TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Informatik
Institut Künstliche Intelligenz
General Game Playing

## Content

Program Design

Game Analysis

Visualizer

Singleplayer

Multiplayer

# laikLee

Christoph Möbius
André Viergutz
Robert Willner

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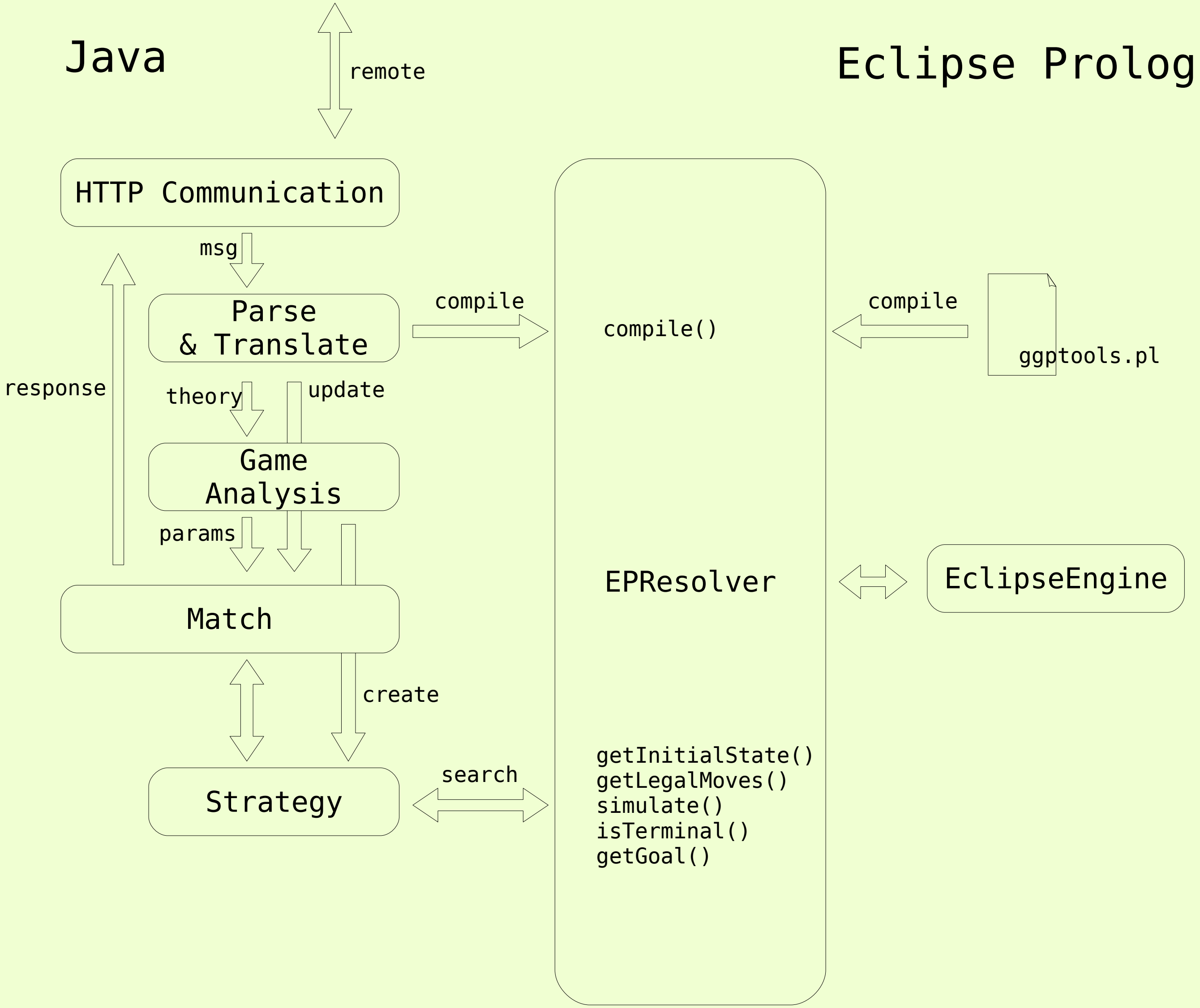
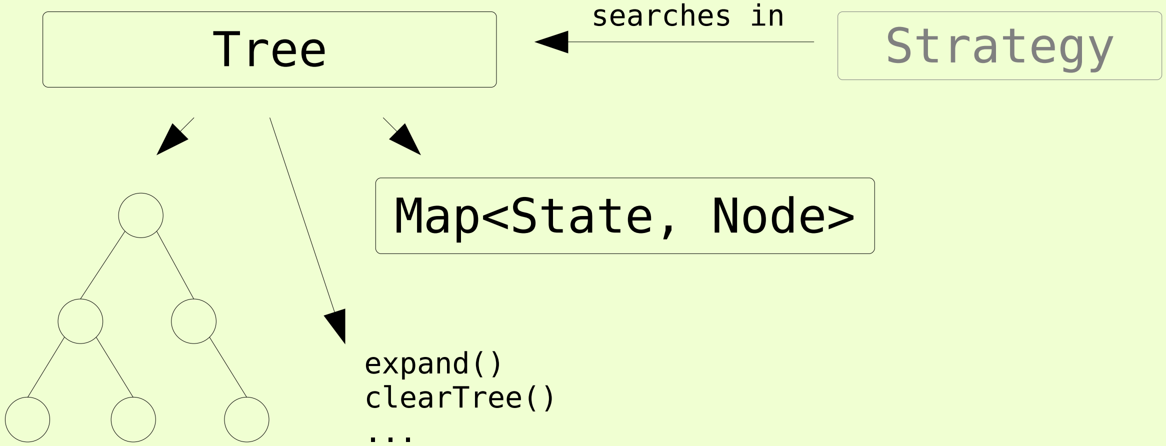


Using data structure for tree to get fast access to nodes


Tree

searches in

Strategy

Map<State, Node>

expand()
clearTree()
...

