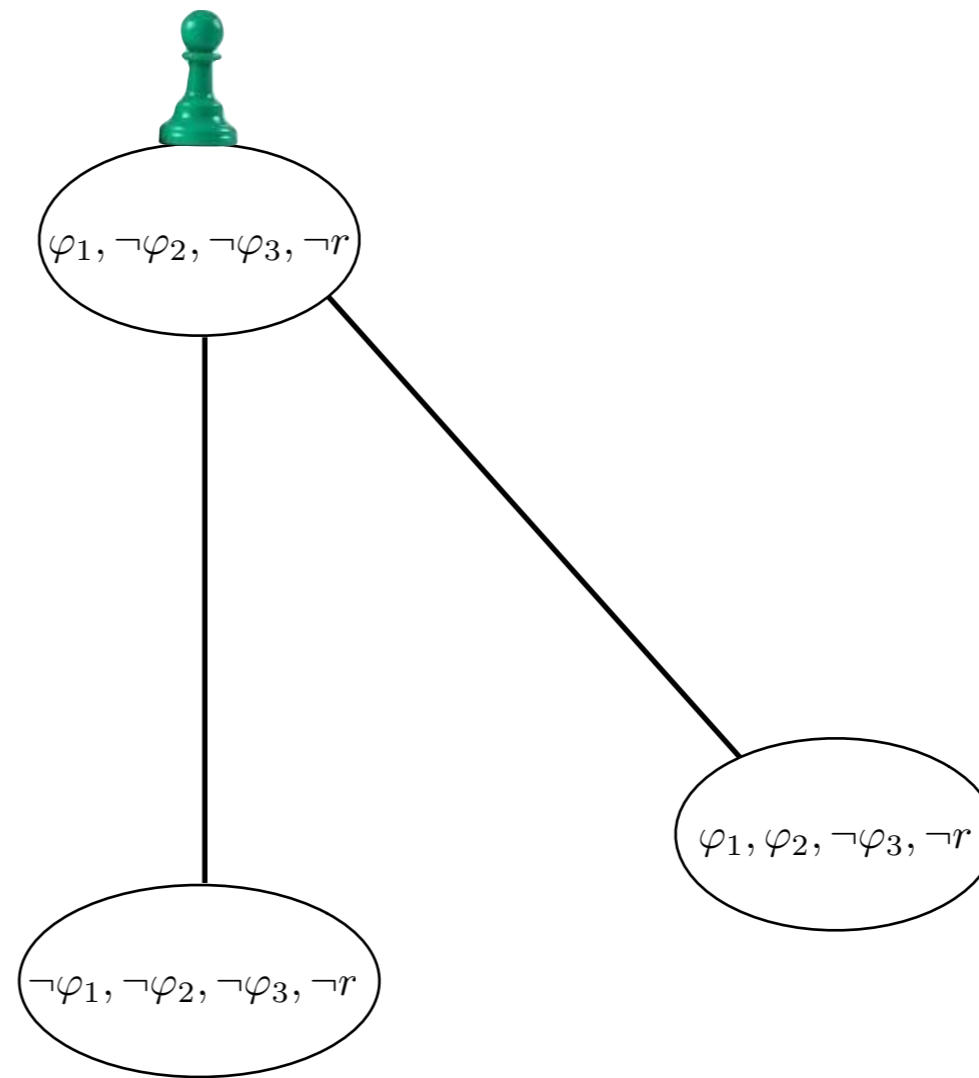
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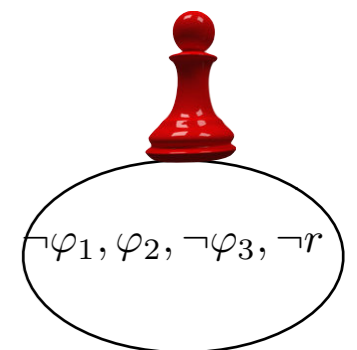
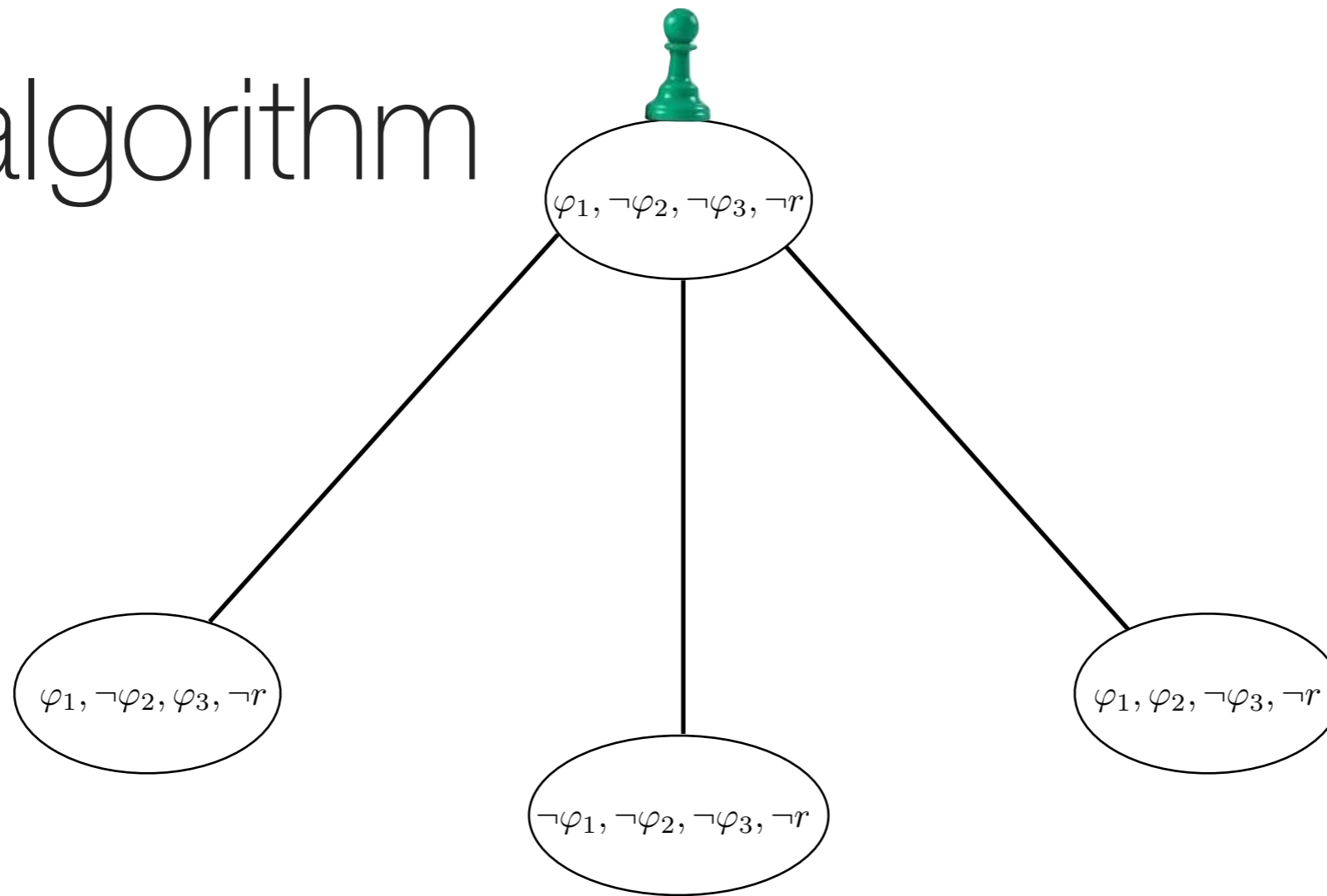
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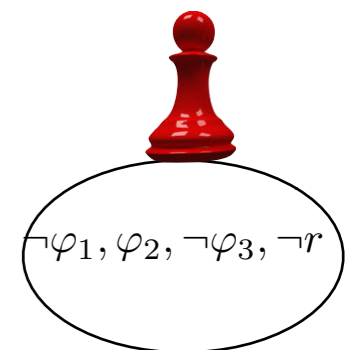
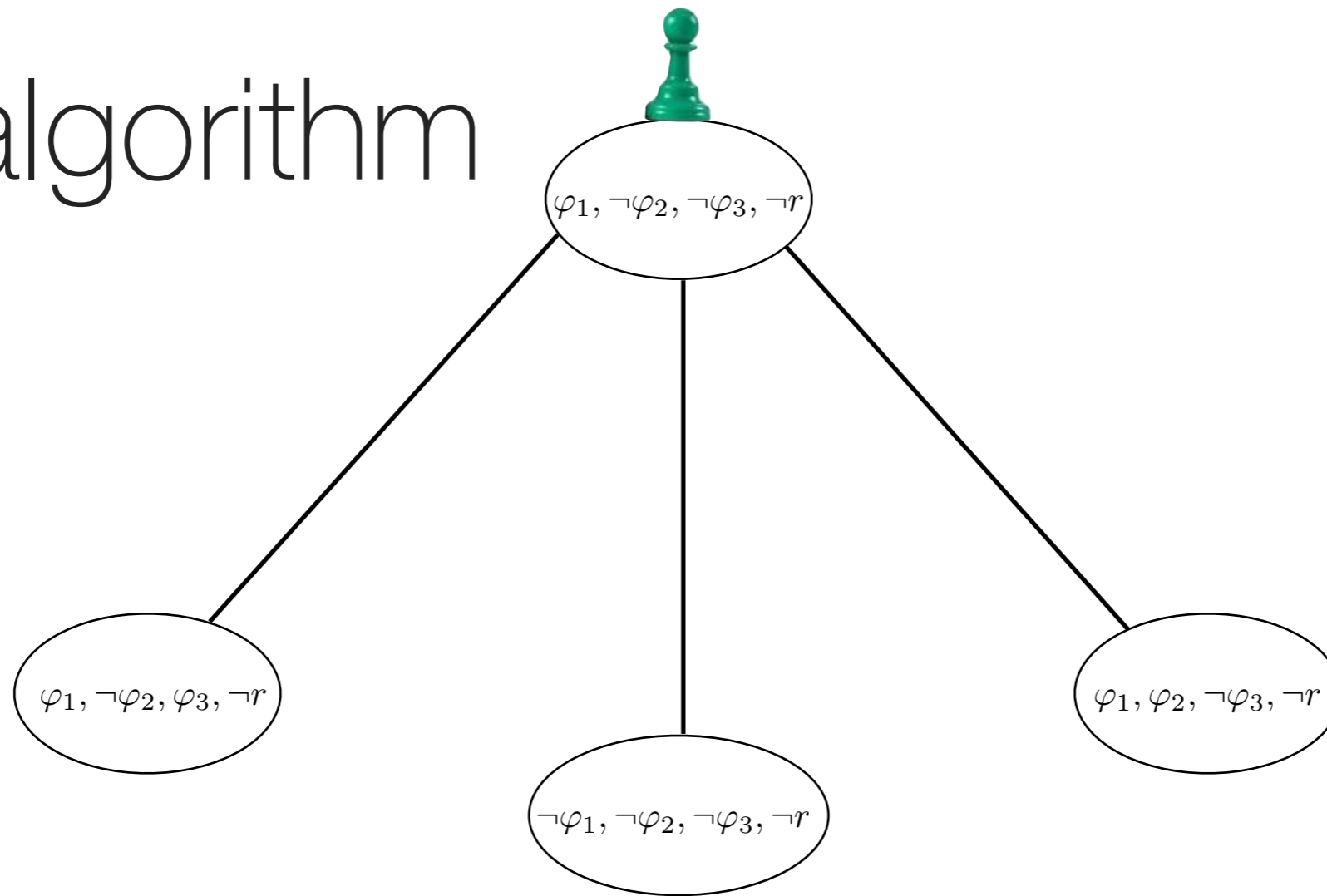
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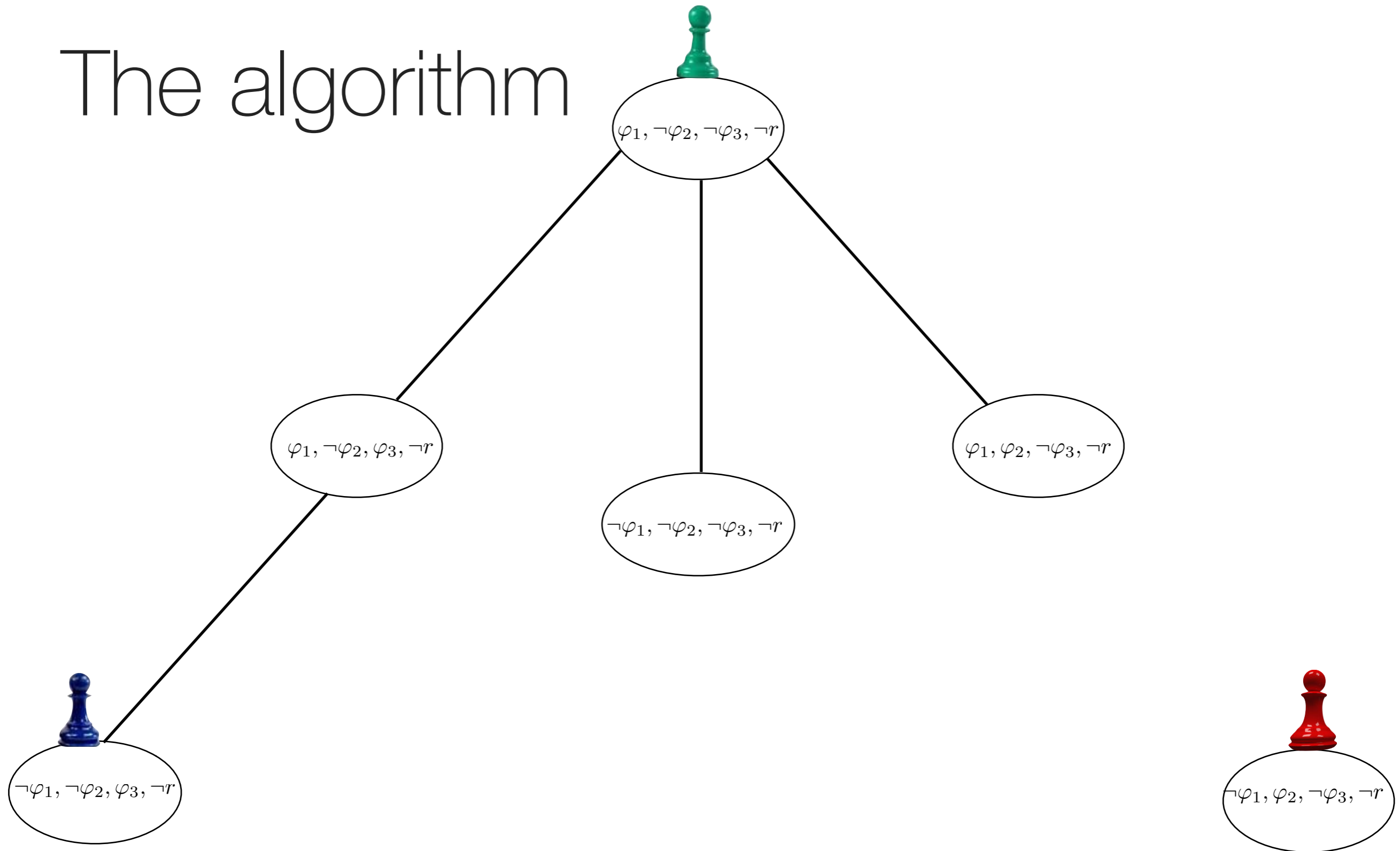
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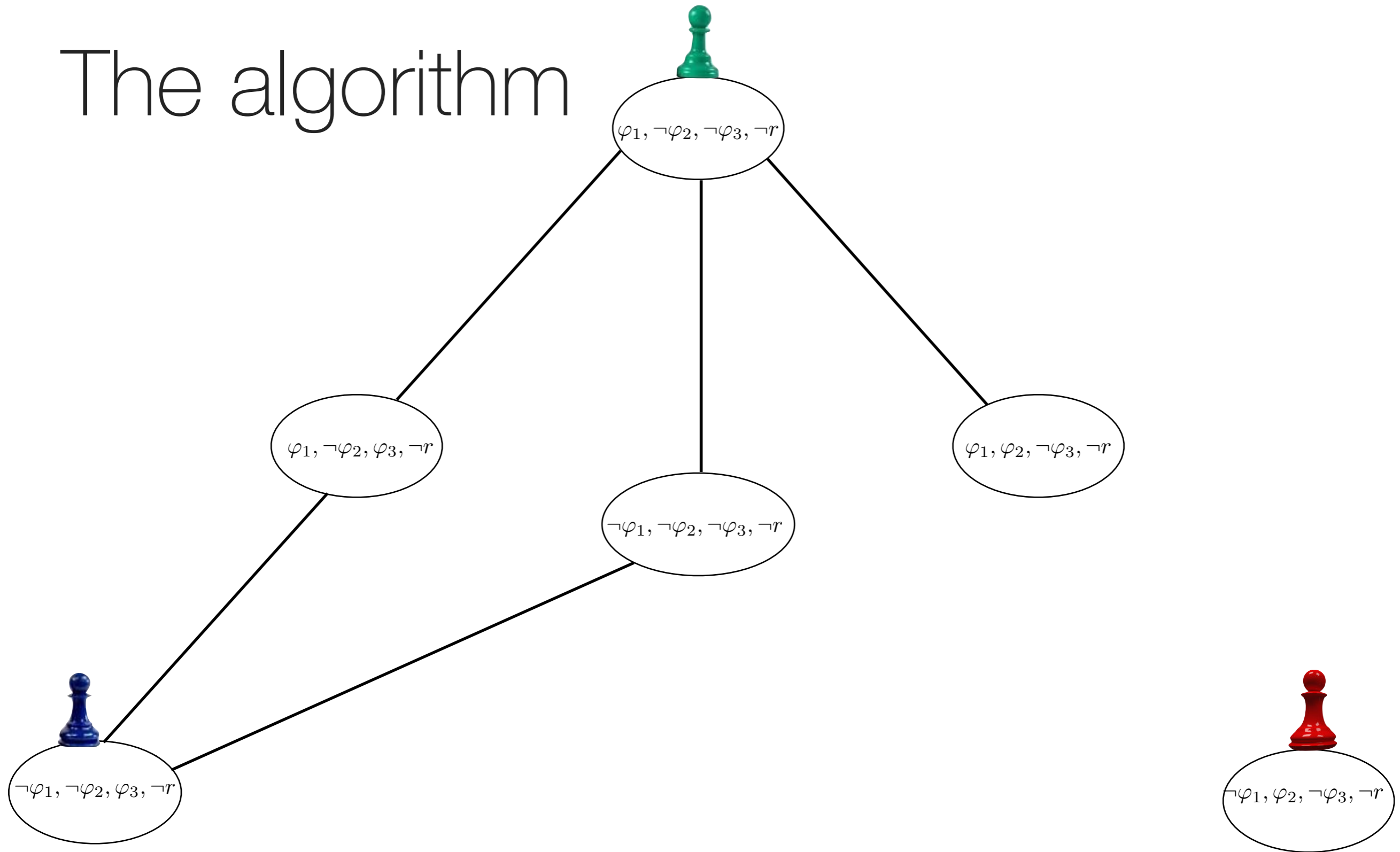
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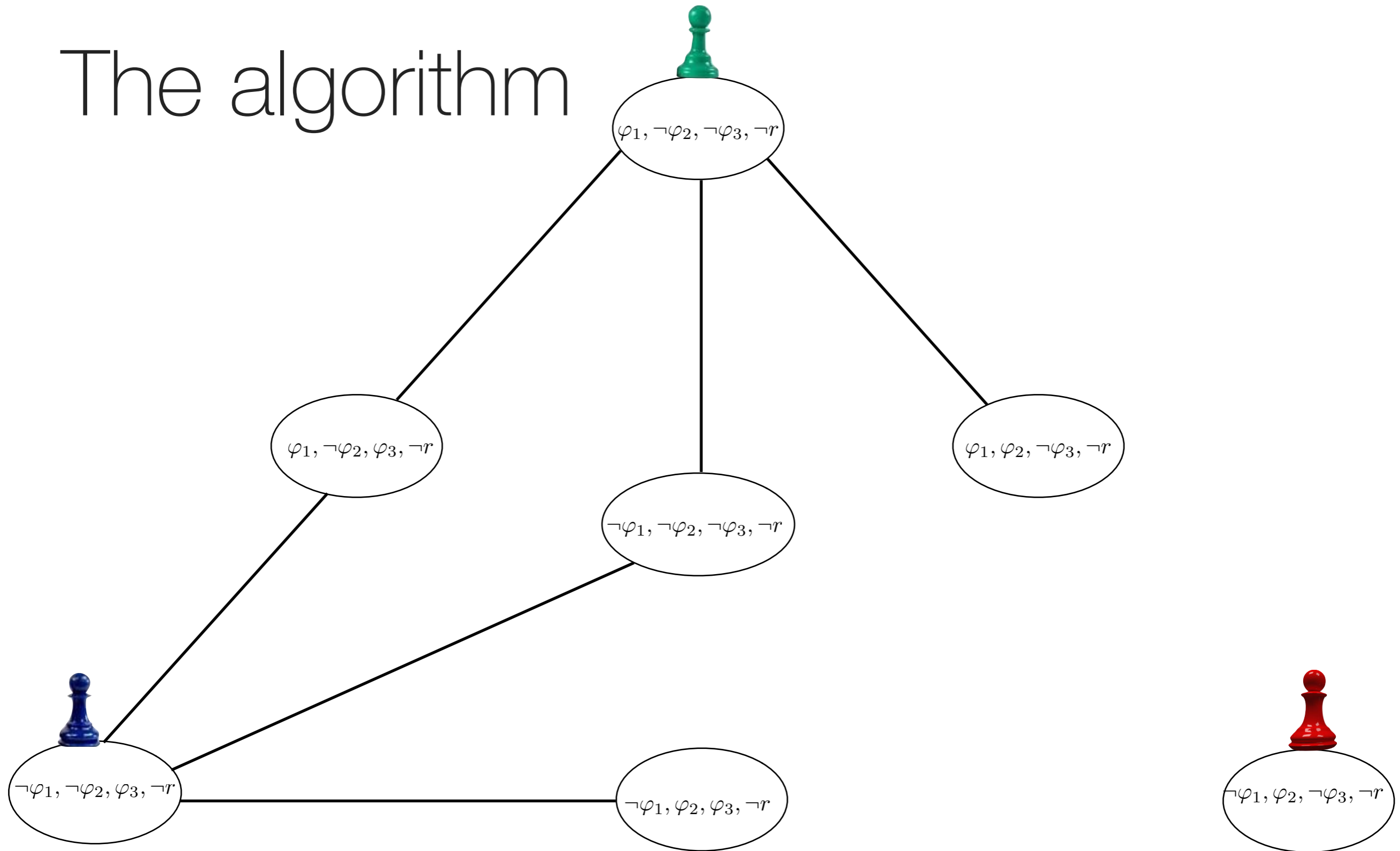
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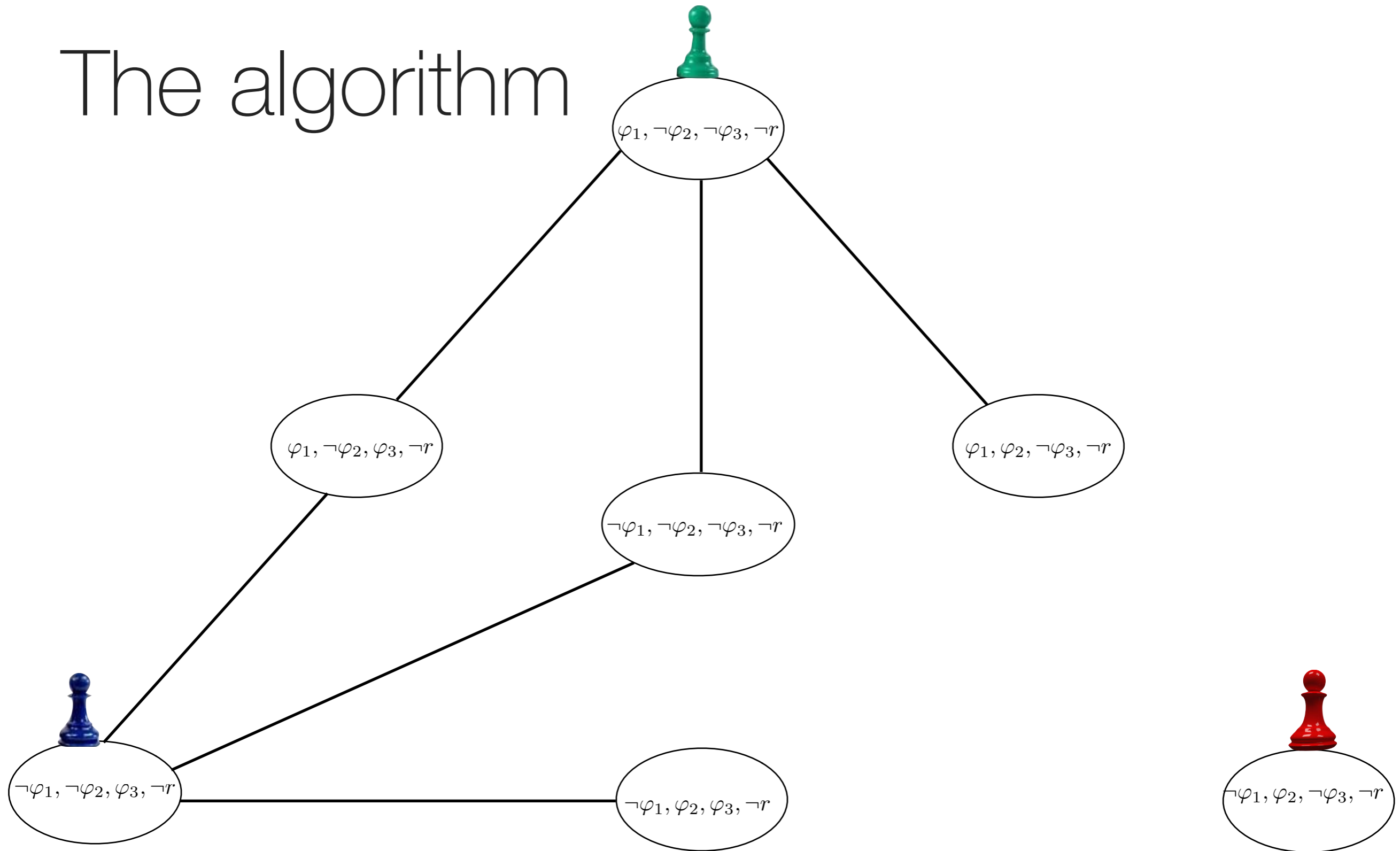
