

Fuz In A Row

A Fuzzy Tactics Agent For Connect-4

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1 Our Challenge

- Explanation
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2 Timeline

Explanation

- Specific Challenge
- Challenge Domain
- Uncertainty
 - Opponent

1 Our Challenge

- Explanation
- **Approaches**
- Our approach/solution
- Miscellaneous

2 Timeline

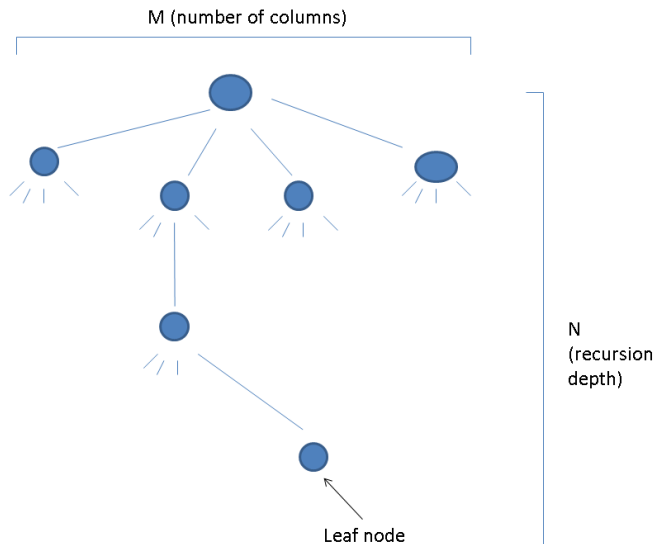
- Using Linguistic Fuzzy Logics for a more flexible decision making
 - Linguistic Fuzzy-Logic Game Theory
- Use a knowledgebase with rules and previous games
 - A Knowledge-based Approach of Connect-Four
- Using a Fuzzy Agent in a game for tactics
 - Fuzzy Tactics: A scripting game that leverages fuzzy logic as an engaging game mechanic

1 Our Challenge

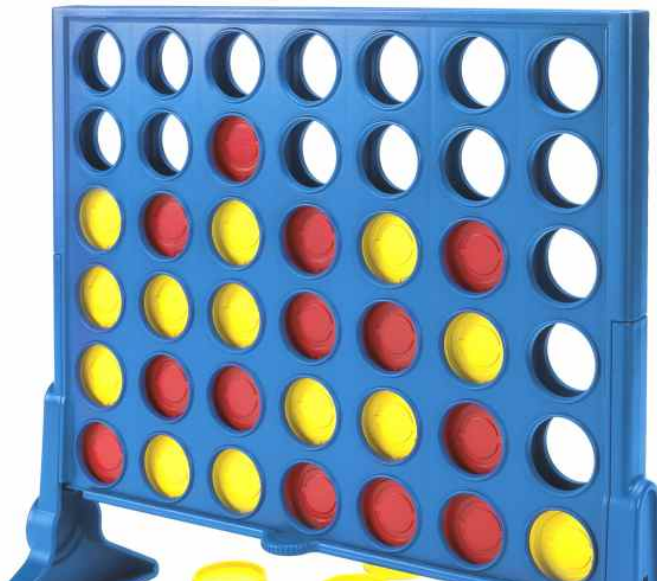
- Explanation
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2 Timeline

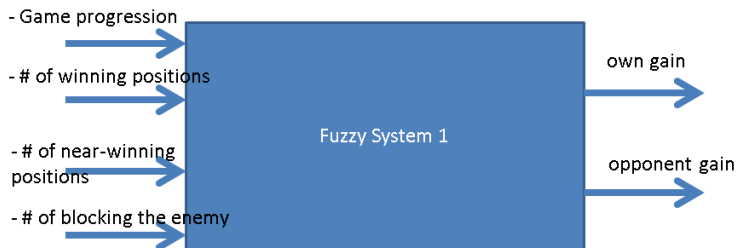
Our approach/solution



Our approach/solution



Leaf Node fuzzy system



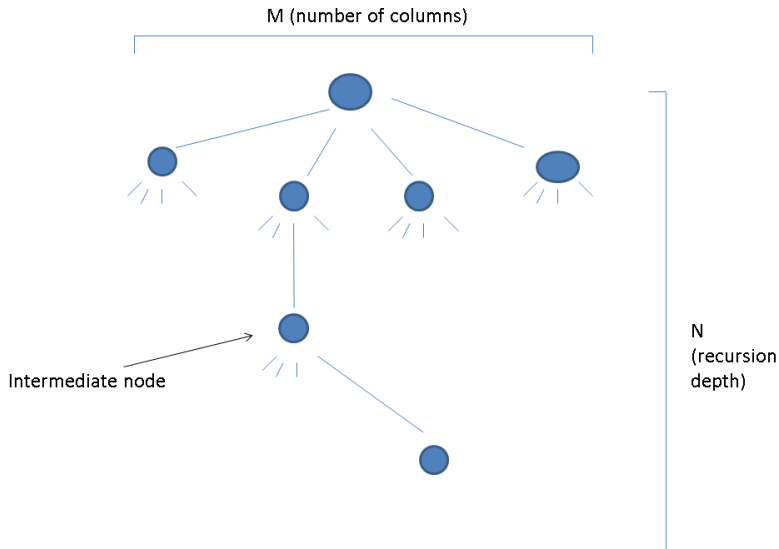
Example Rule:

IF #winningpositions IS High AND game progression IS early THEN
own gain IS high

7 inputs

2 outputs

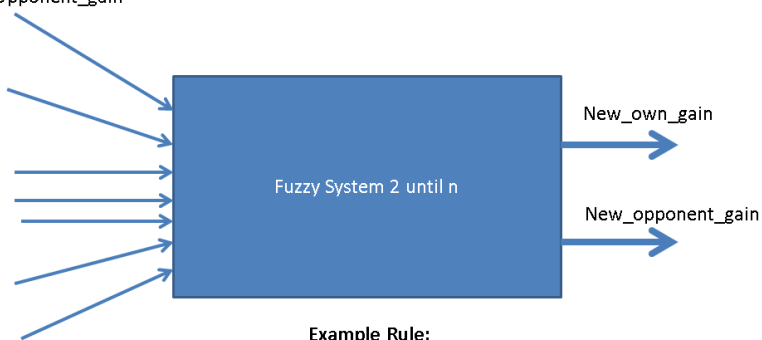
Our approach/solution



Intermediate Node fuzzy system

M times from deeper nodes:

- Own_gain
- Opponent_gain



Example Rule:

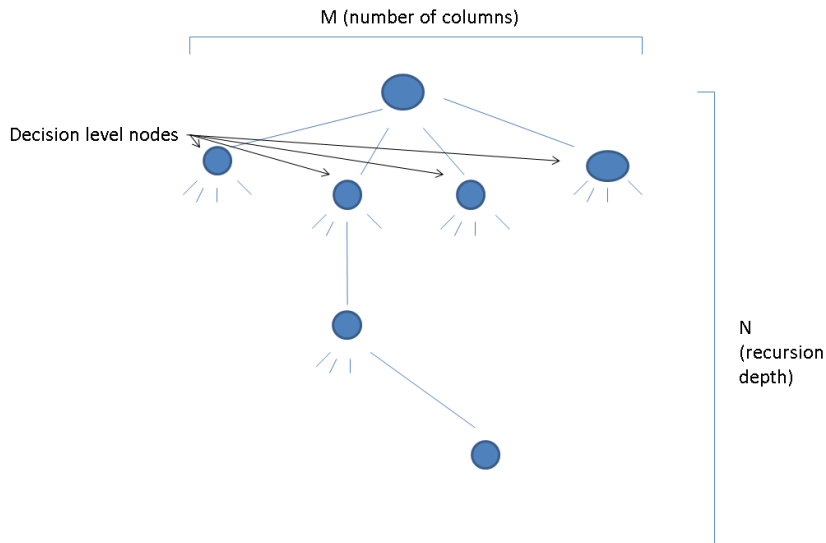
IF $\text{sum}(\text{own_gain})$ IS high AND $\text{sum}(\text{opponent_gain})$ IS low THEN
new_own_gain IS high

M*2 inputs

2 outputs

M = number of columns

Our approach/solution



Things to possibly research

- If we change parametrisation within the fuzzy systems, how does that change the performance of the agent?
- How does the agent hold against a agent based on other algorithms such as MonteCarlos or Neural Networks?
- Does the agent perform better when recursion depth increases?

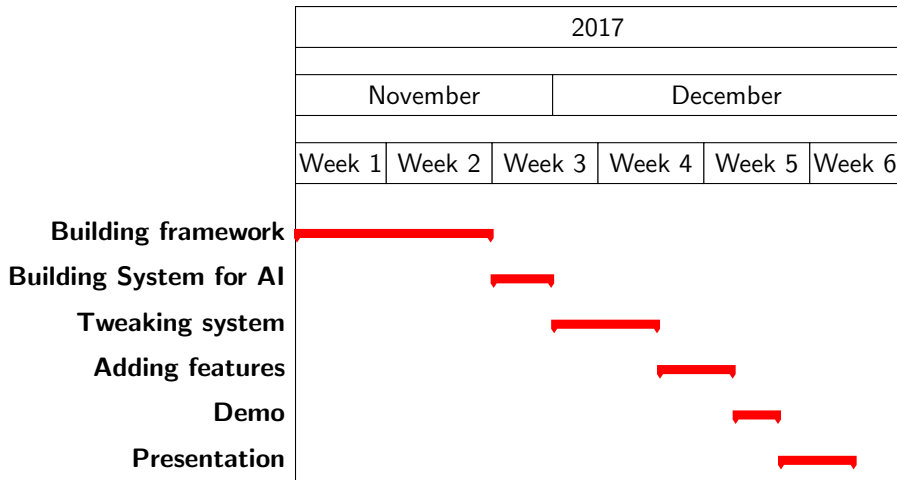
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2 Timeline

- Expert knowledge
- Software tools
- Evaluation
- Collaboration

Timeline



- Allis, L. V. (1988). A knowledge-based approach of connect-four. Vrije Universiteit, Subfaculteit Wiskunde en Informatica.
- Arfi, B. (2006). Linguistic fuzzy-logic game theory. Journal of conflict resolution, 50(1), 28-57.
- Pirovano, M., Lanzi, P. L. (2014). Fuzzy Tactics: A scripting game that leverages fuzzy logic as an engaging game mechanic. Expert Systems with Applications, 41(13), 6029-6038.