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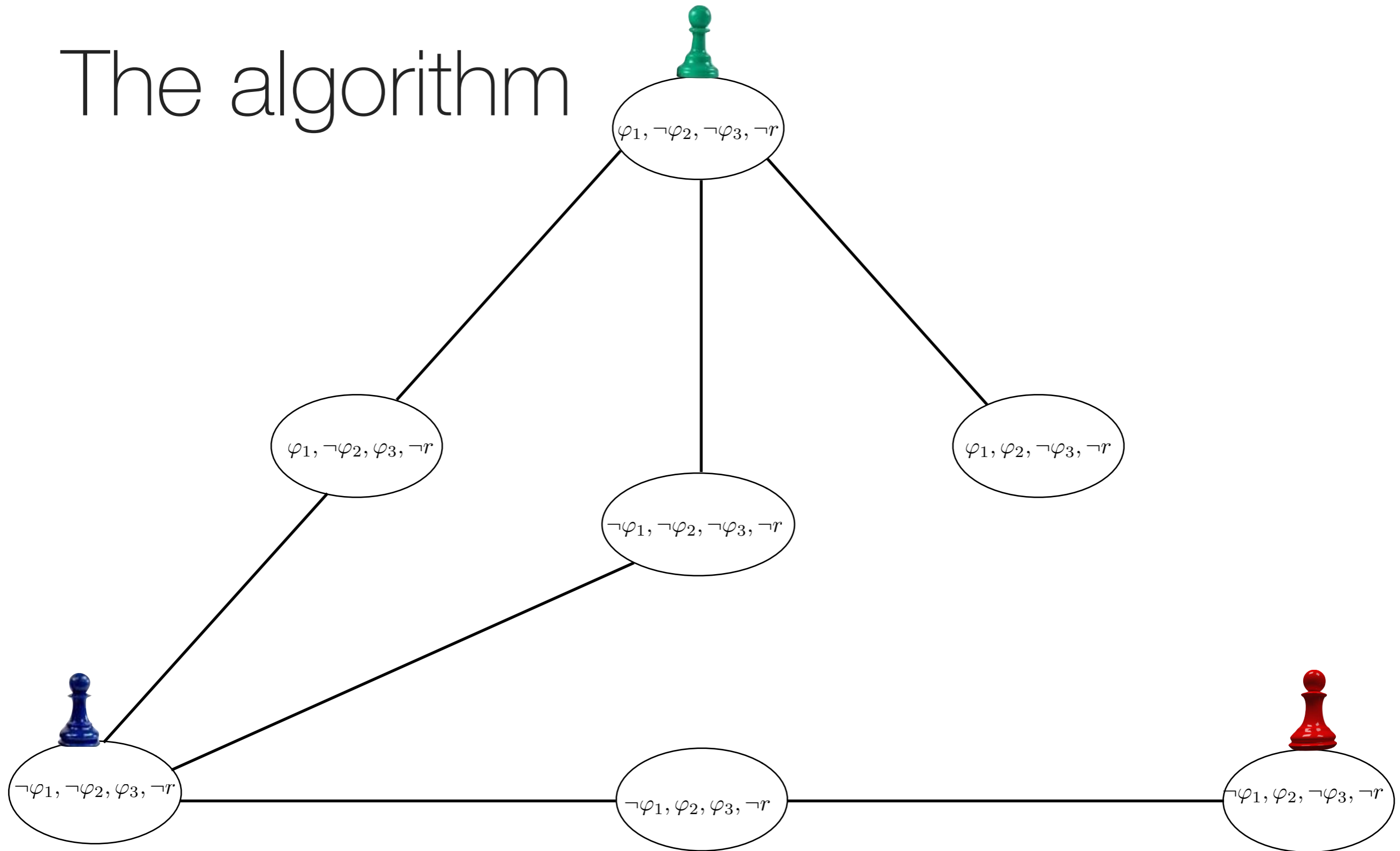
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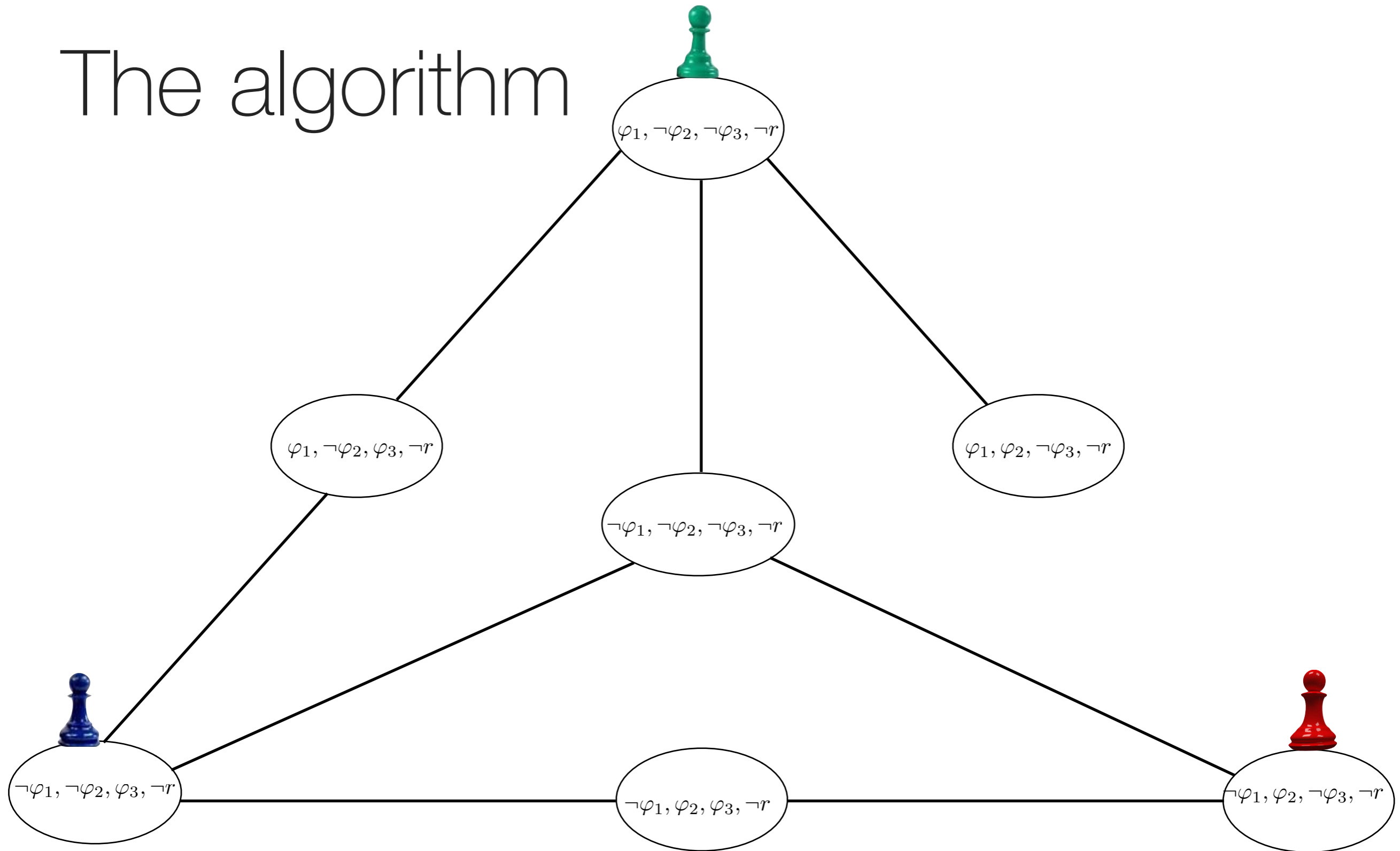
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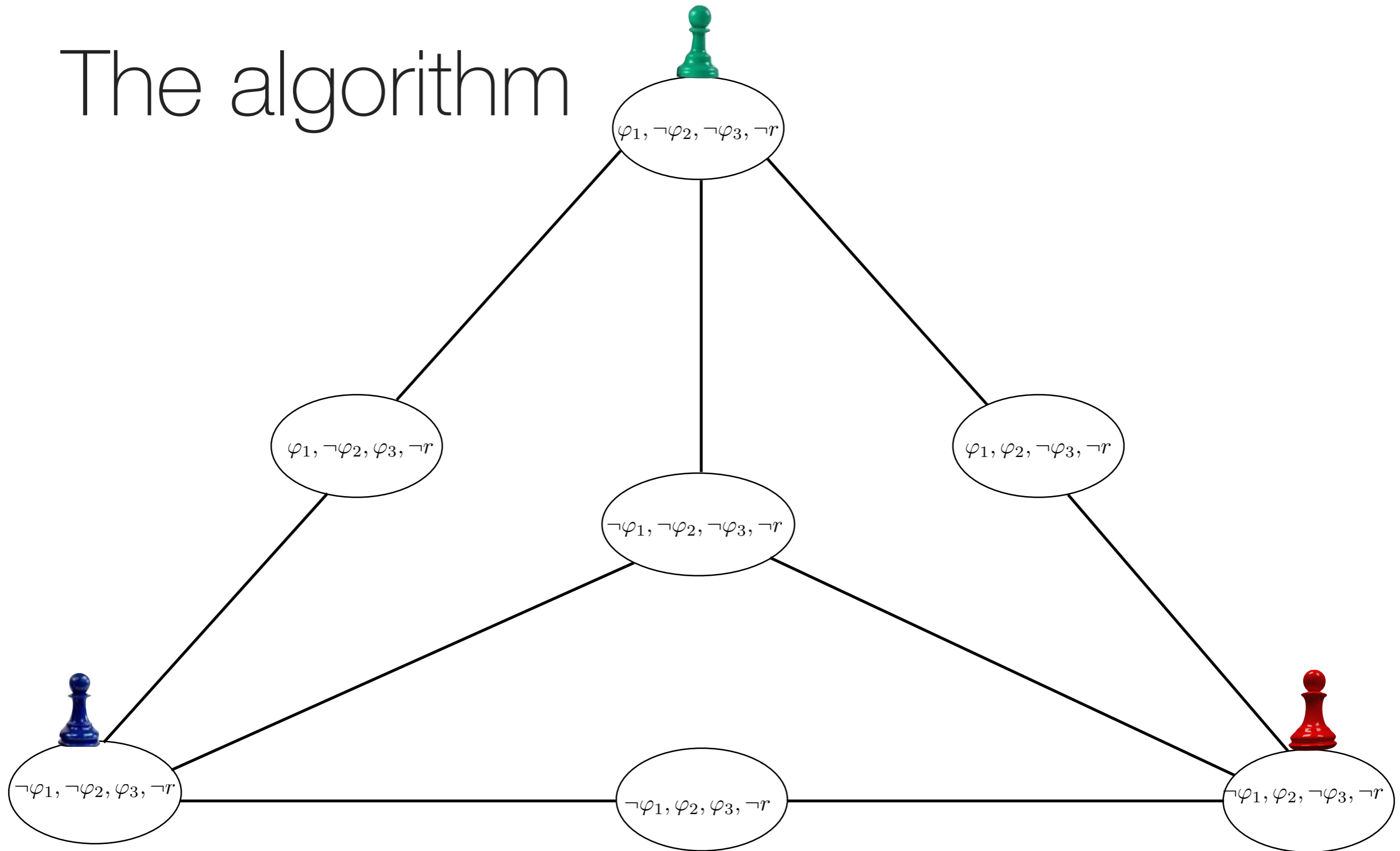
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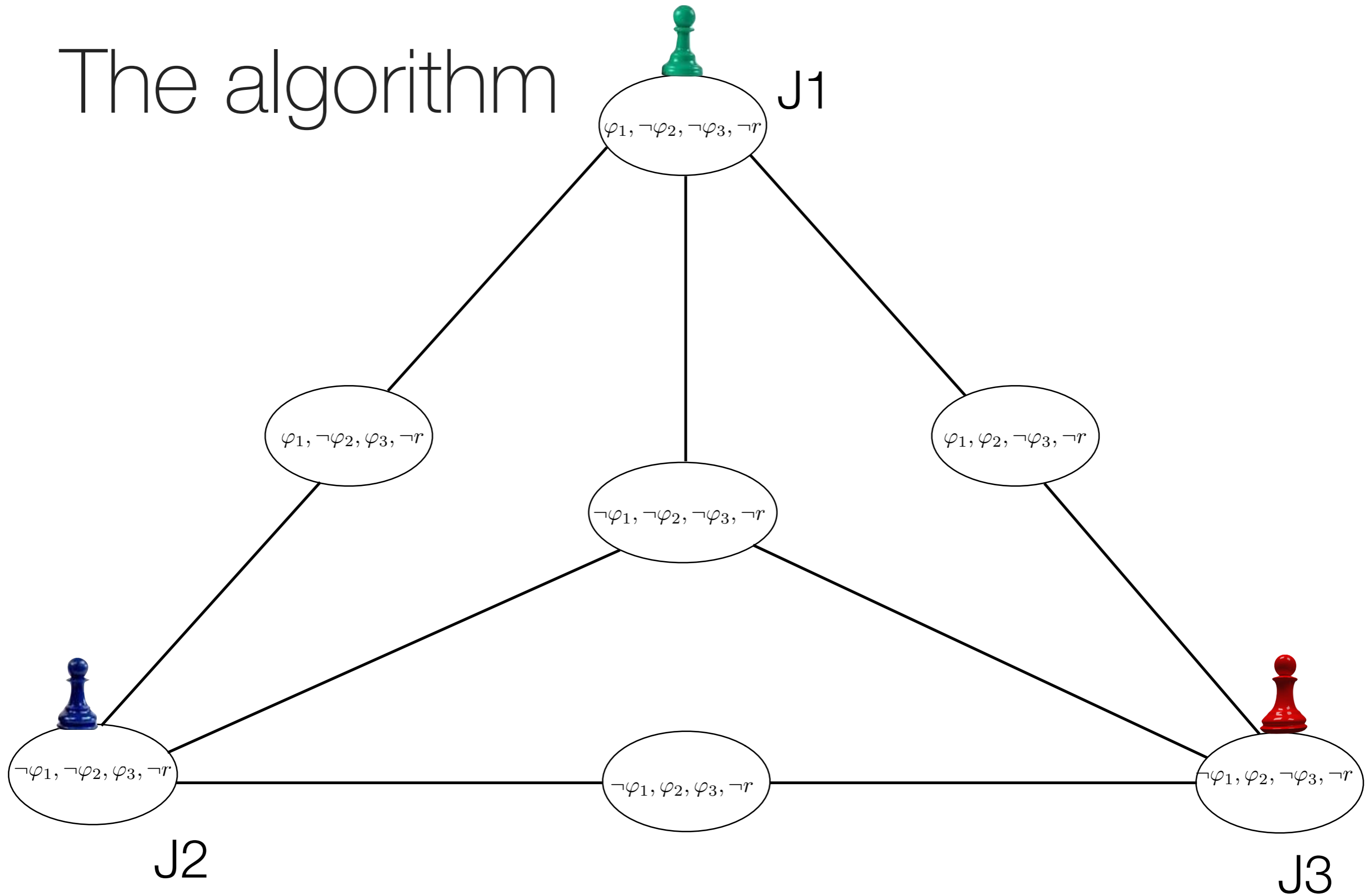
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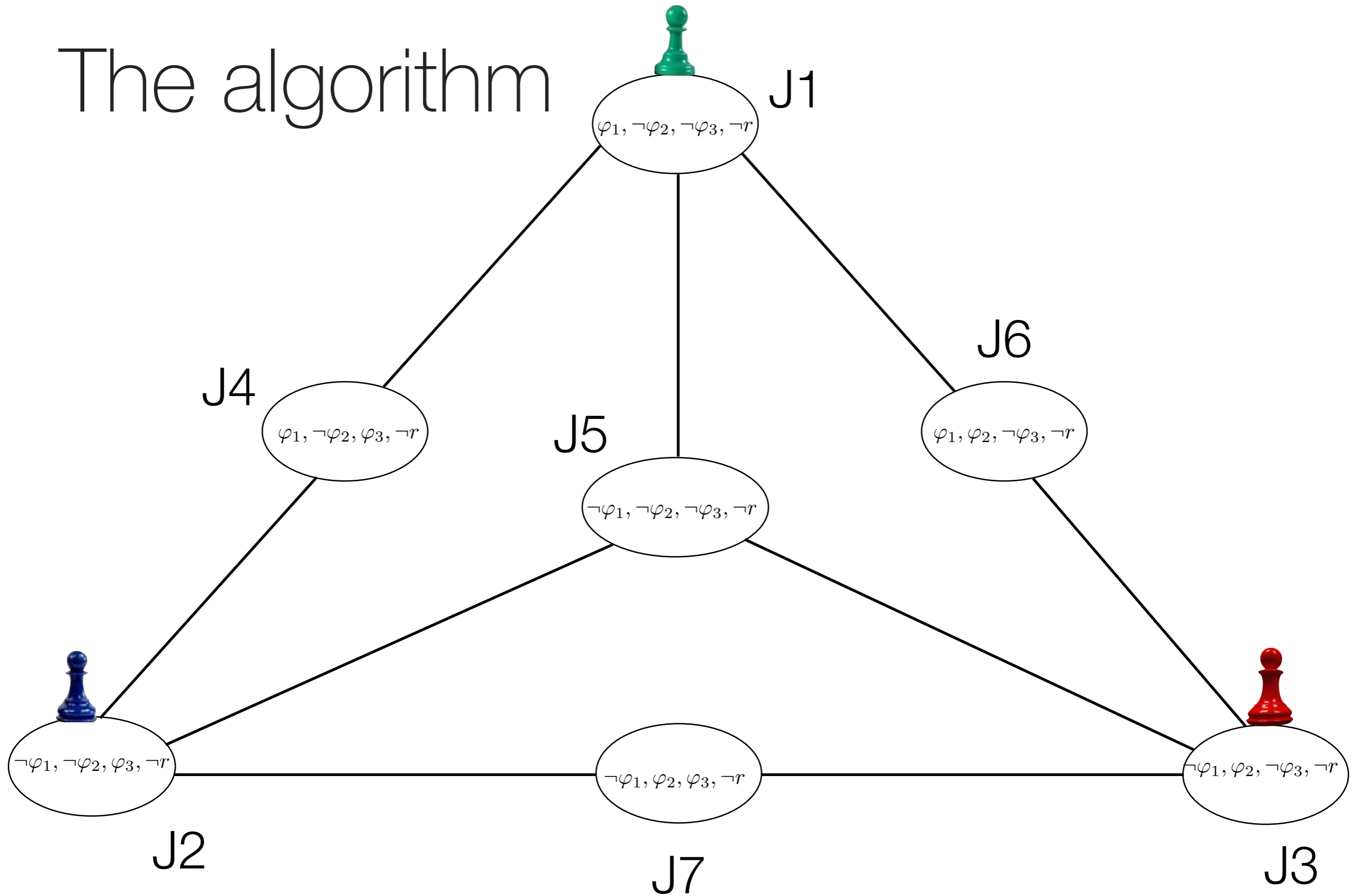
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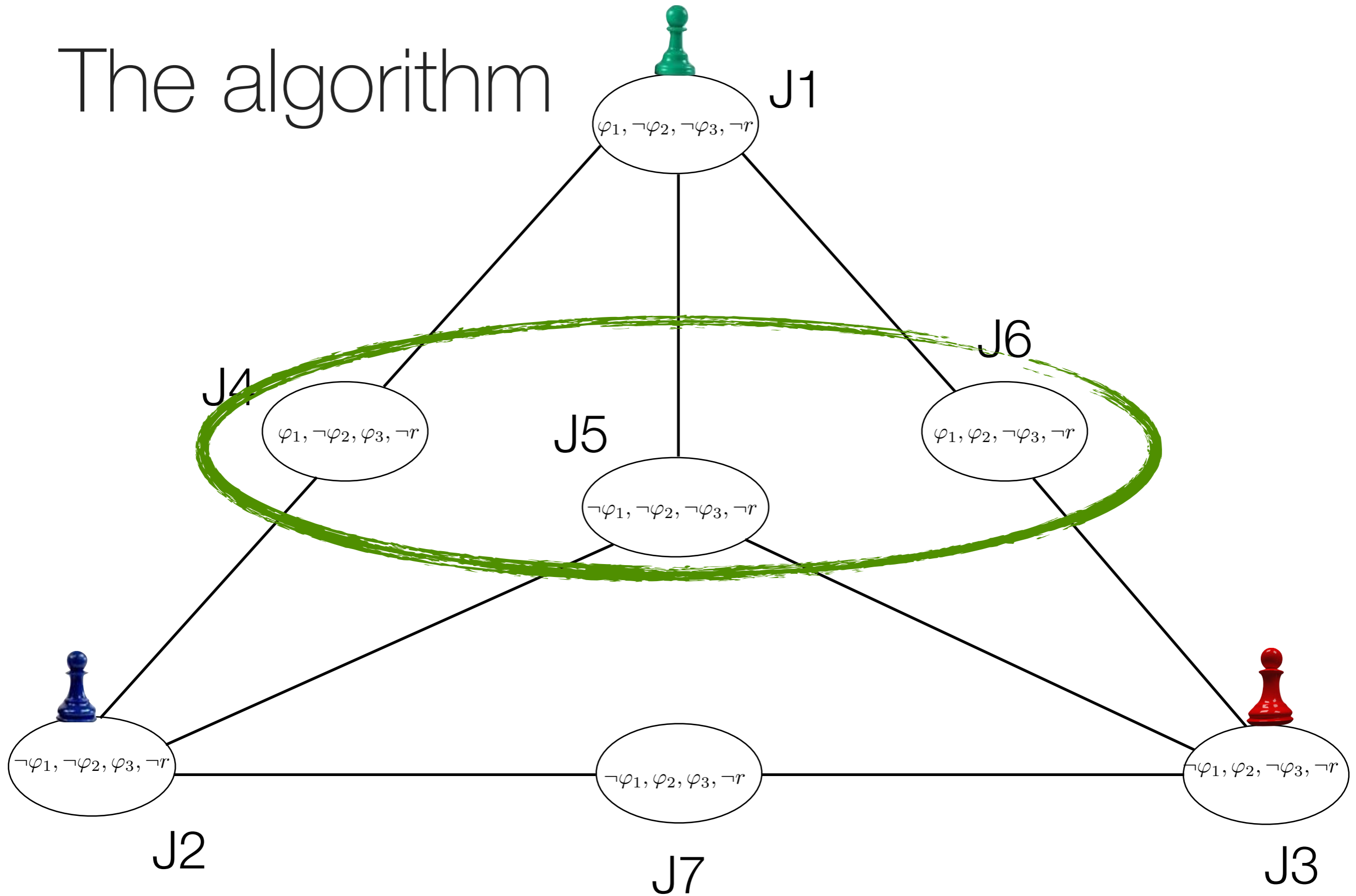
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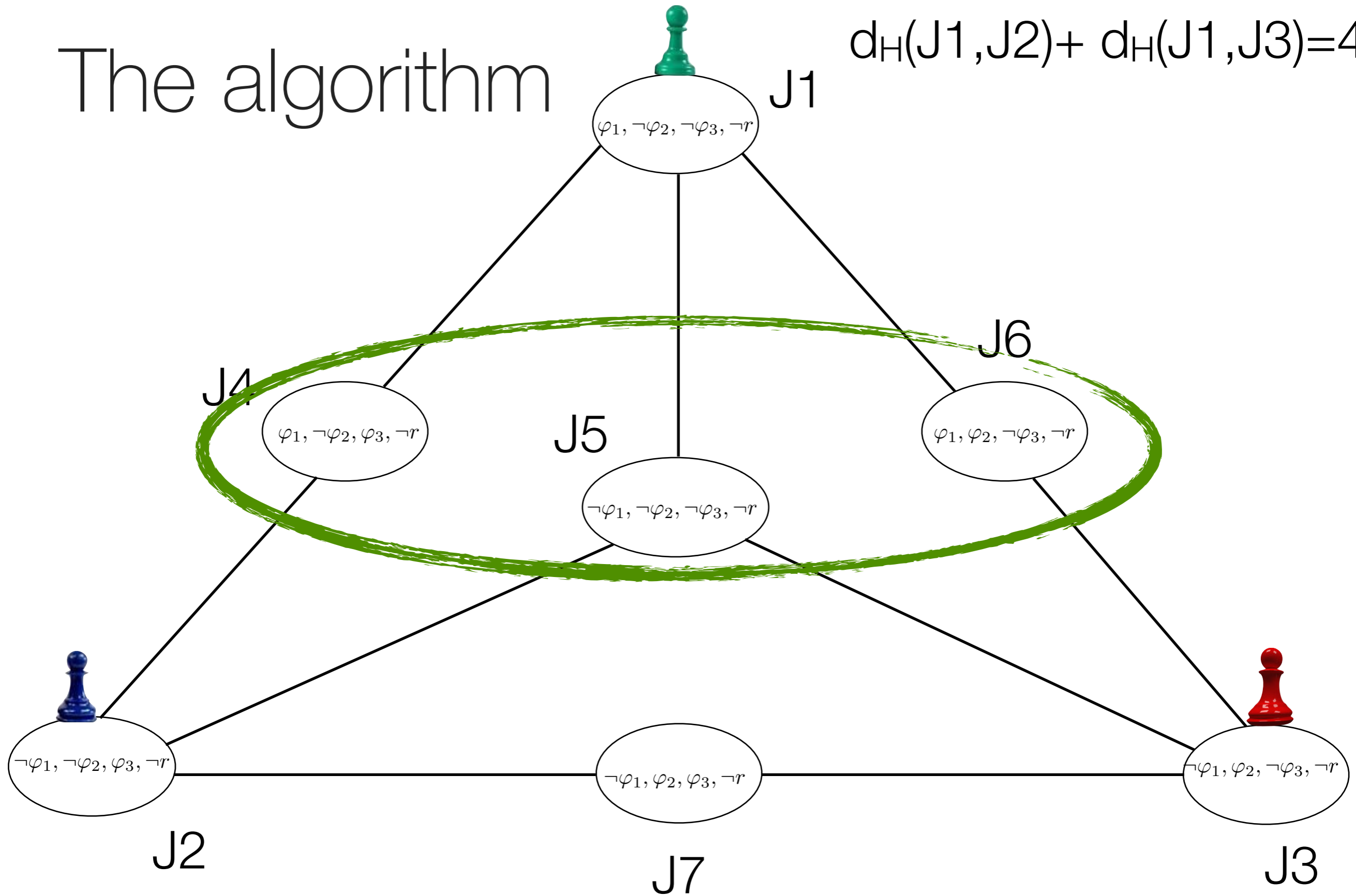


The algorithm



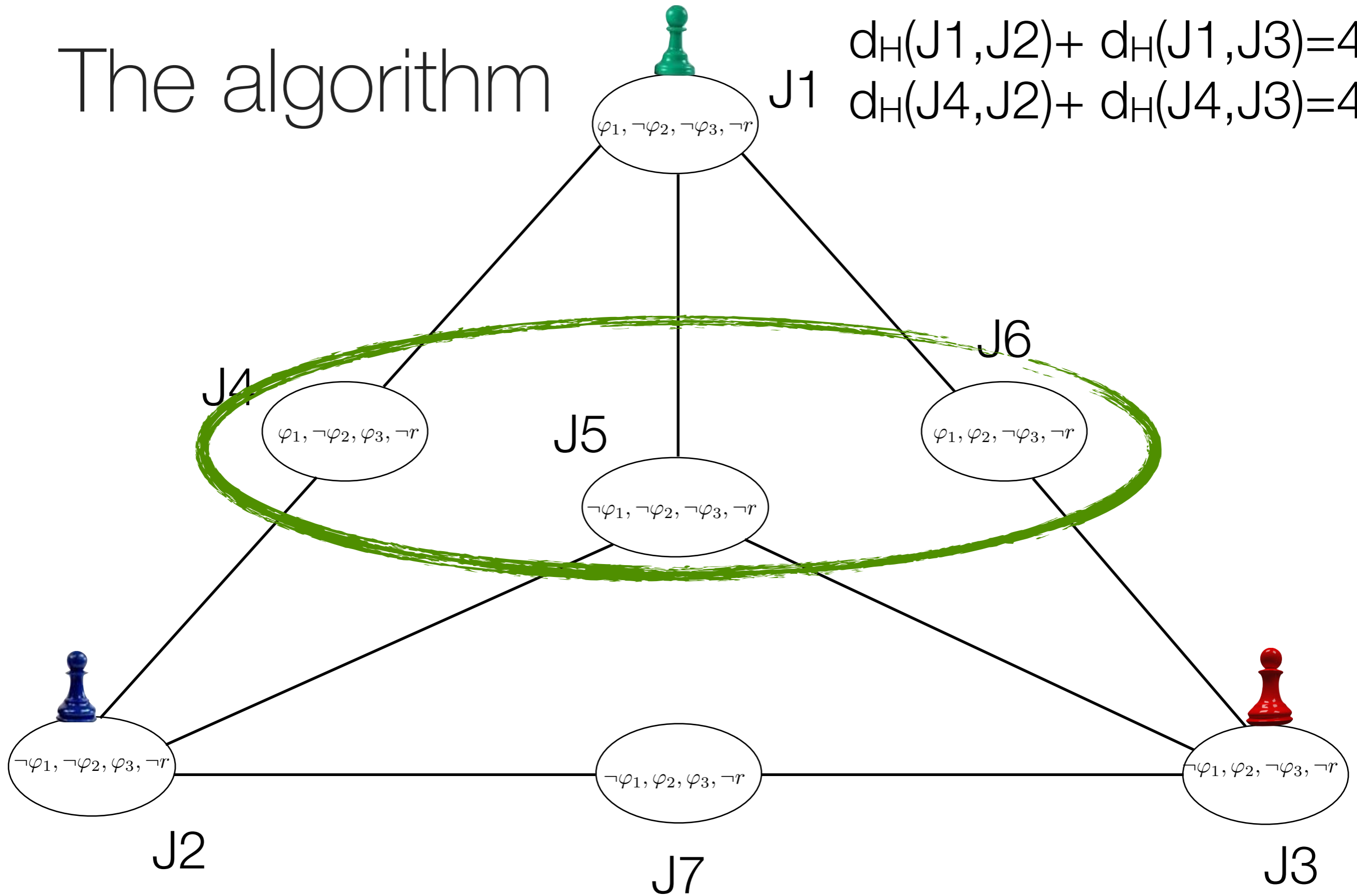
The algorithm

$$d_H(J1, J2) + d_H(J1, J3) = 4$$

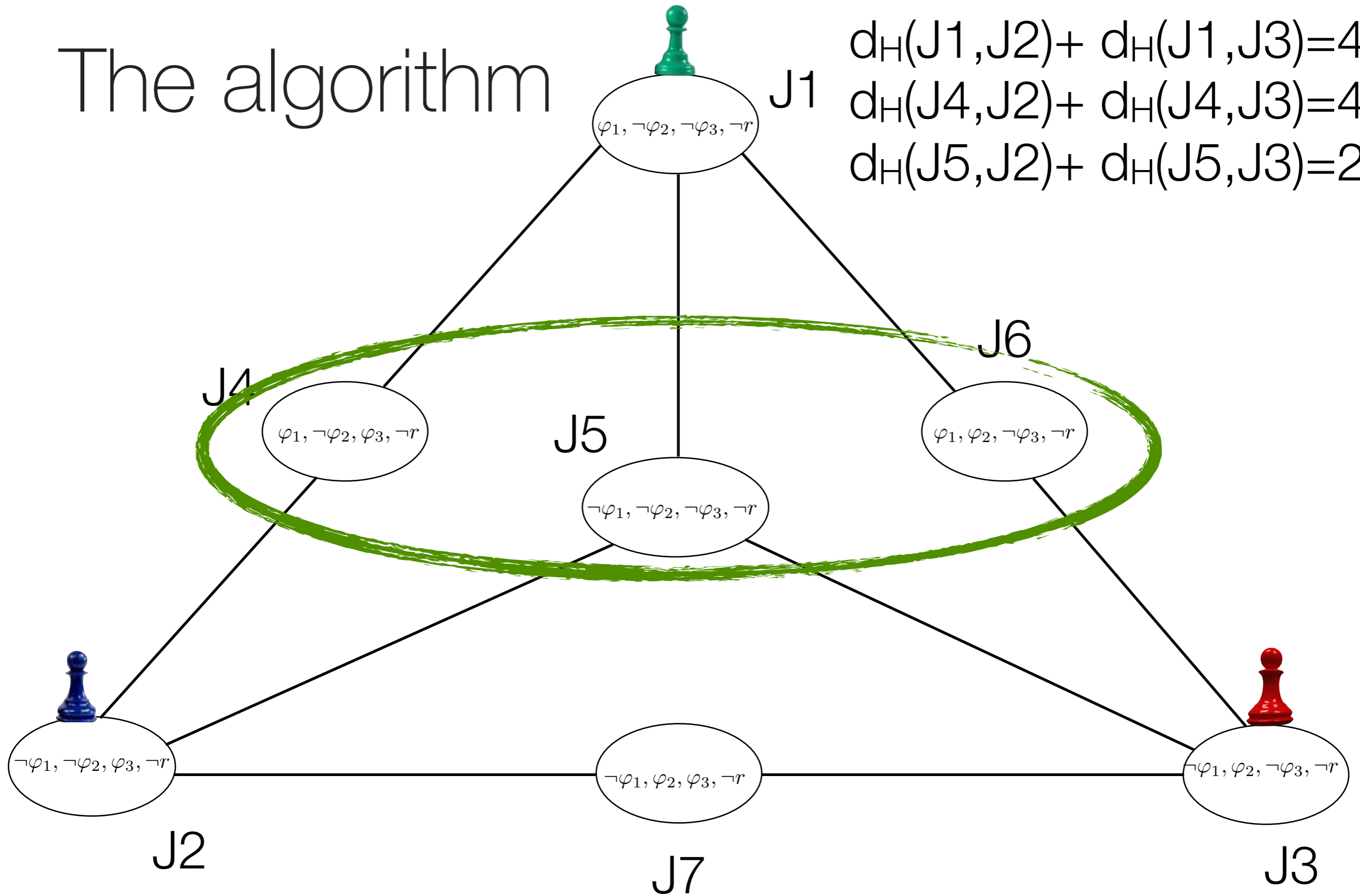


The algorithm

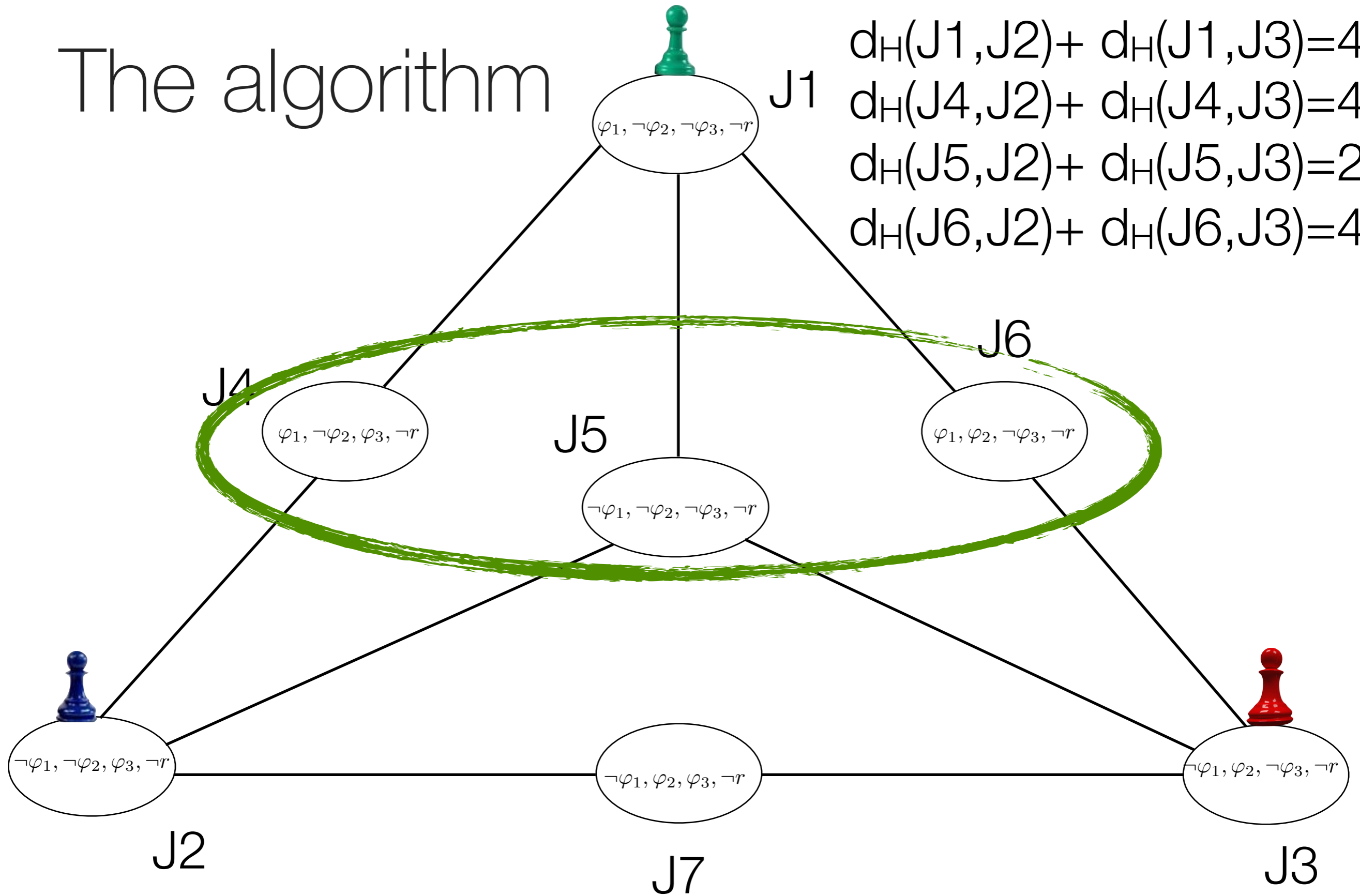
$$d_H(J1, J2) + d_H(J1, J3) = 4$$
$$d_H(J4, J2) + d_H(J4, J3) = 4$$



The algorithm

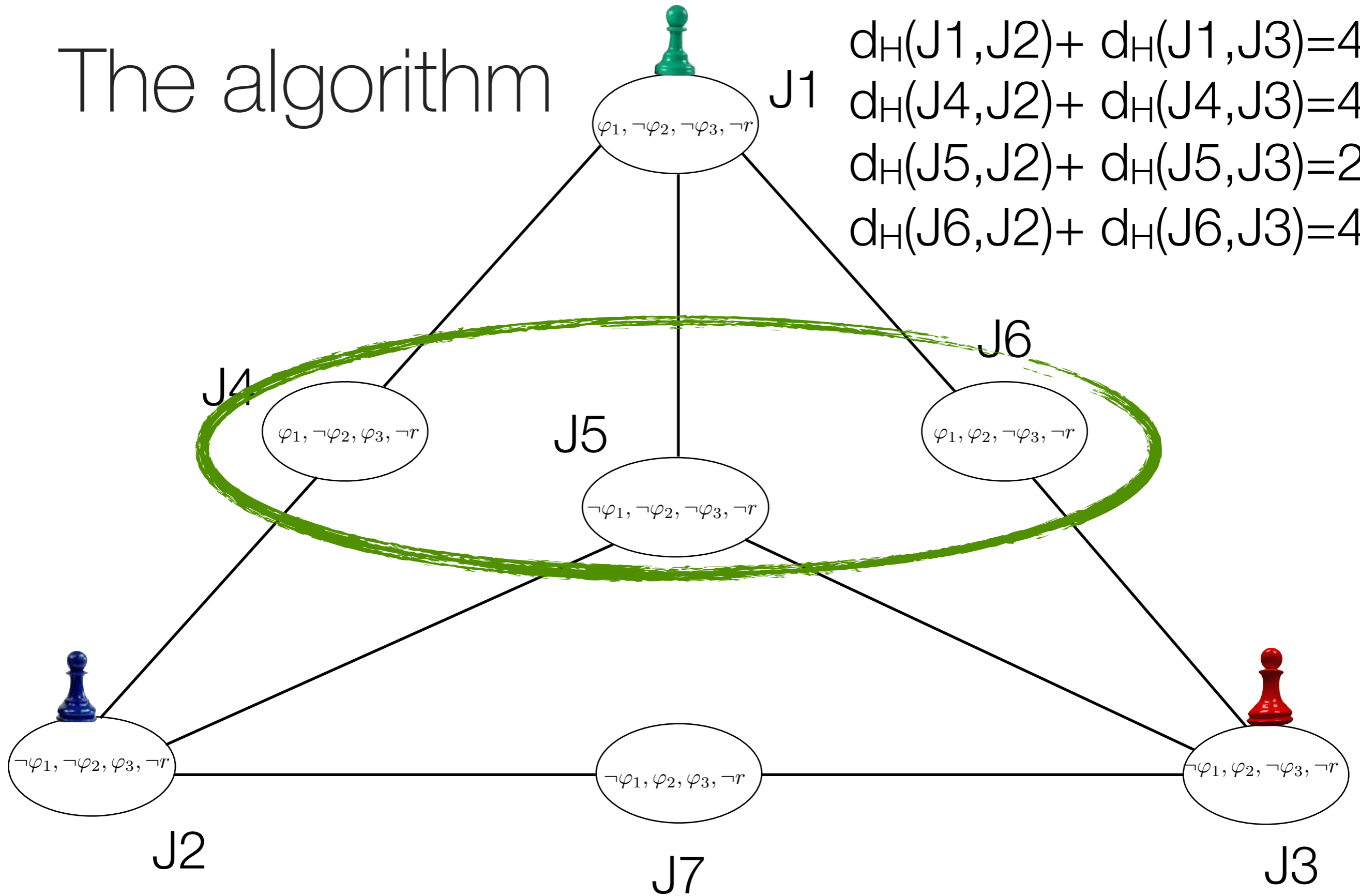


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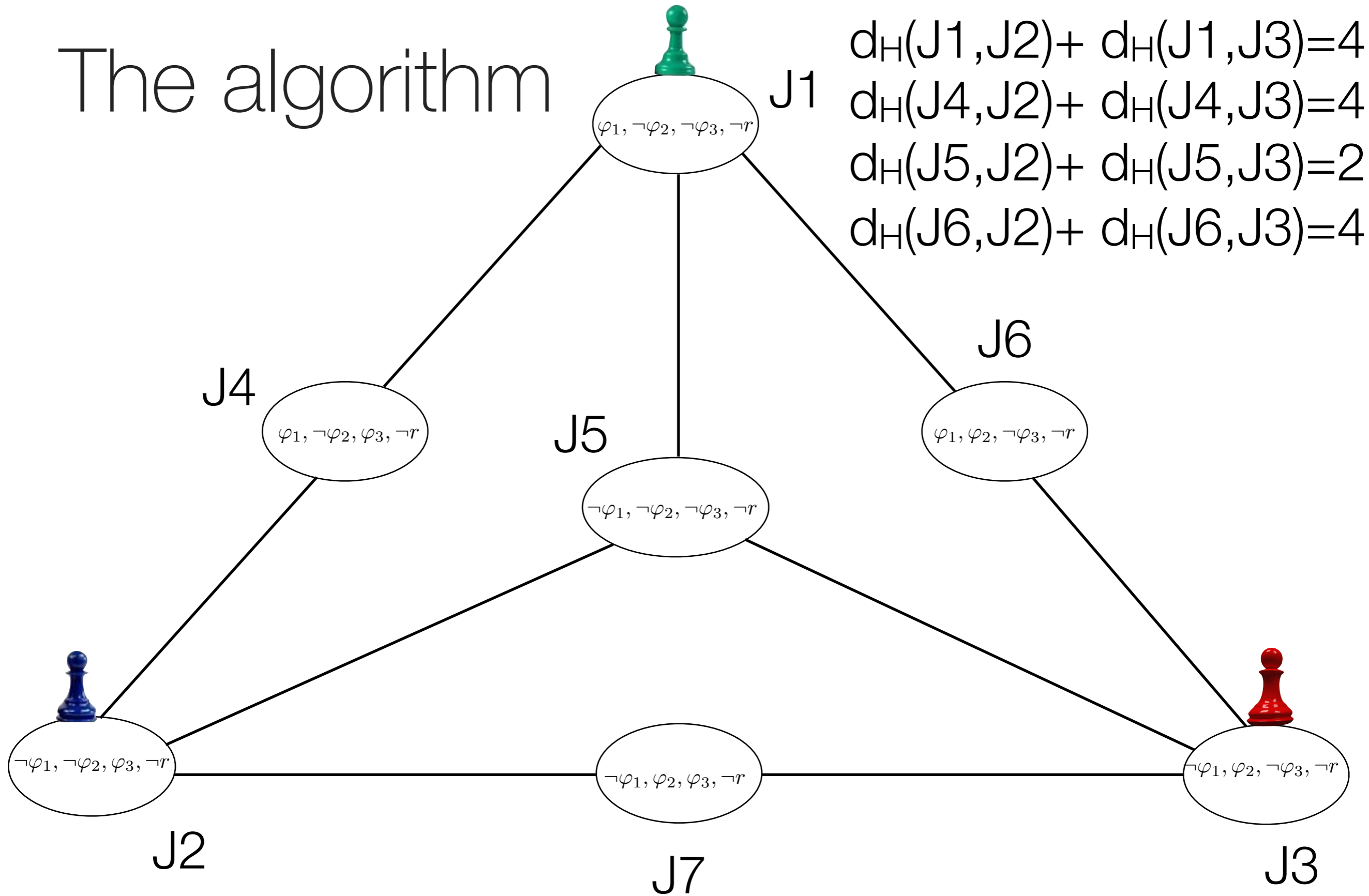
$$\begin{aligned}d_H(J1, J2) + d_H(J1, J3) &= 4 \\d_H(J4, J2) + d_H(J4, J3) &= 4 \\d_H(J5, J2) + d_H(J5, J3) &= 2 \\d_H(J6, J2) + d_H(J6, J3) &= 4\end{aligned}$$

The algorithm

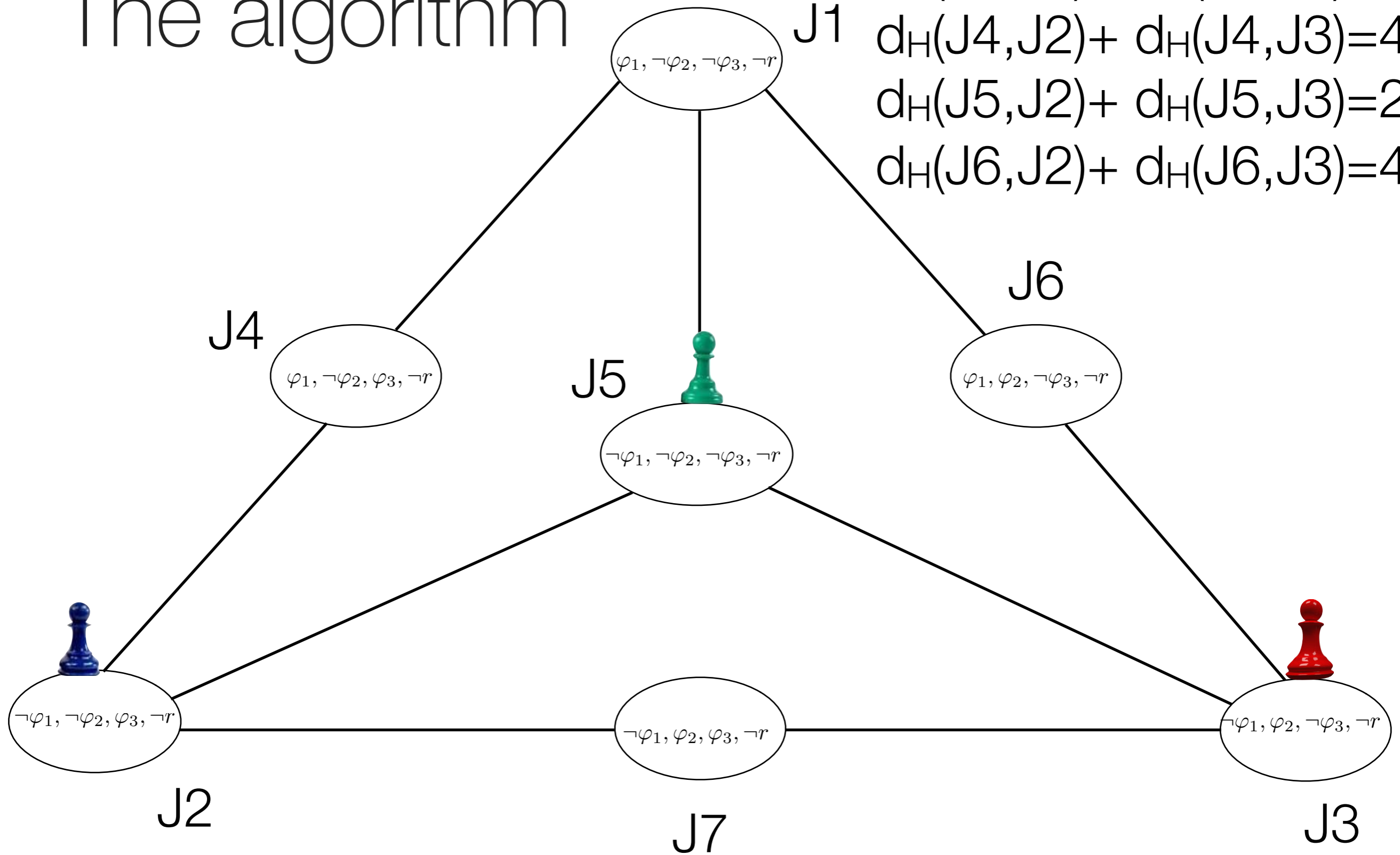


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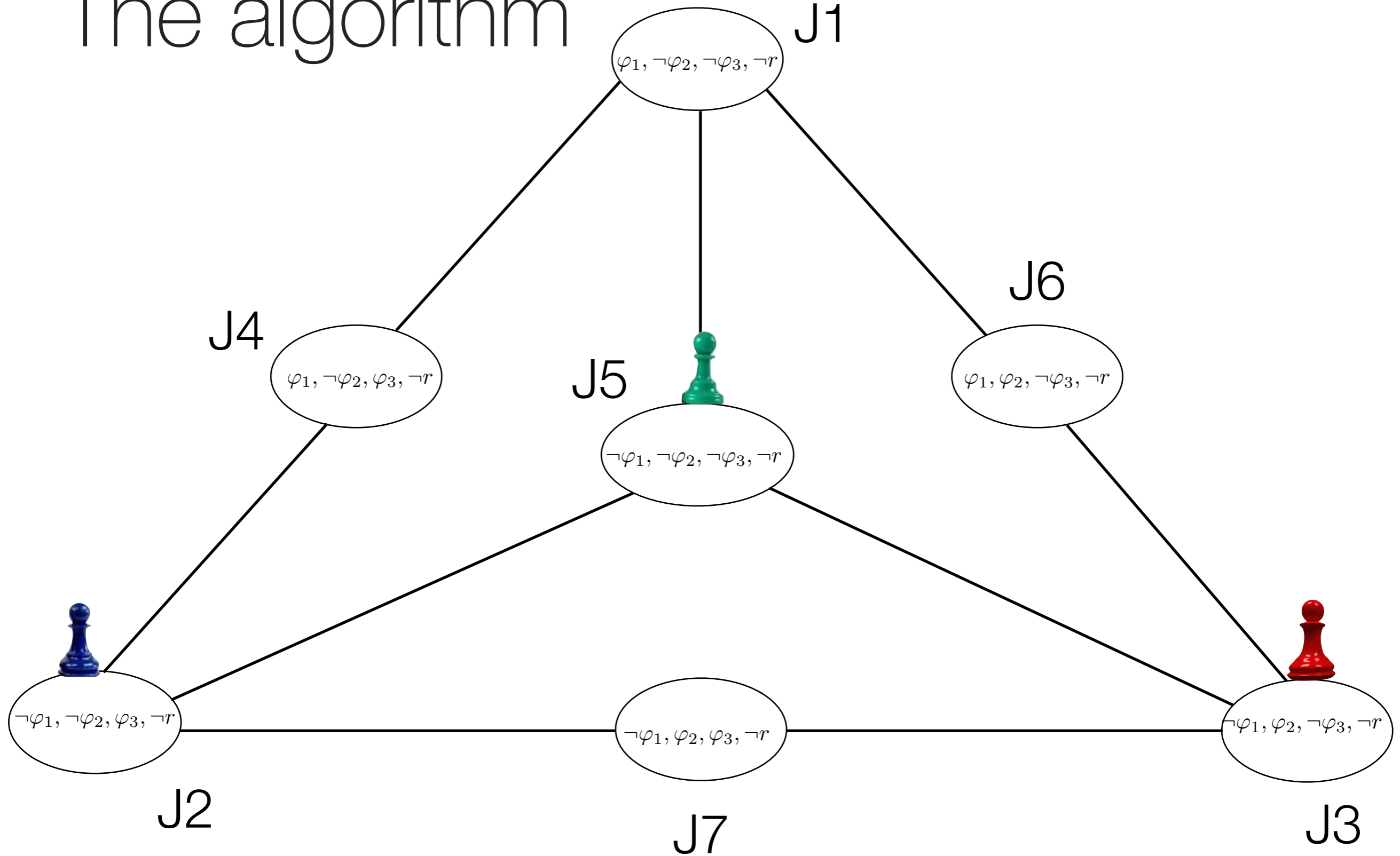


The algorithm

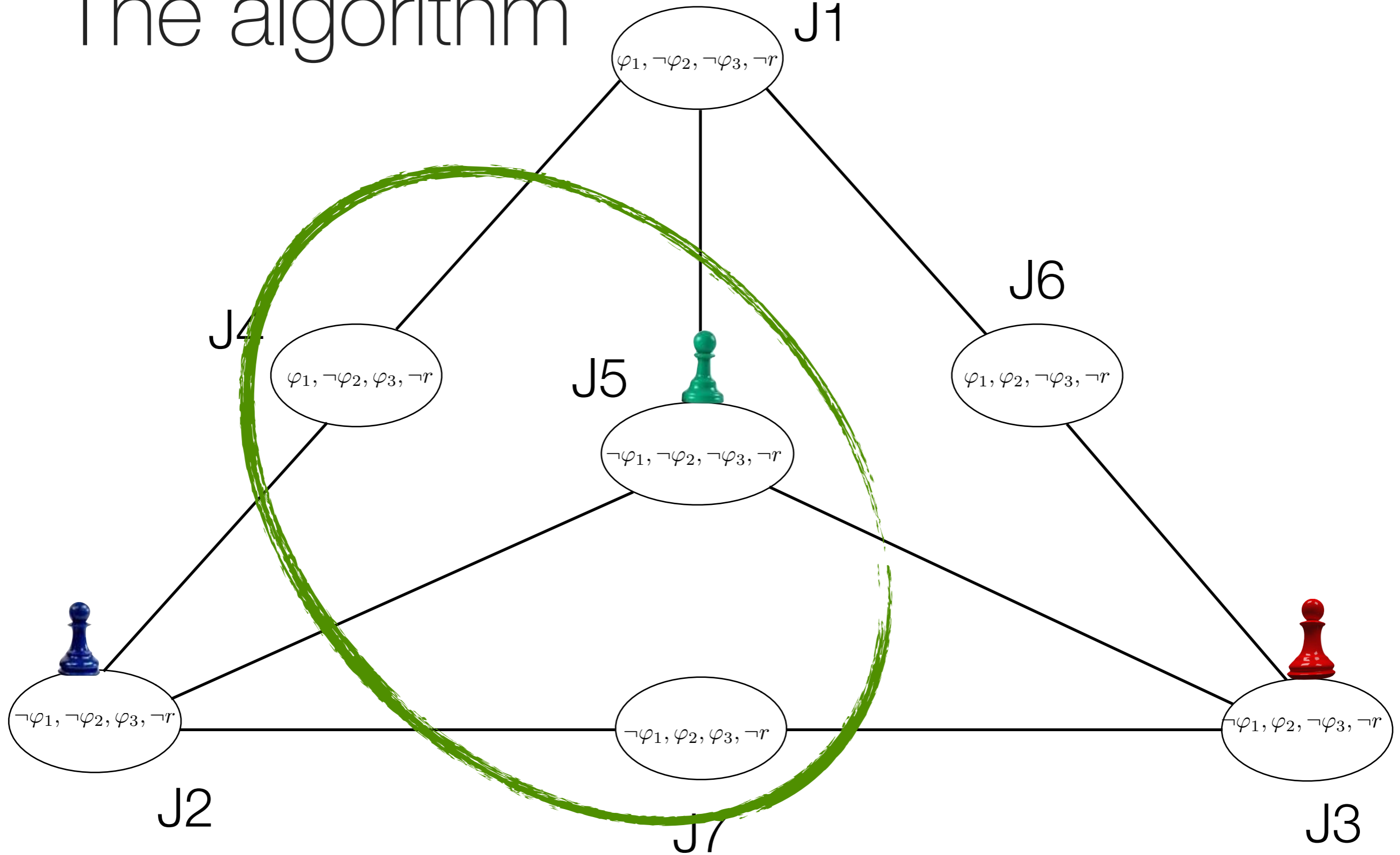


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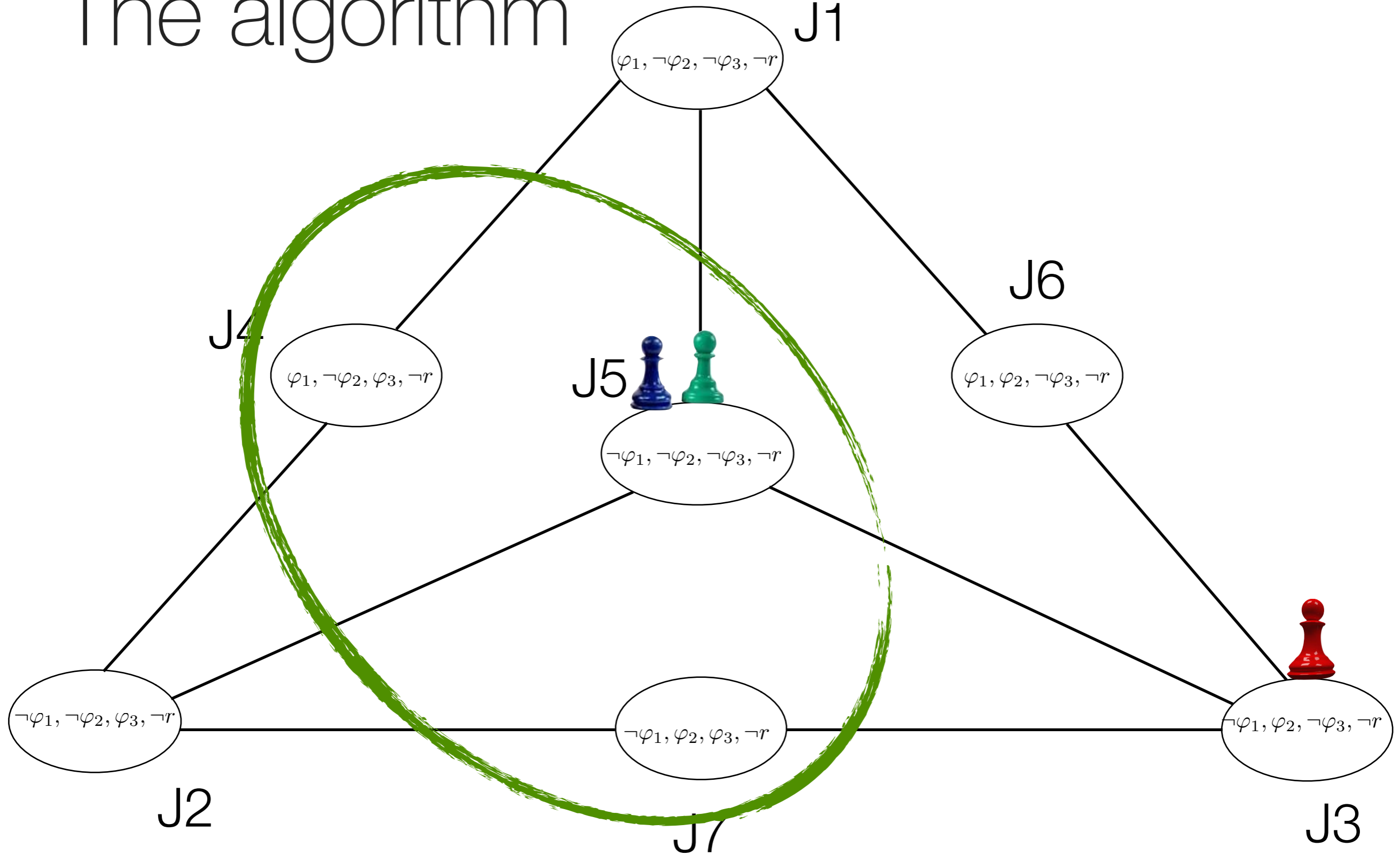
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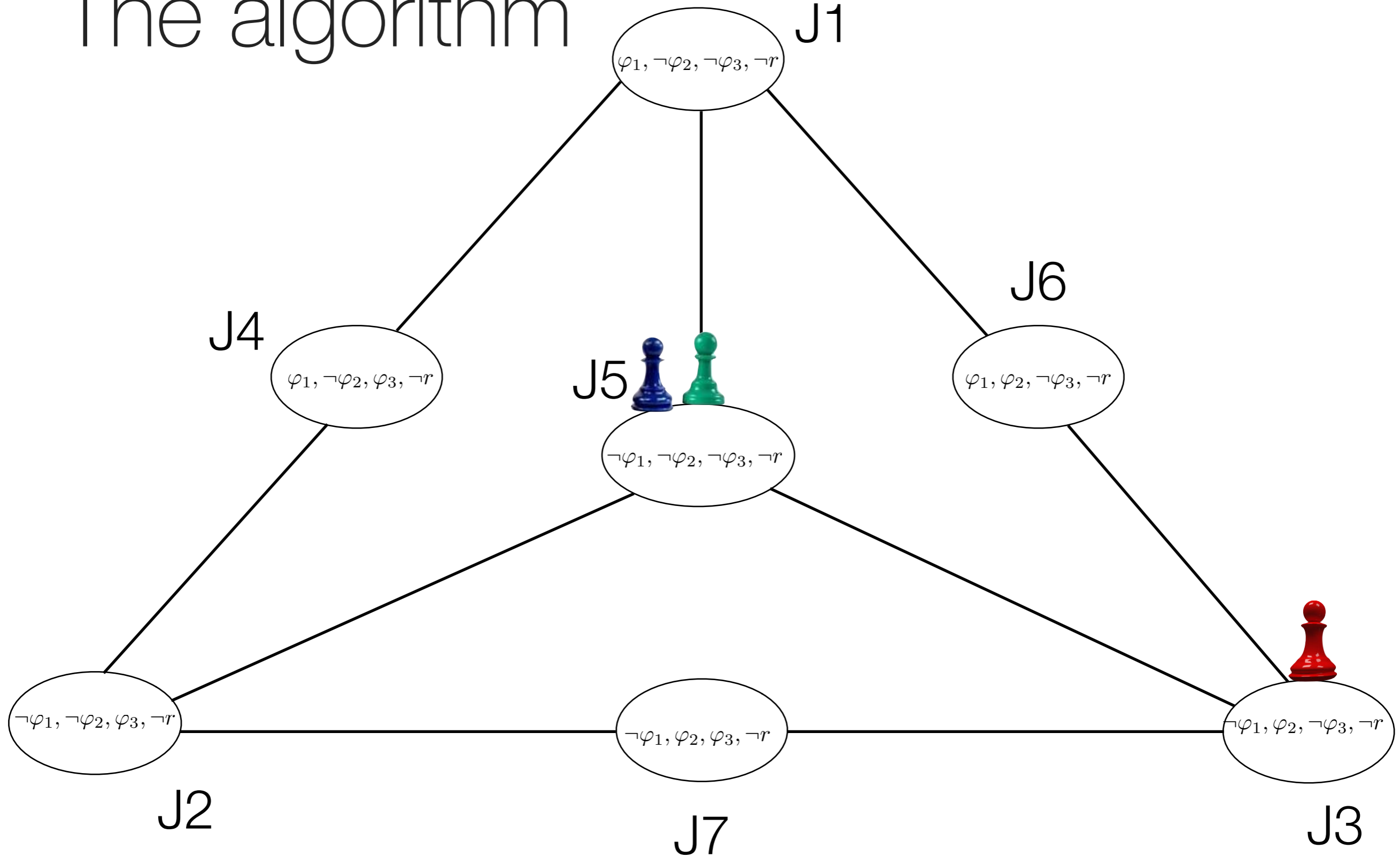
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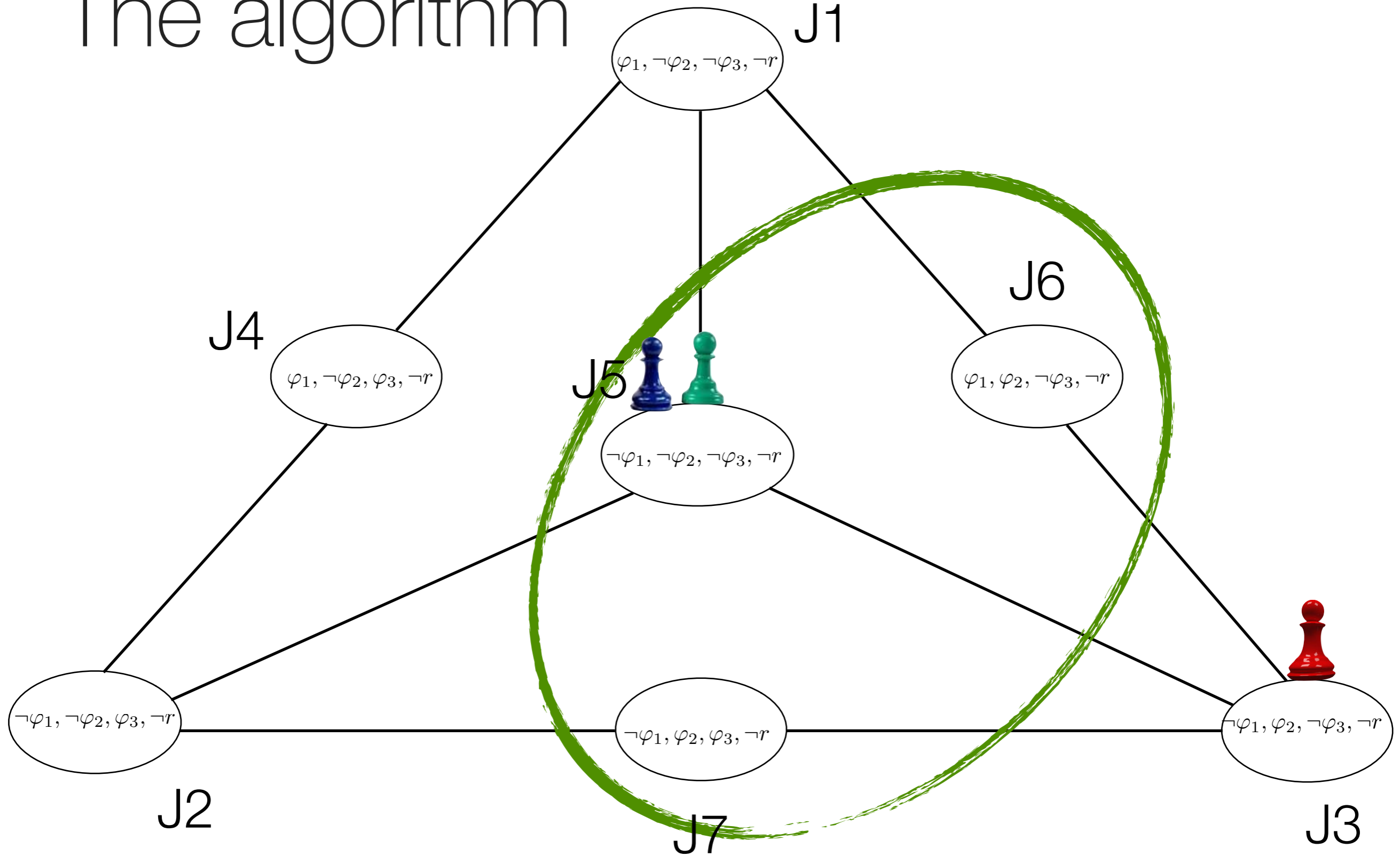
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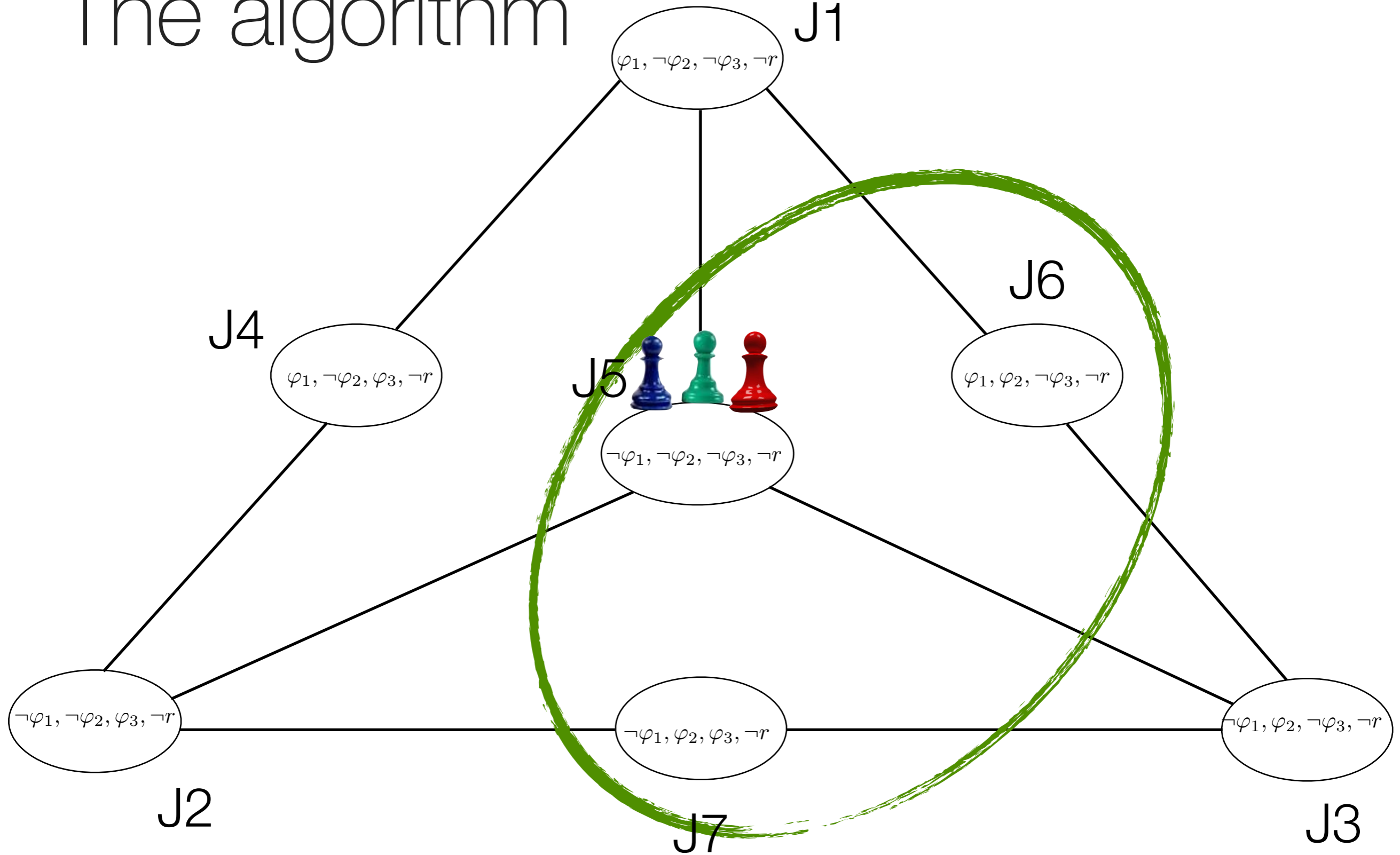
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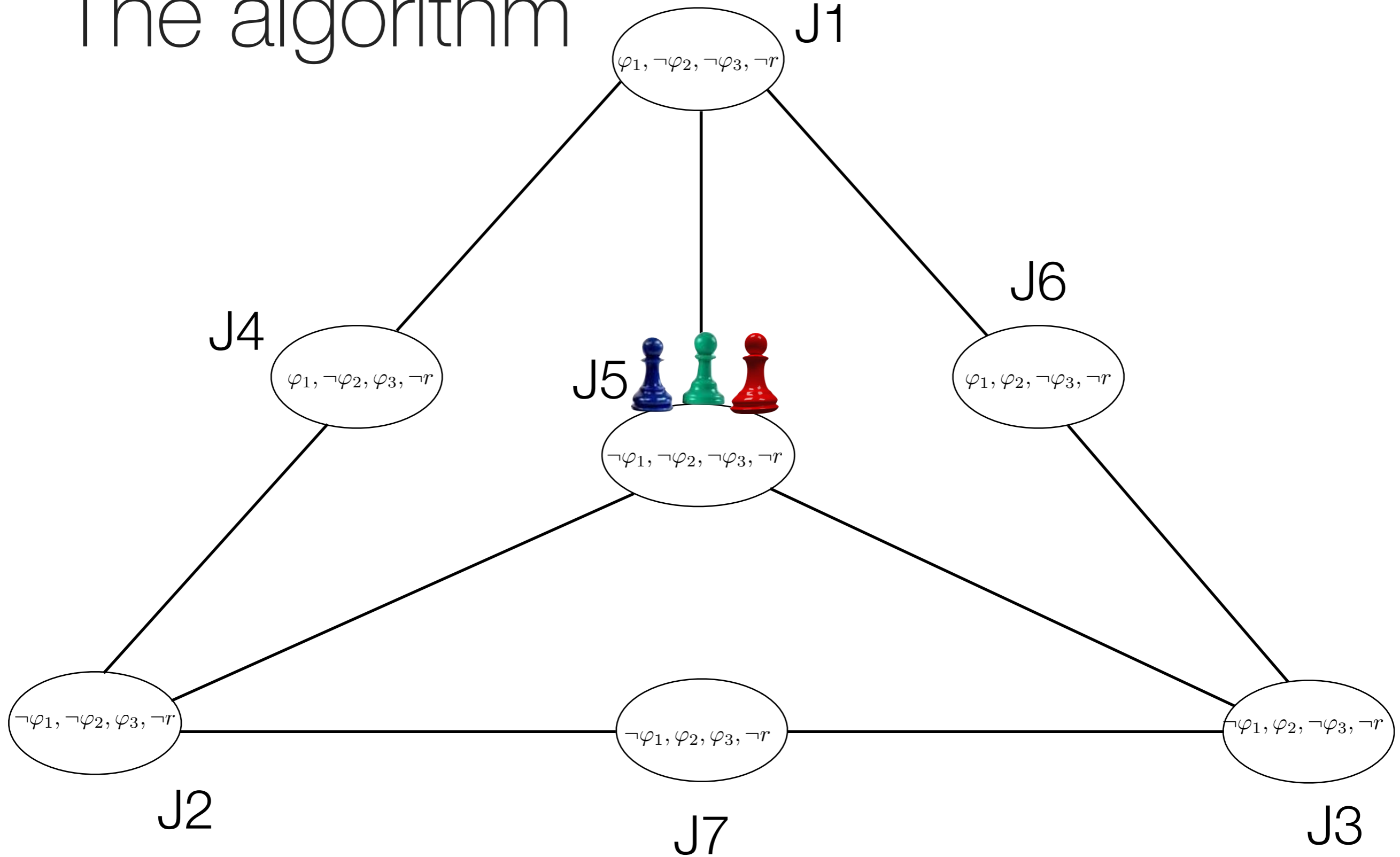
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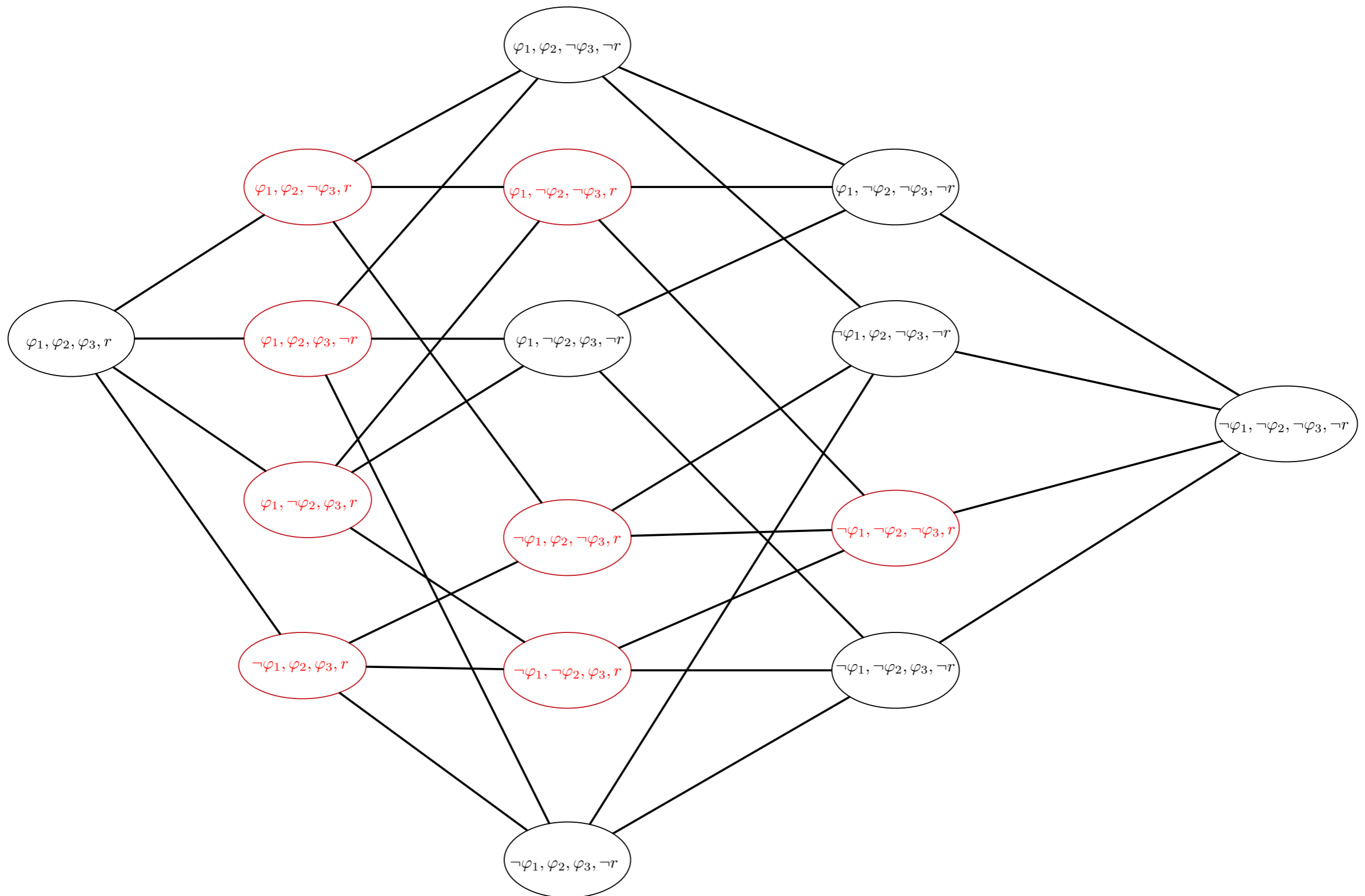


When does the algorithm (probabilistically) terminate?

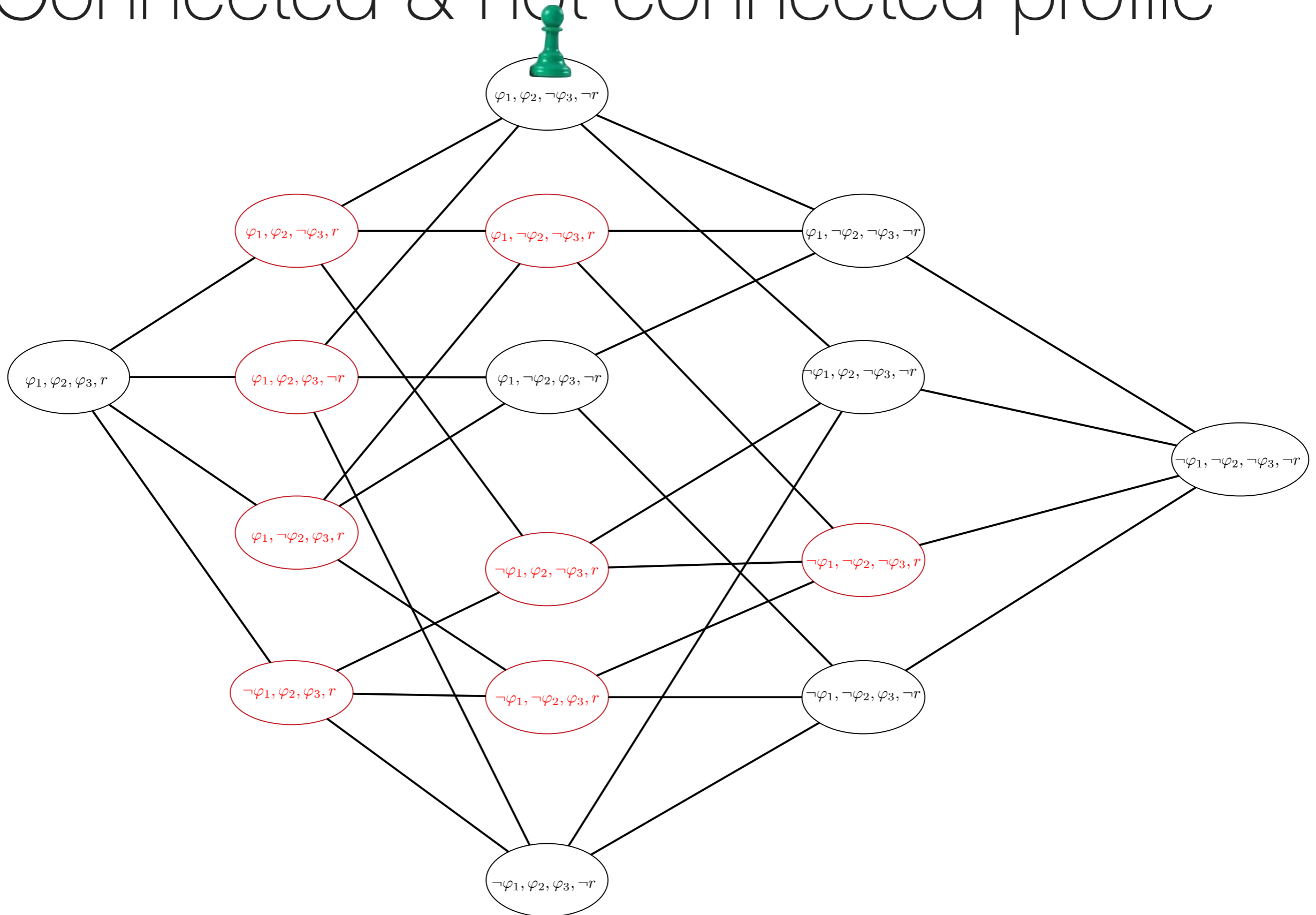
Necessary conditions:

- Odd number of agents
- Connected profile

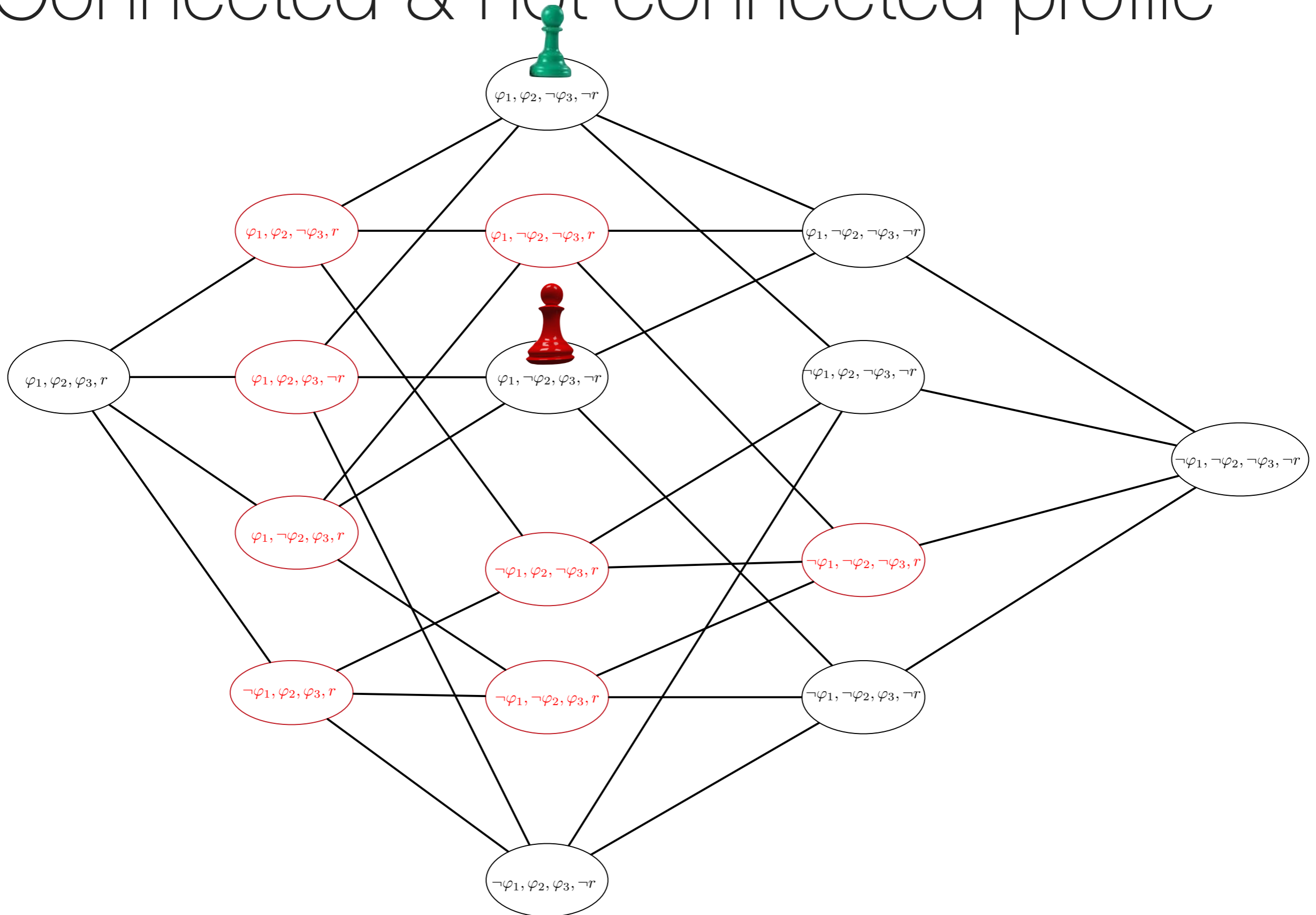
Connected & not connected profile



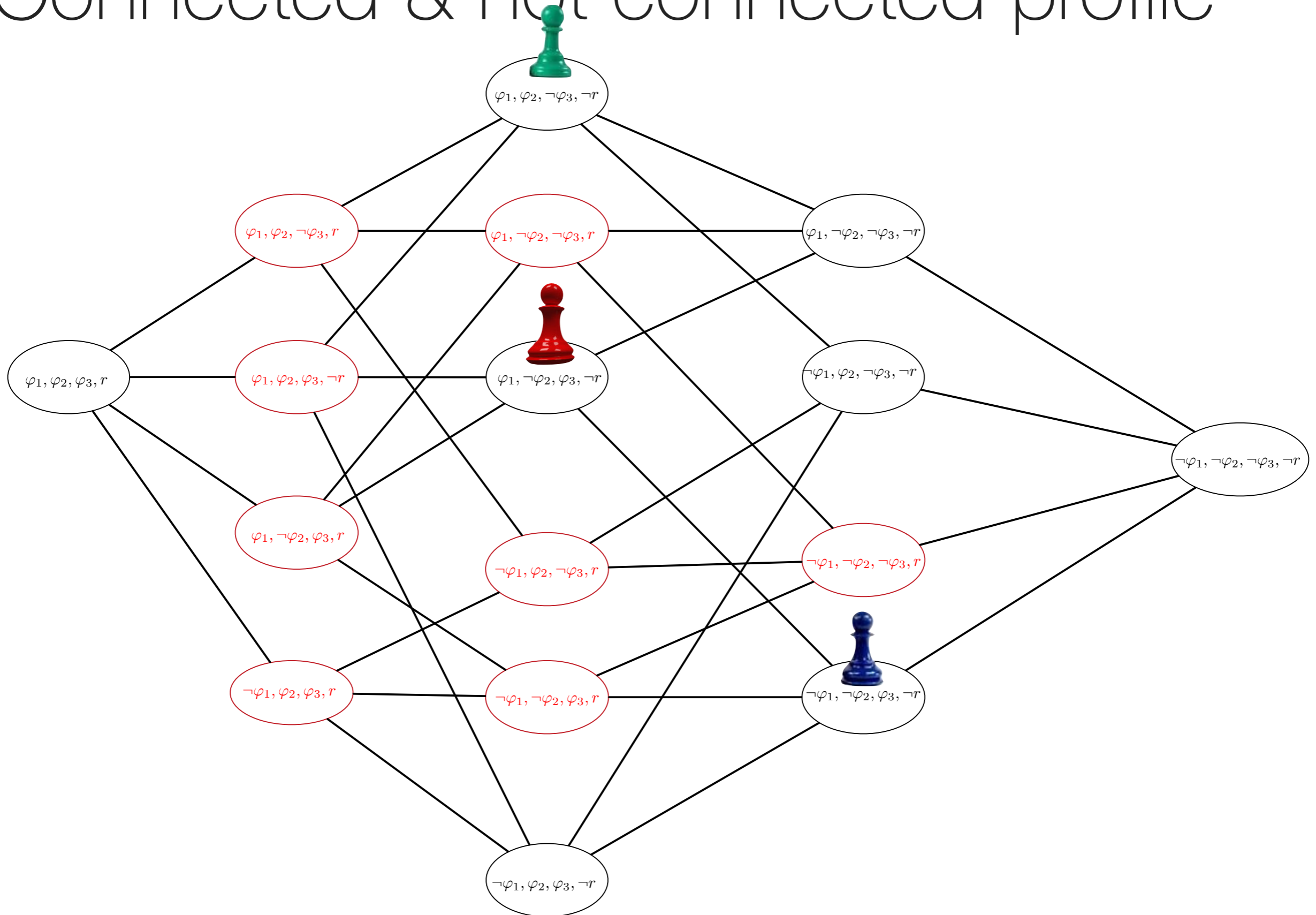
Connected & not connected profile



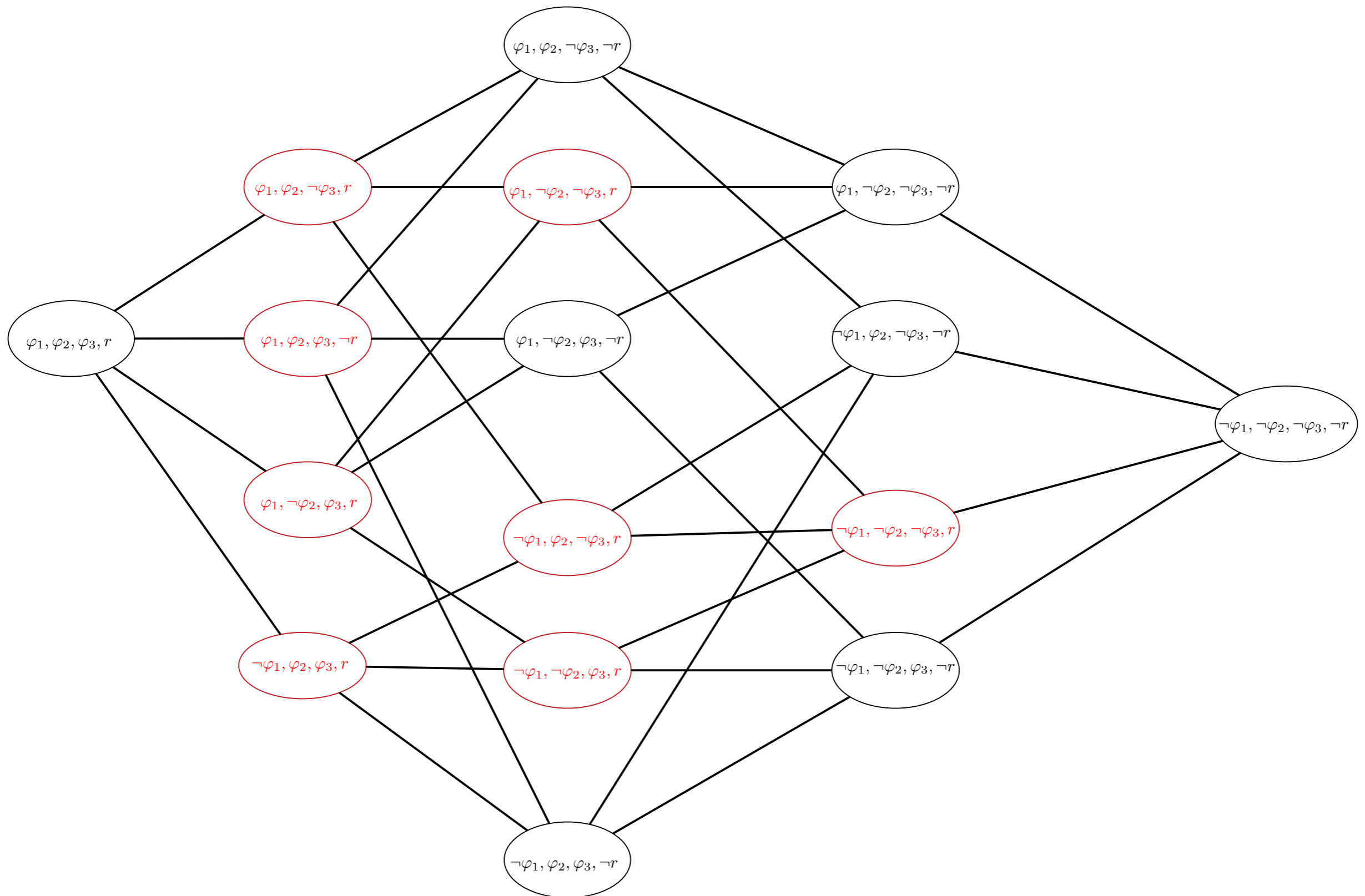
Connected & not connected profile



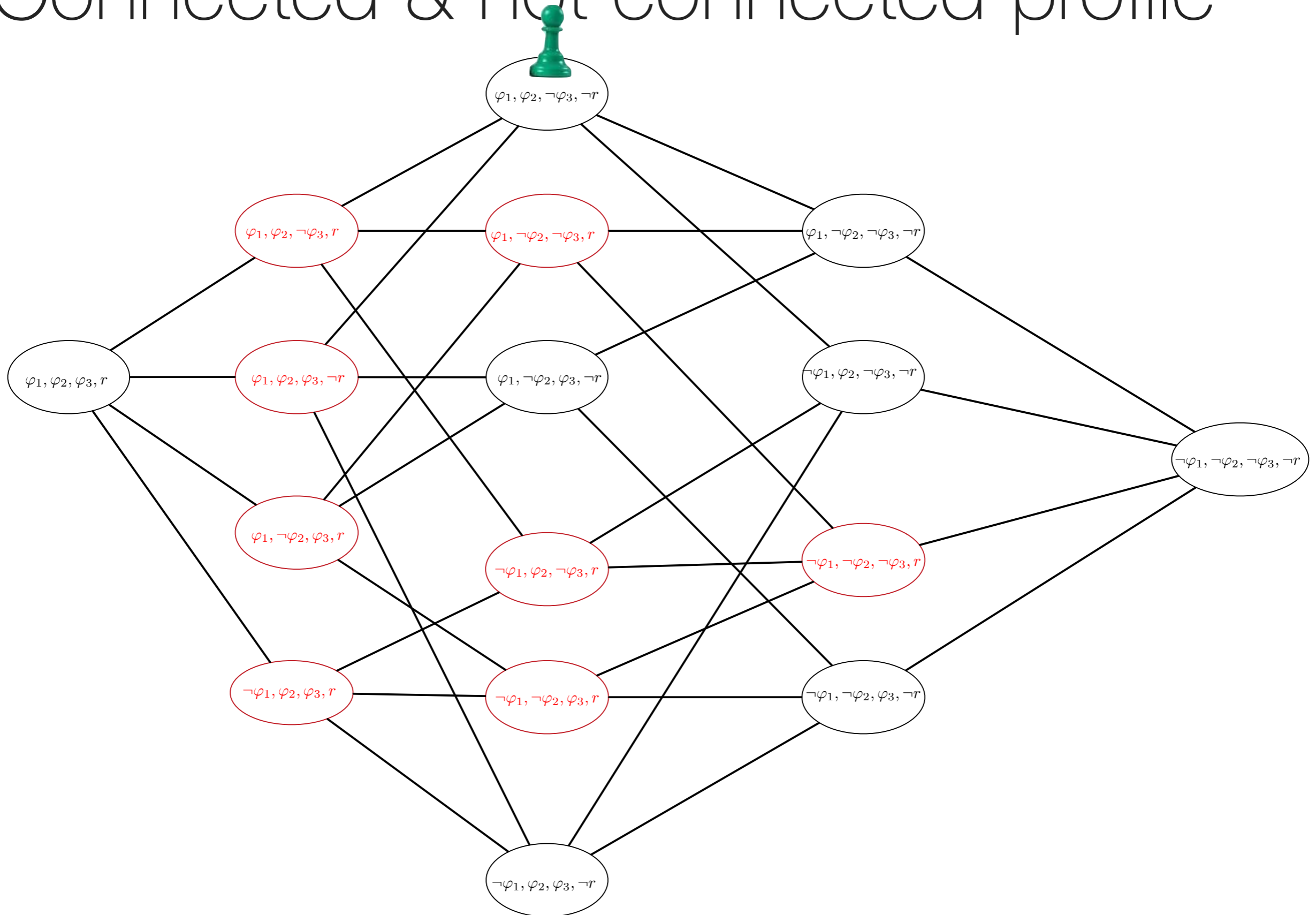
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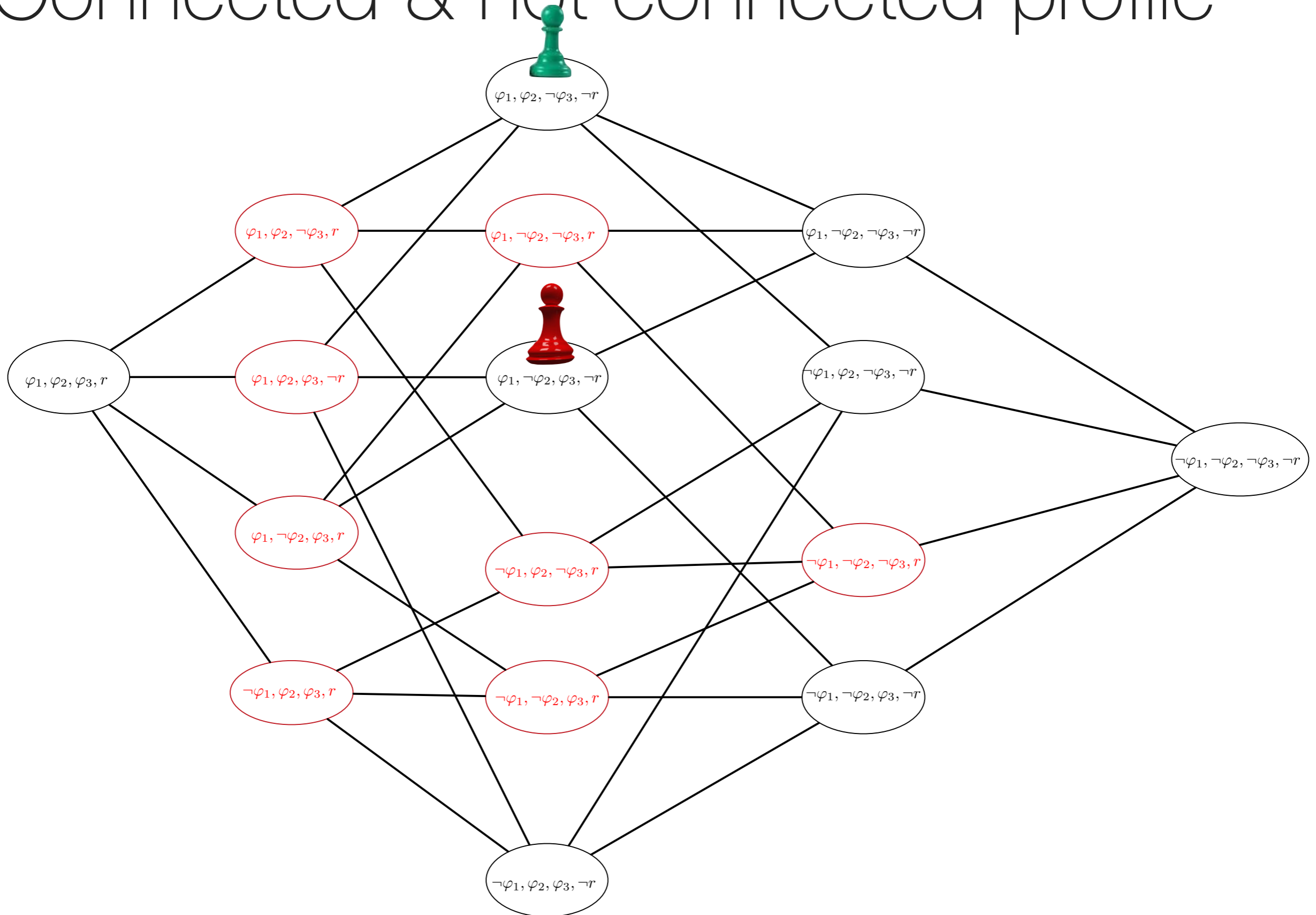
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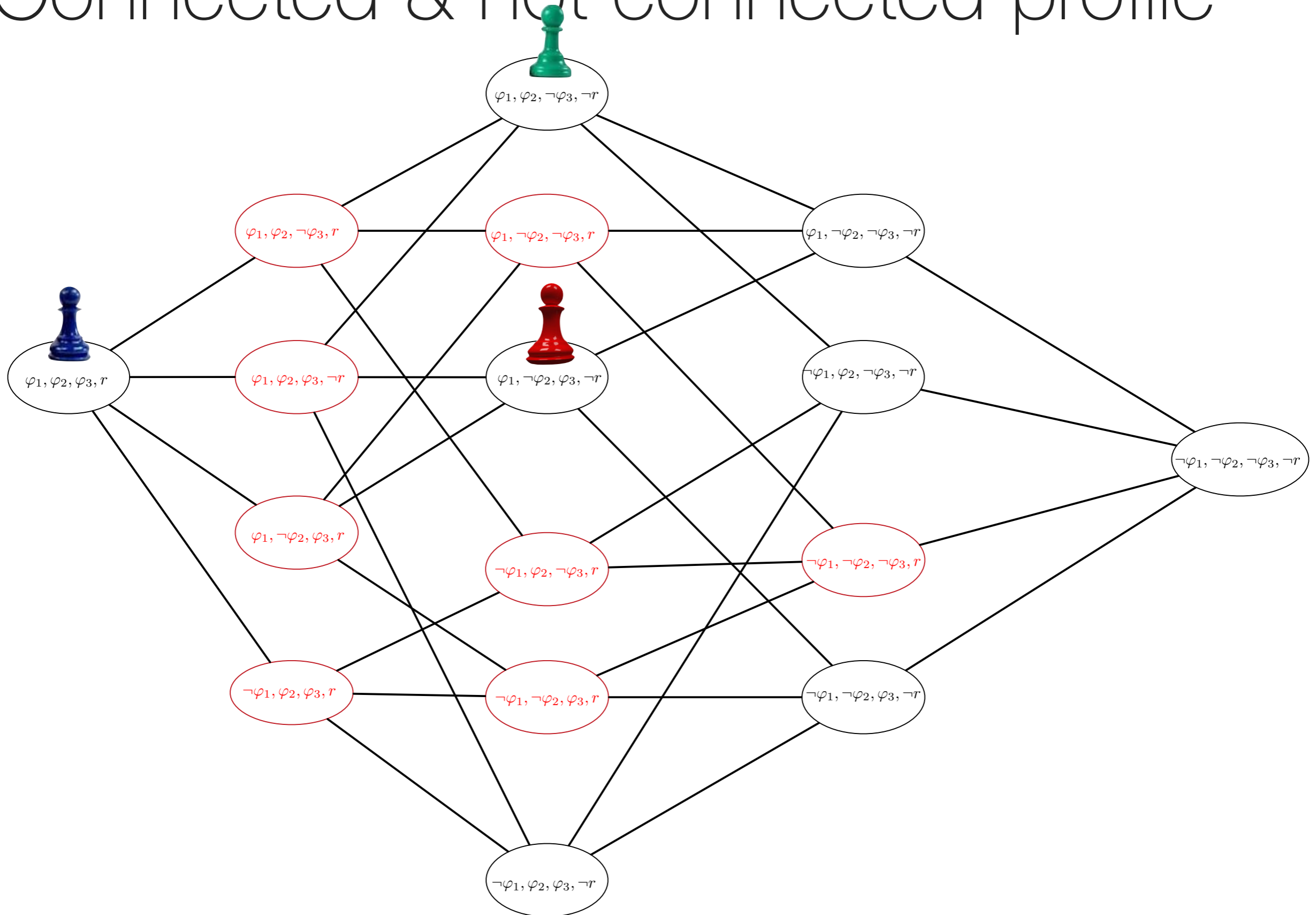
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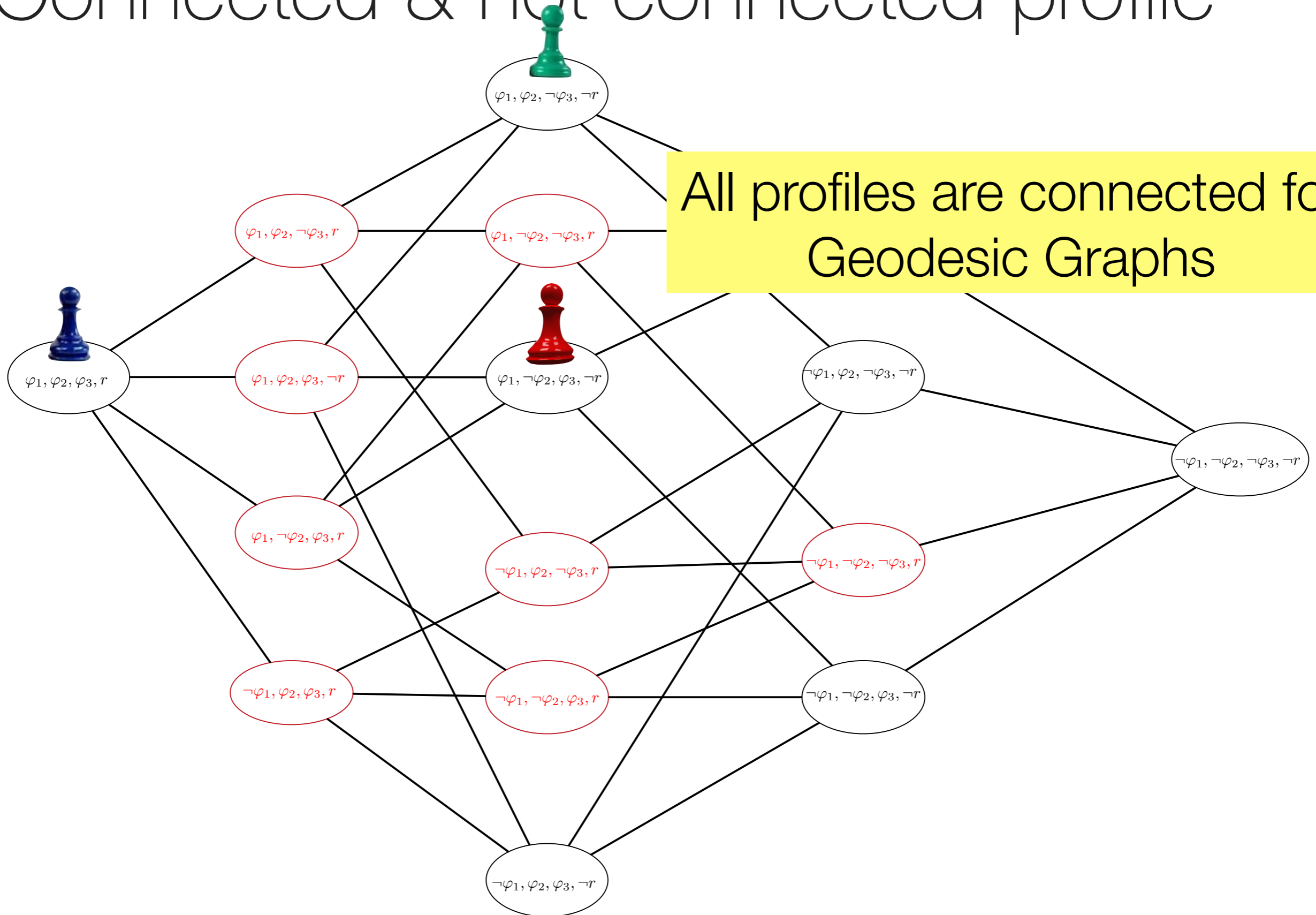
Connected & not connected profile



Connected & not connected profile



Connected & not connected profile

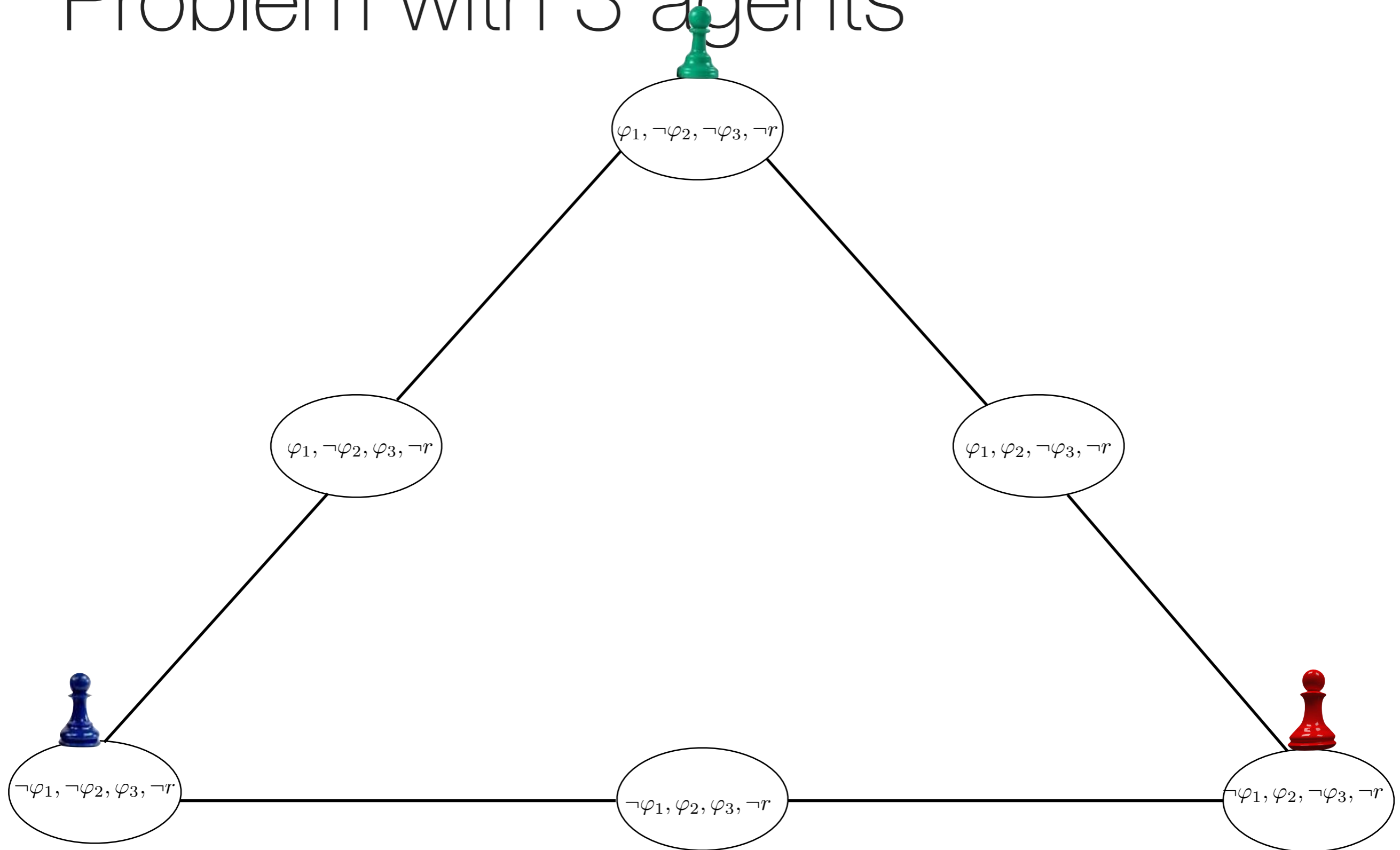


When does the algorithm (probabilistically) terminate?

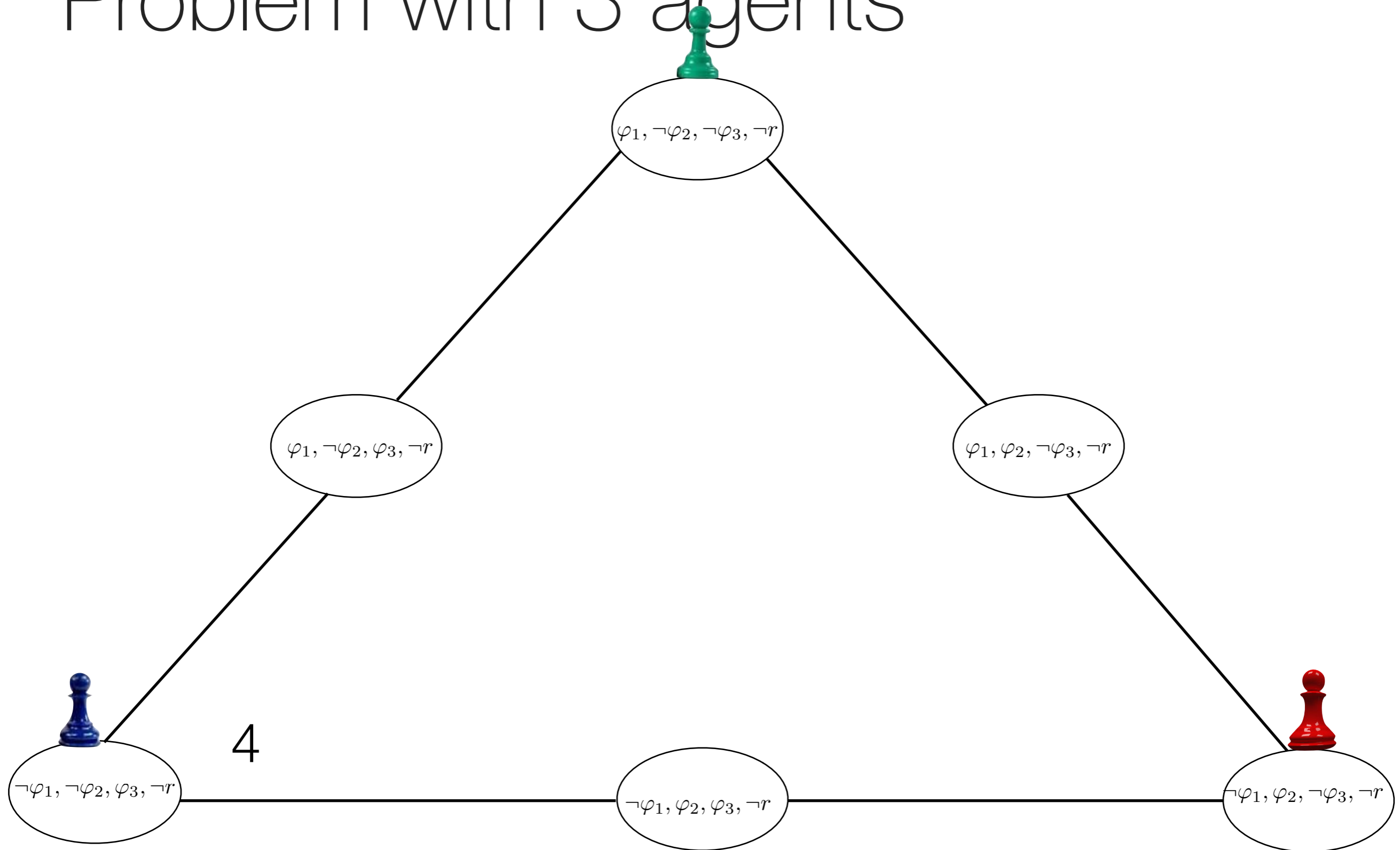
Sufficient conditions:

- More than 3 agents
- Good shape of profile subgraph

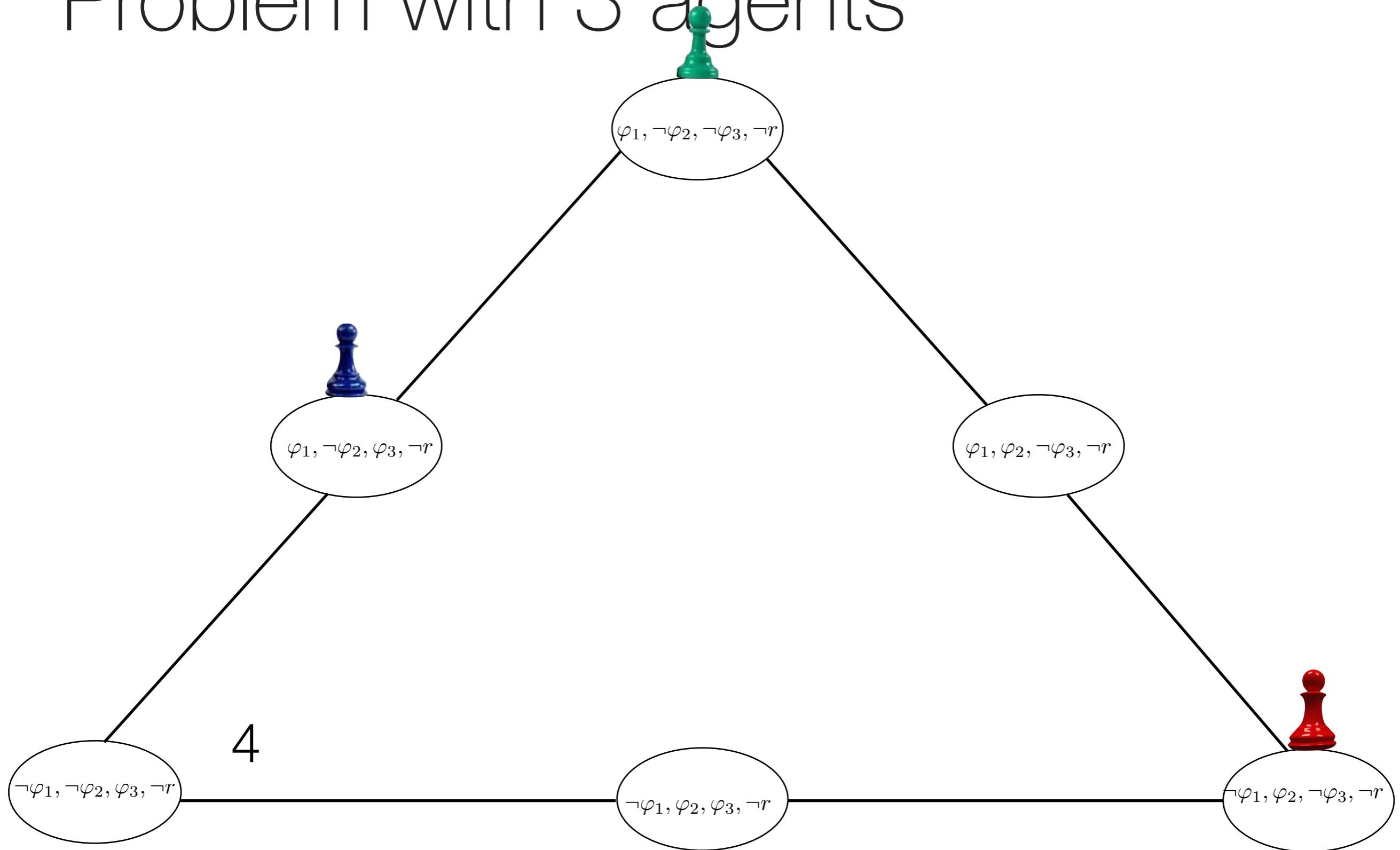
Problem with 3 agents



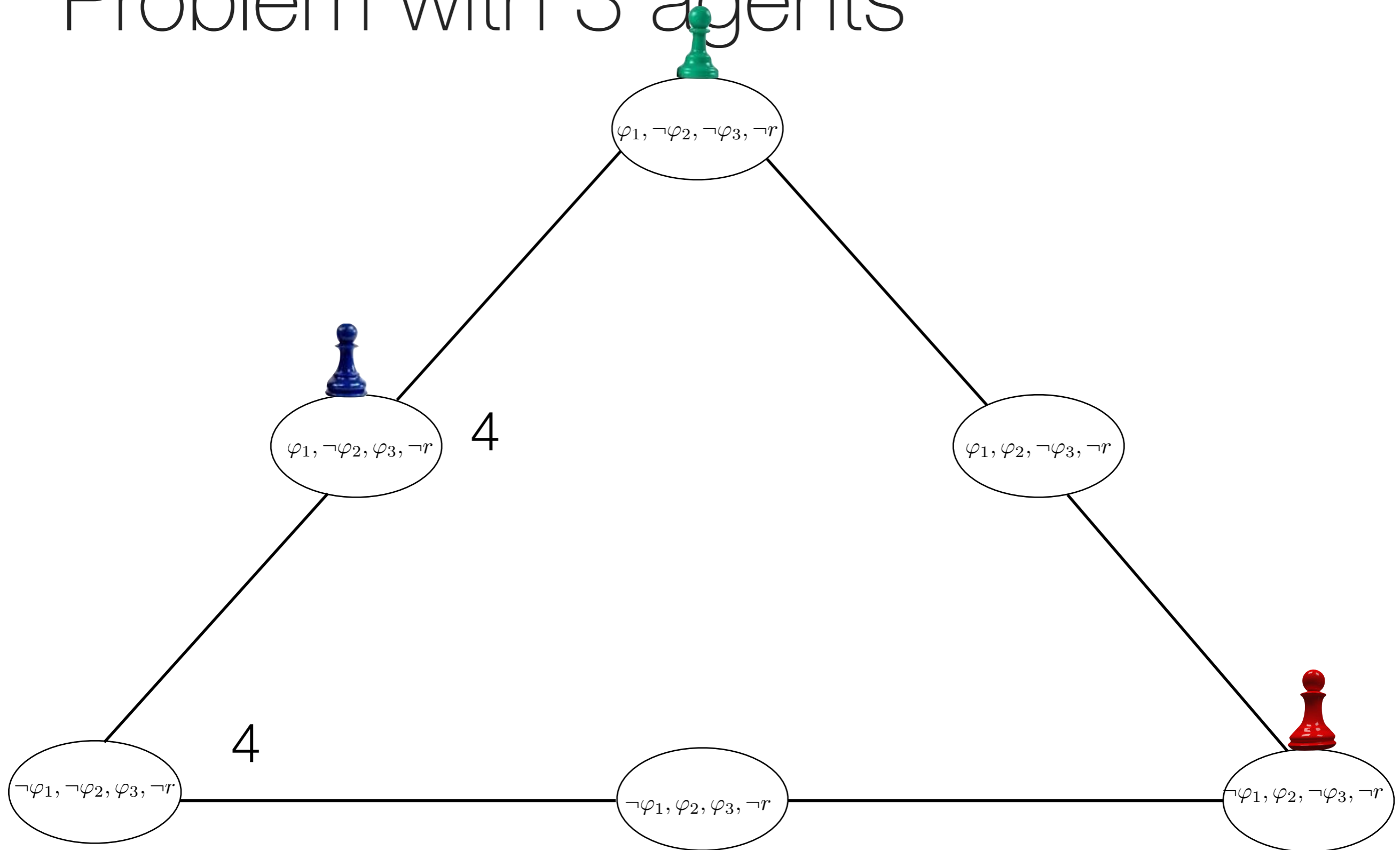
Problem with 3 agents



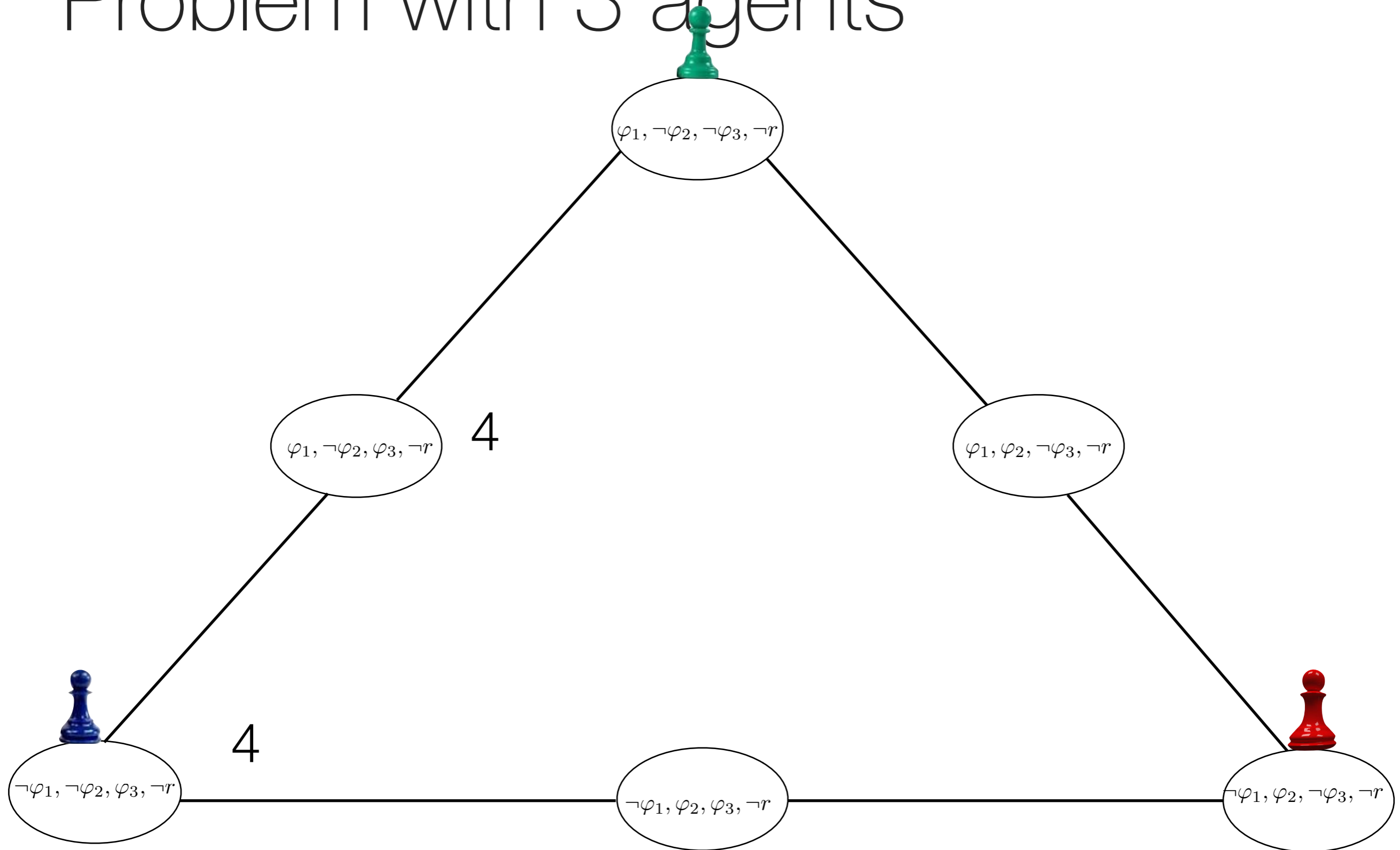
Problem with 3 agents



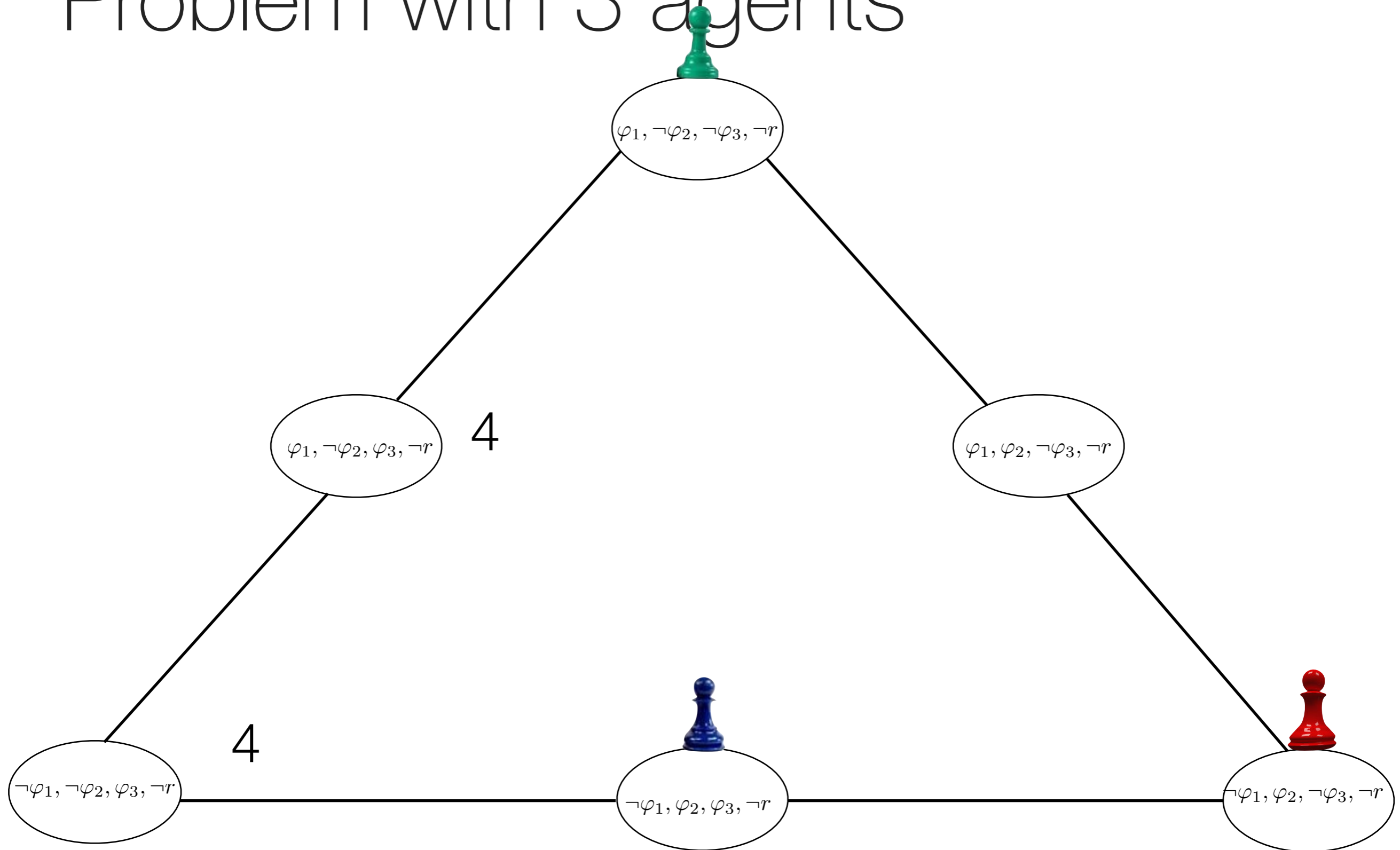
Problem with 3 agents



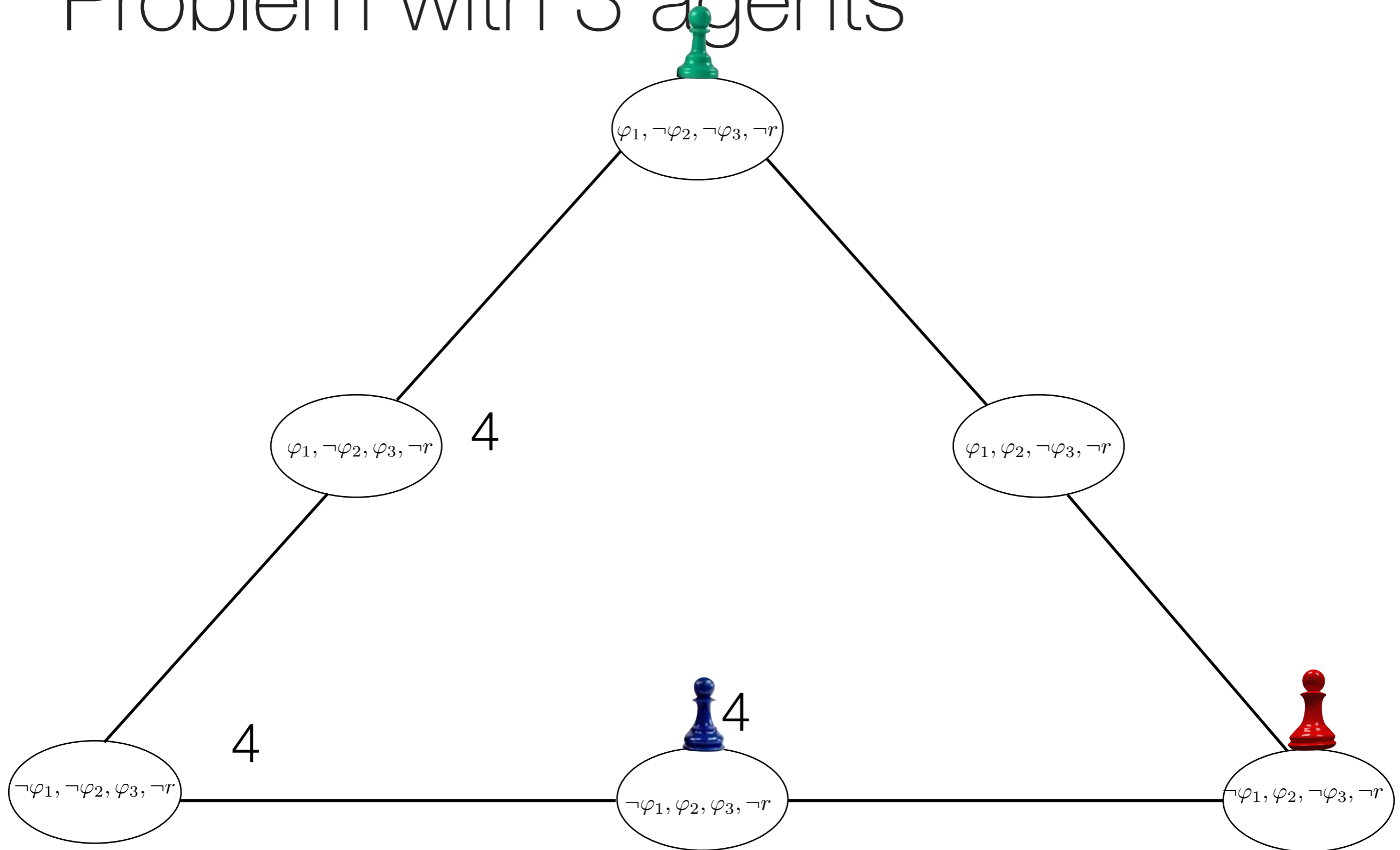
Problem with 3 agents



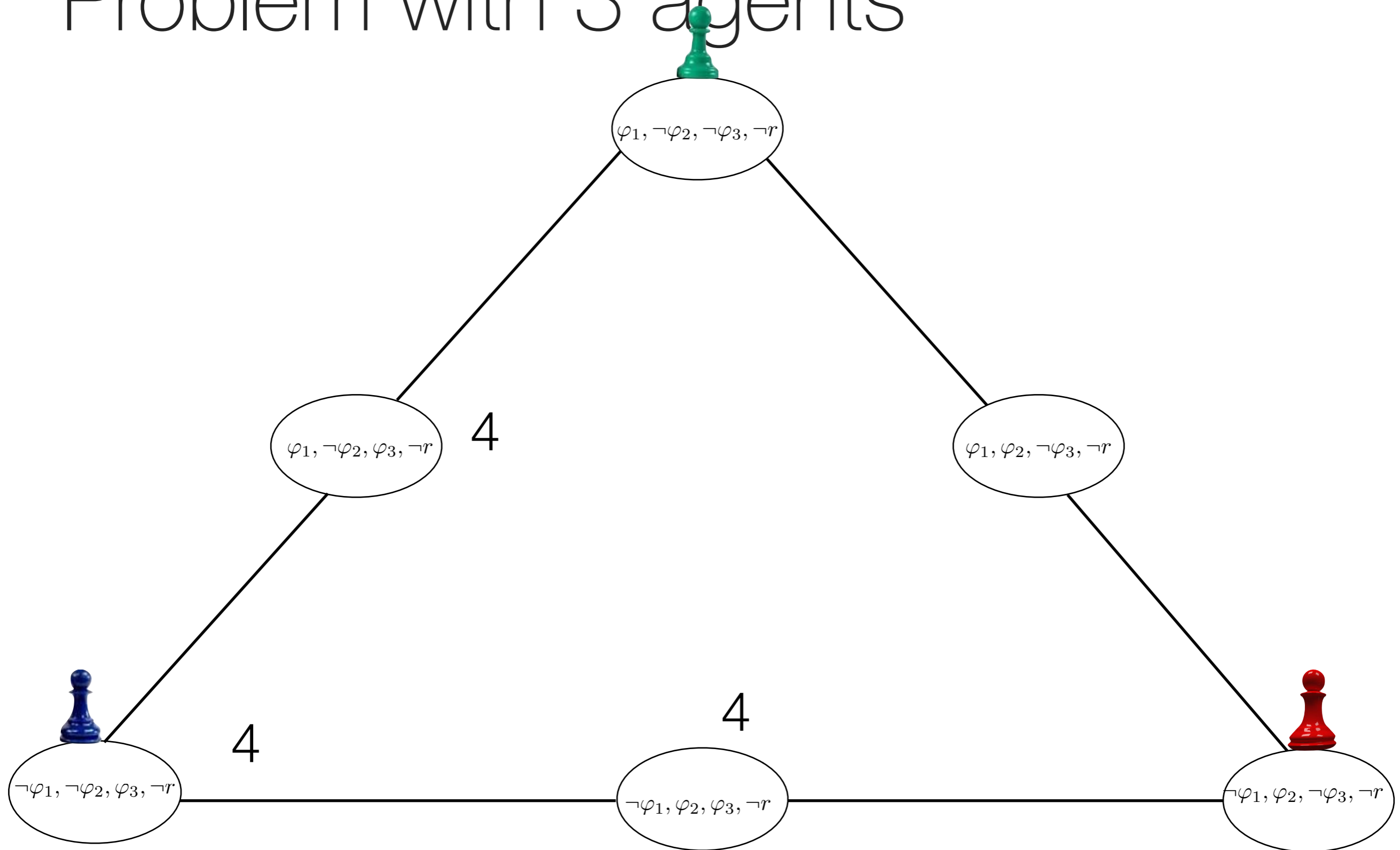
Problem with 3 agents



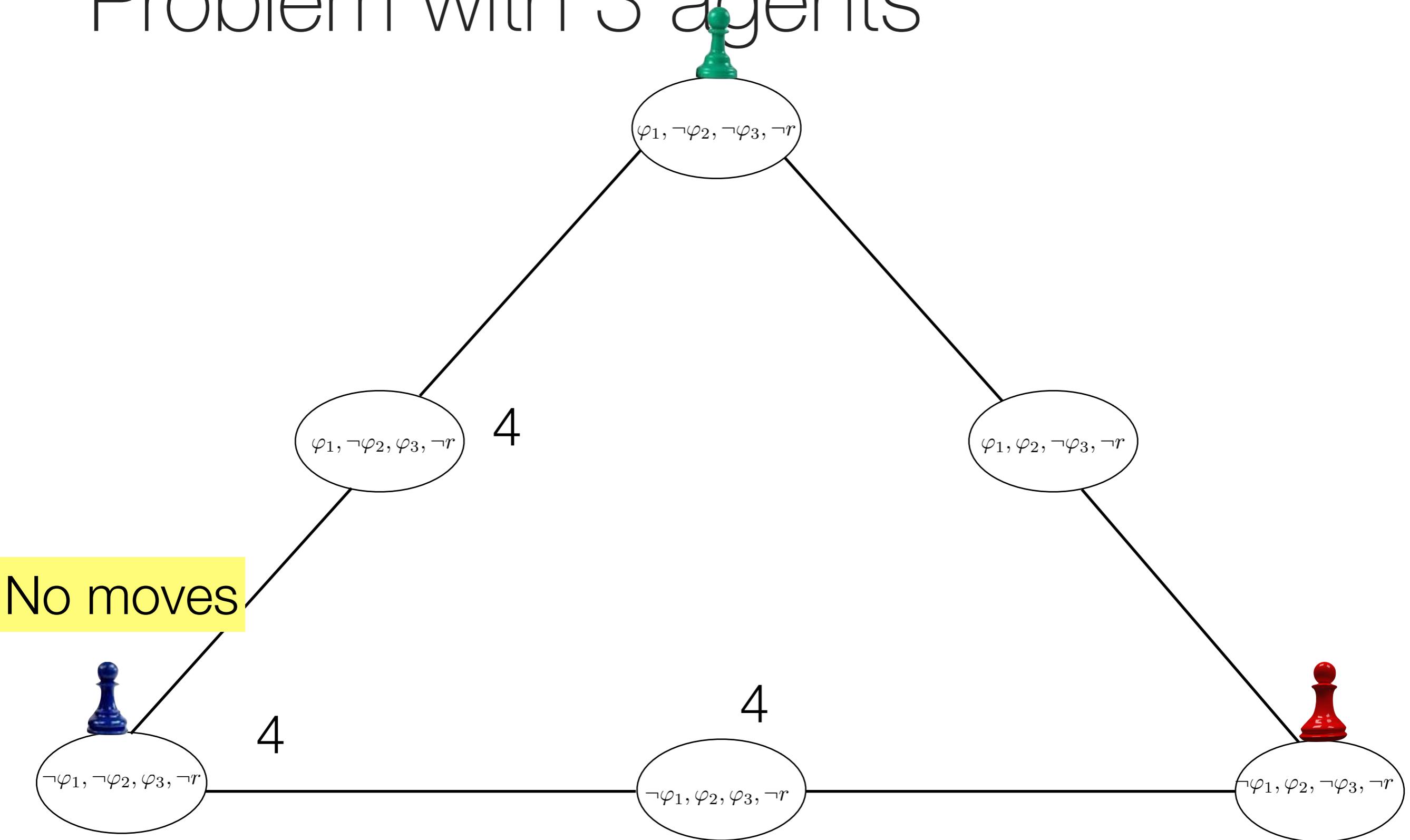
Problem with 3 agents



Problem with 3 agents



Problem with 3 agents



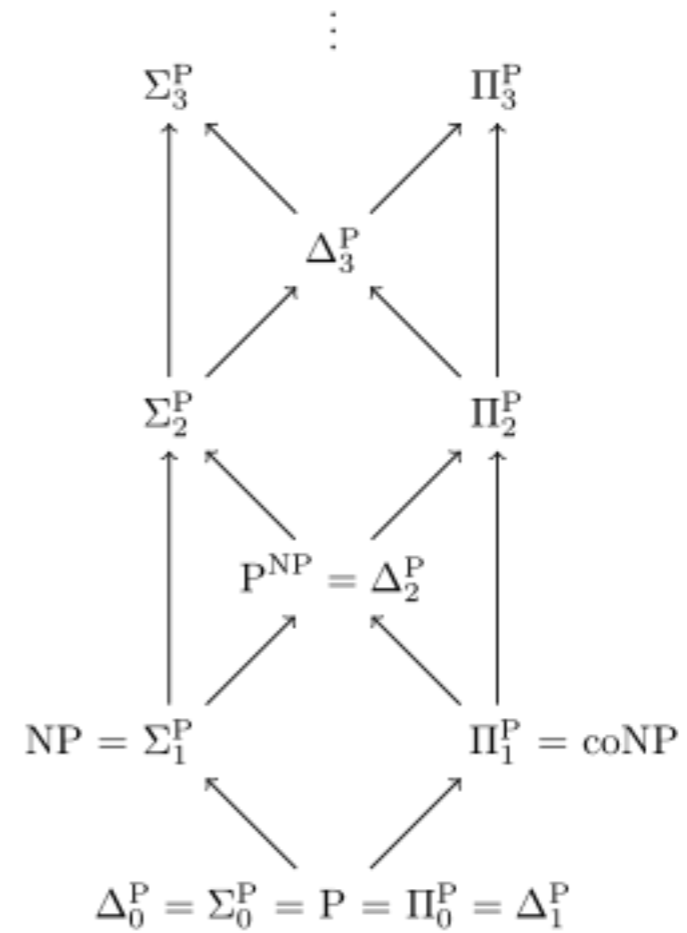
Good profile sub-graph shapes

So far:

- Trees, or
- No more than 2 edges per node

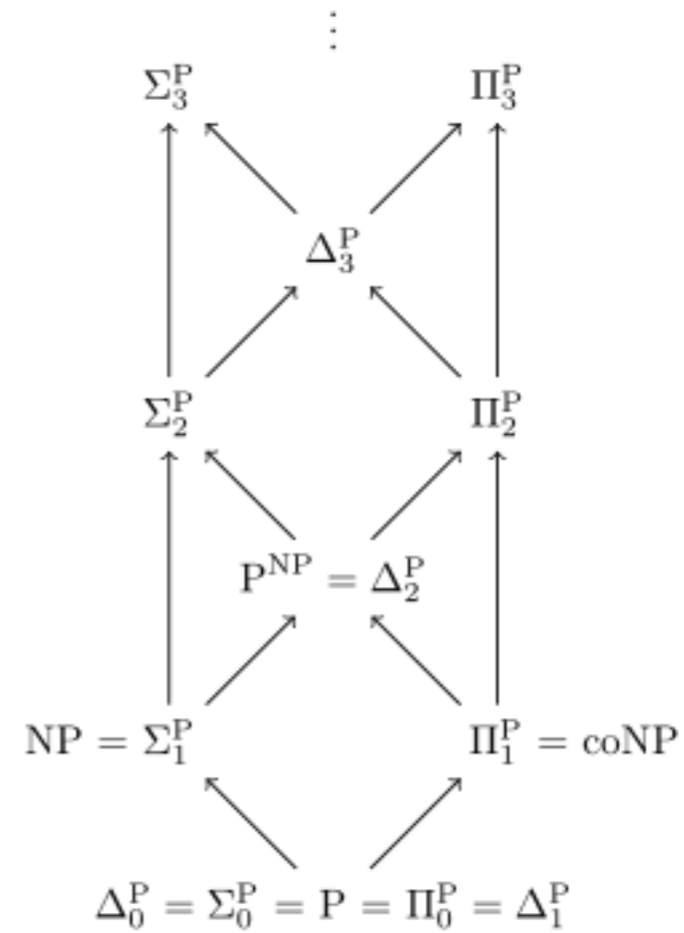
Complexity

Complexity



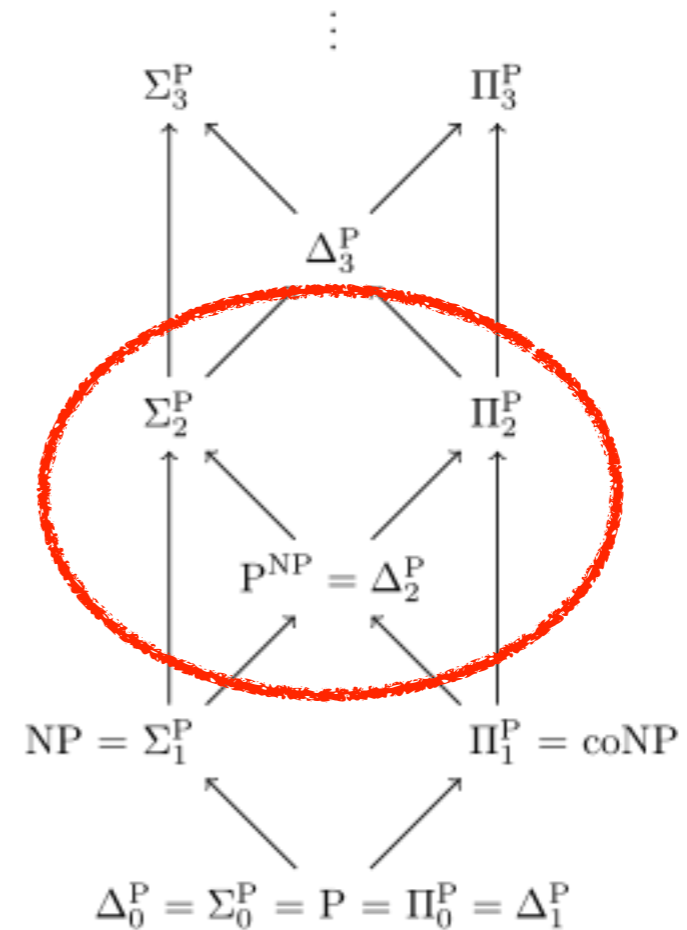
Complexity

Geodesic graph



Complexity

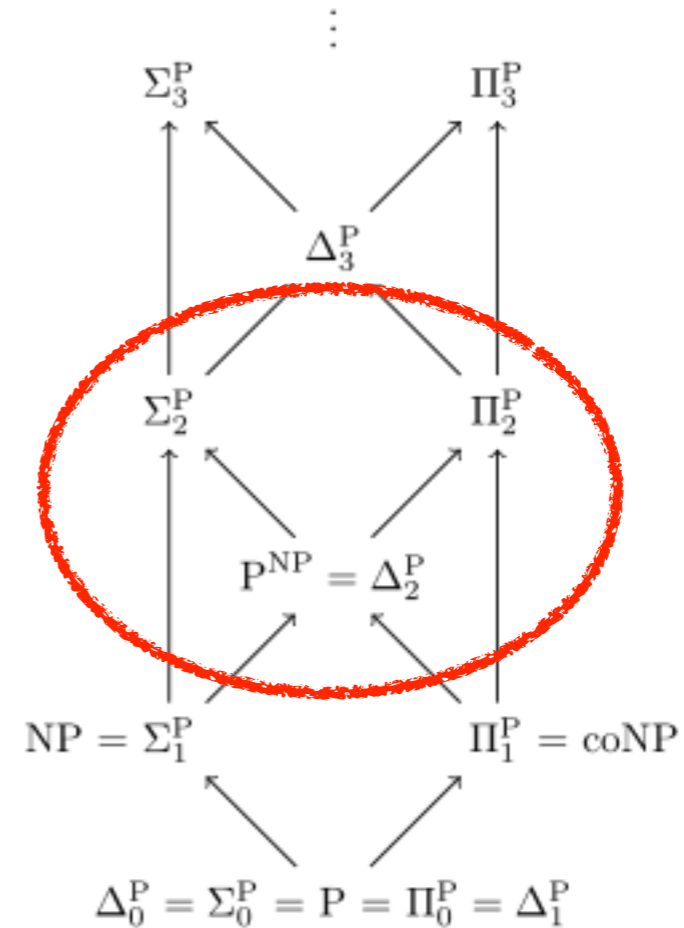
Geodesic graph



Complexity

Geodesic graph

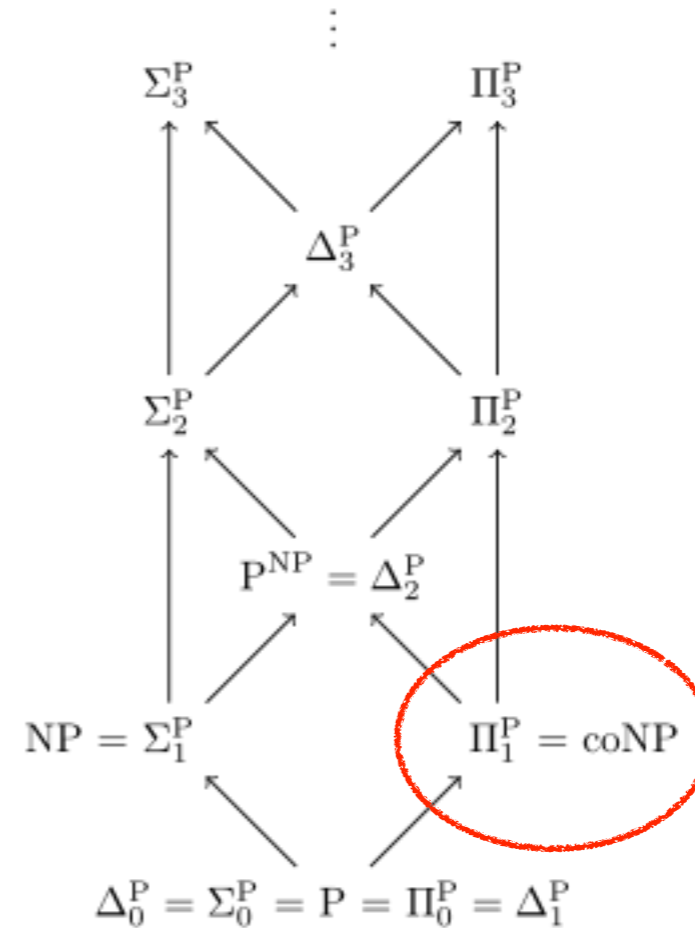
Hamming graph



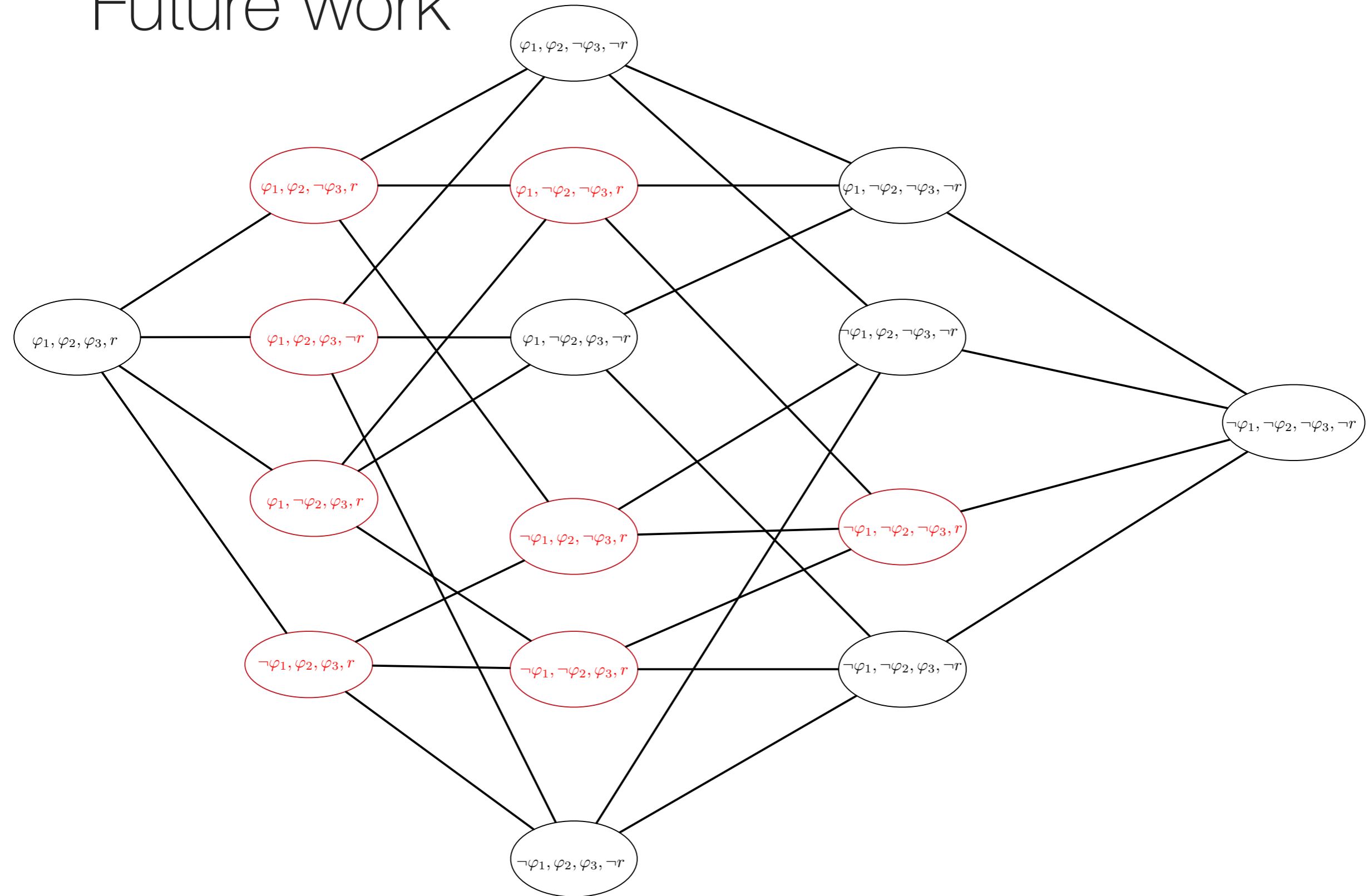
Complexity

Geodesic graph

Hamming graph

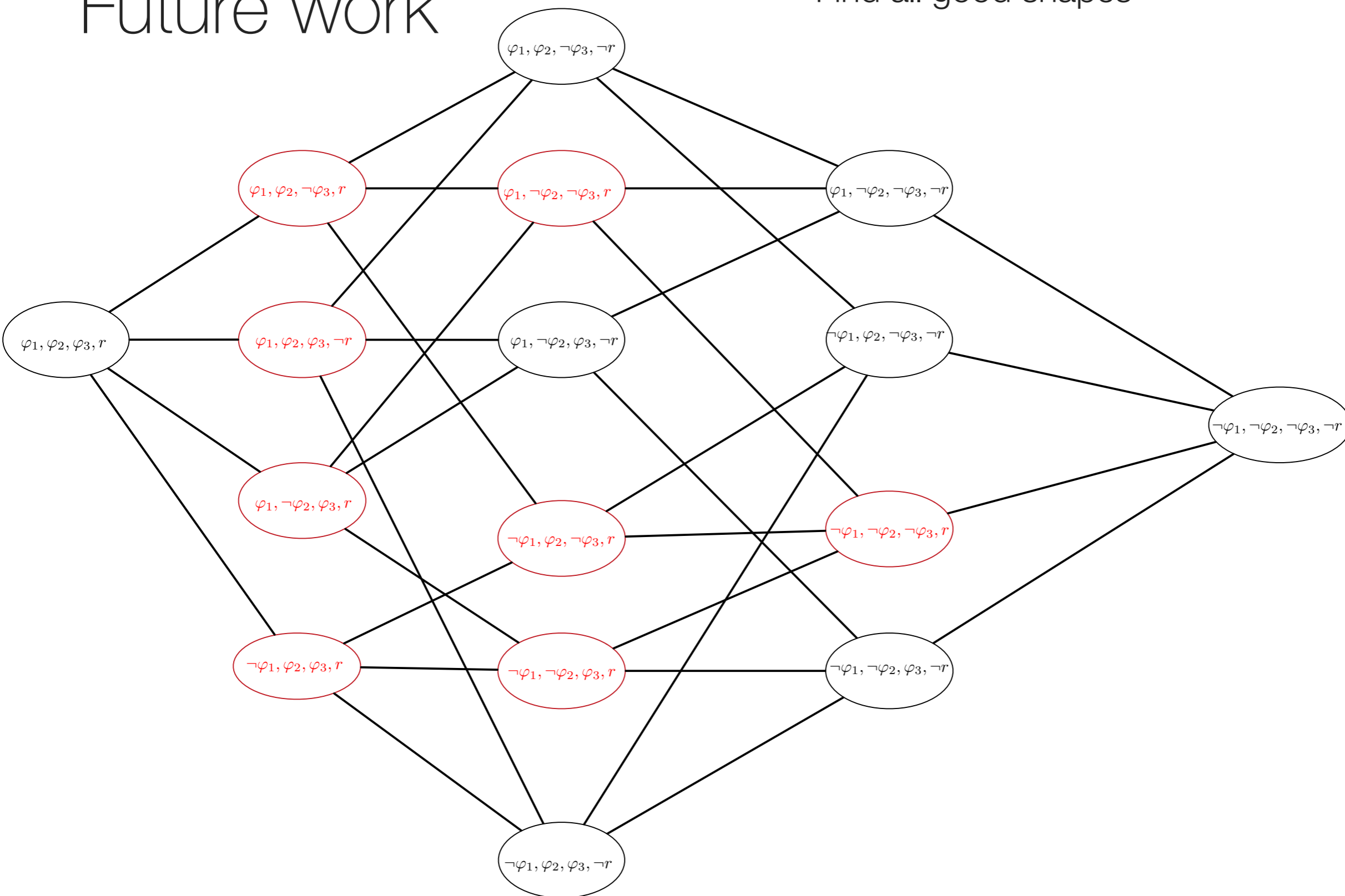


Future work



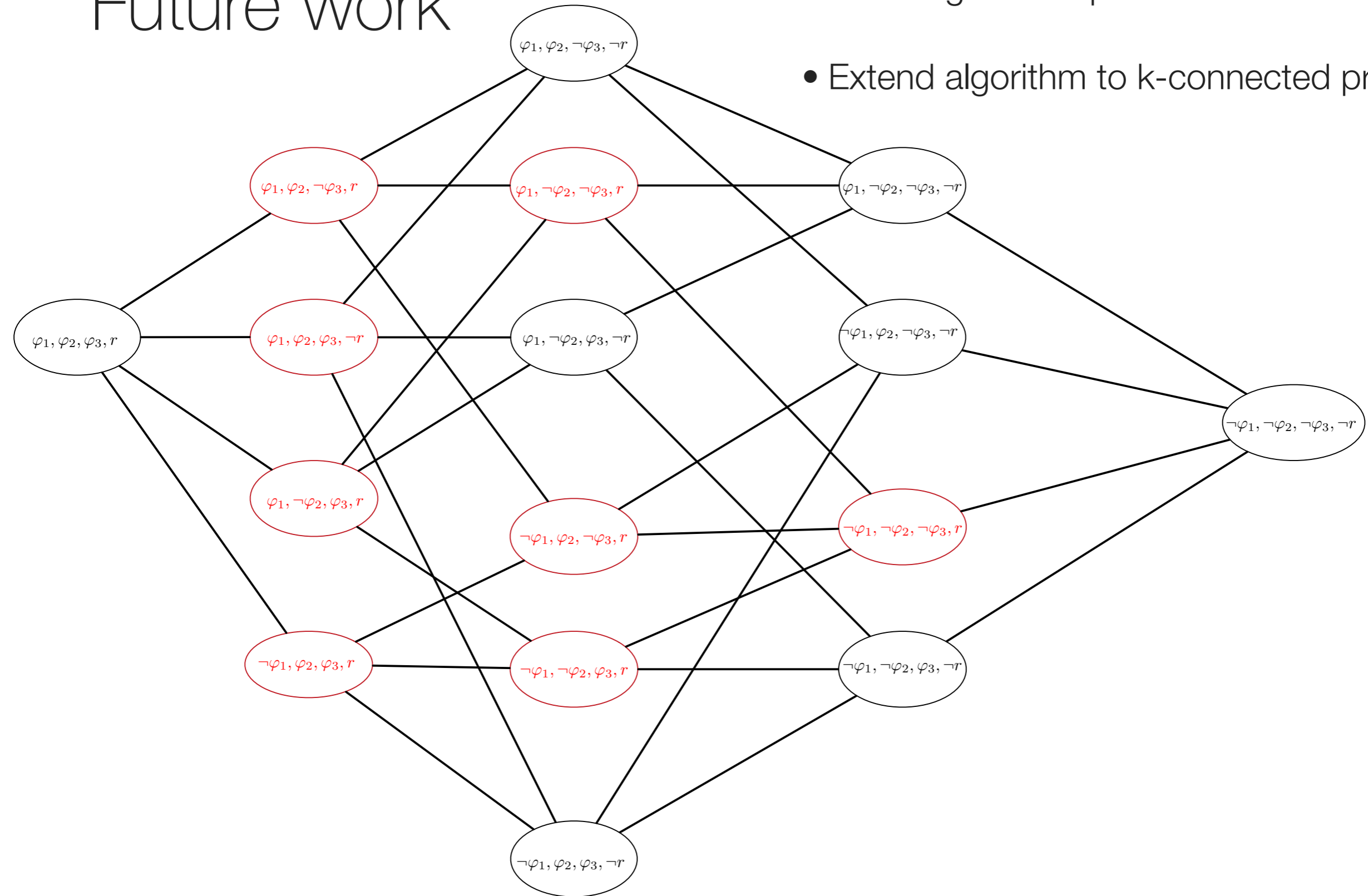
Future work

- Find all good shapes



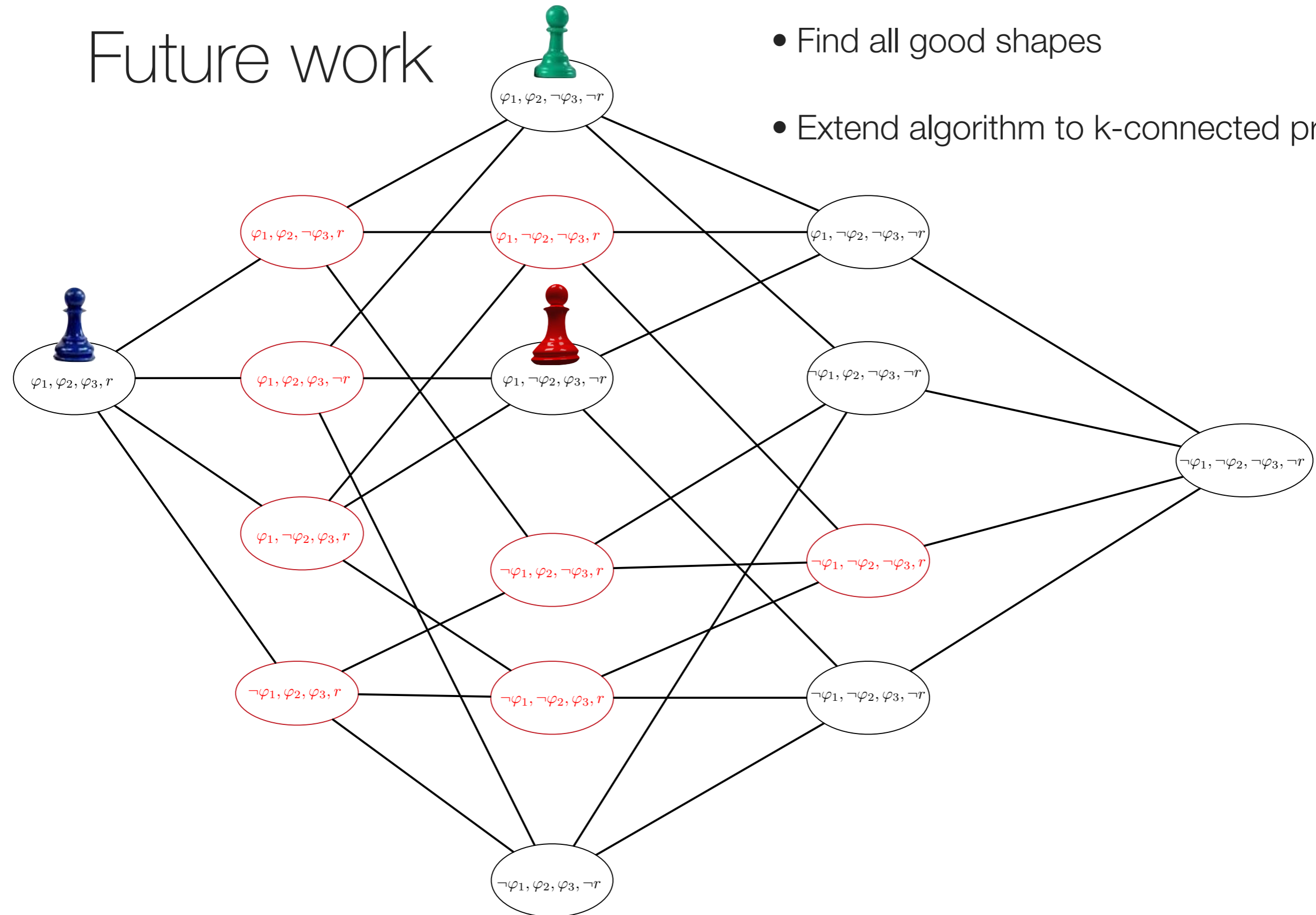
Future work

- Find all good shapes
- Extend algorithm to k-connected profiles



Future work

- Find all good shapes
- Extend algorithm to k-connected profiles



Future work

- Find all good shapes
- Extend algorithm to k-connected profiles
- Get closer to friends not to all