Complicated clearing routines needed due to growing heap. At the time only possible to clear whole tree.

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Able to determine the domain included minimum and maximum element

Finding successor relation

Finding step counter(s) at present but not implemented yet to deal with

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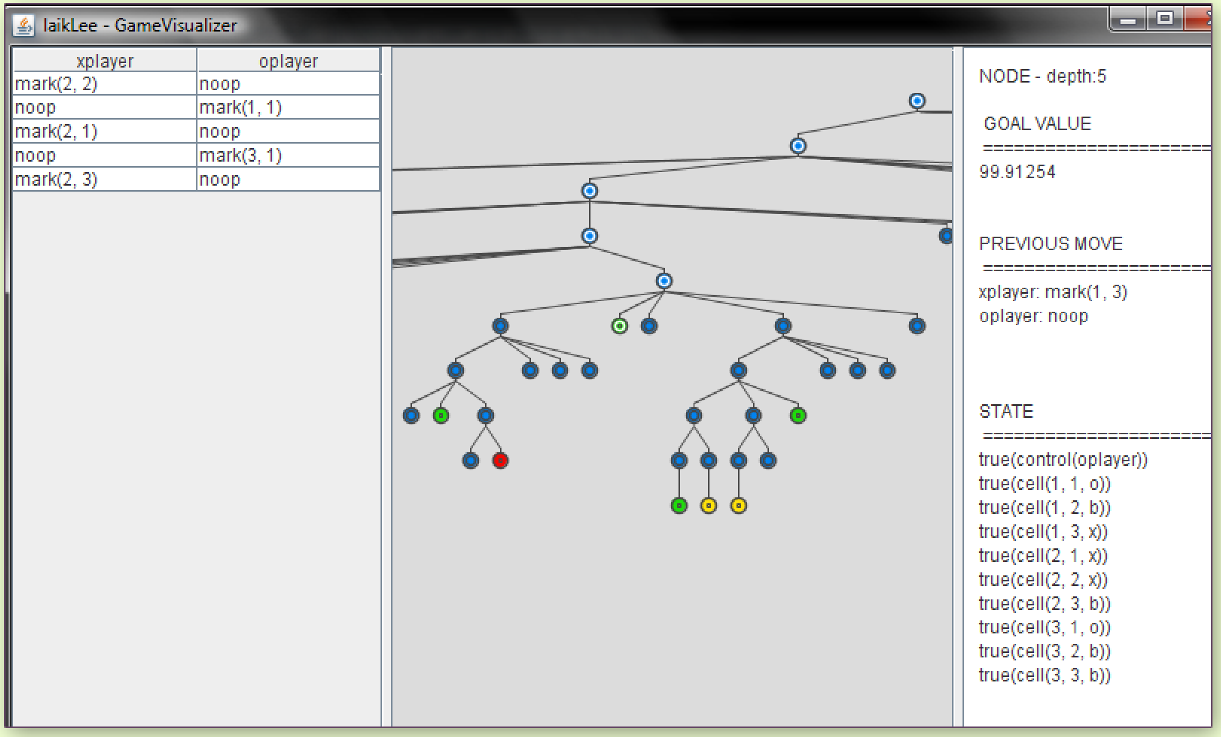


laikLee - GameVisualizer

| xplayer | oplayer |
|---|---|
| mark(2, 2) | noop |
| noop | mark(1, 1) |
| mark(2, 1) | noop |
| noop | mark(3, 1) |
| mark(2, 3) | noop |

NODE - depth:5

GOAL VALUE
======================
99.91254

PREVIOUS MOVE
======================
xplayer: mark(1, 3)
oplayer: noop

STATE
======================
true(control(oplayer))
true(cell(1, 1, o))
true(cell(1, 2, b))
true(cell(1, 3, x))
true(cell(2, 1, x))
true(cell(2, 2, x))
true(cell(2, 3, b))
true(cell(3, 1, o))
true(cell(3, 2, b))
true(cell(3, 3, b))

- can display the complete structure of the game tree
- also displays information stored in our search tree

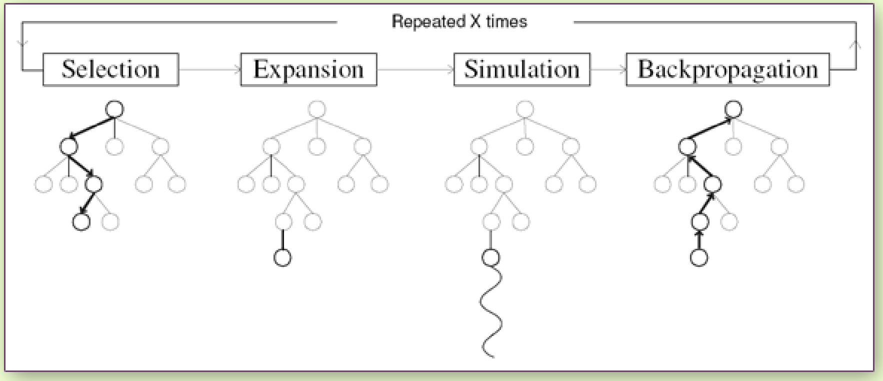
- very useful for debugging the tree-structure

Iterative deepening search

Saving information about best move and maximum evaluation of children per state

Very space consuming, but so far only solution, because of missing evaluation

- UCB1 (Upper Confidence Bounds) for rollout-based Monte-Carlo planning
- builds its lookahead tree by repeatedly sampling games from the current state



- the selection function is applied until a leaf node is reached
- one node is created
- play one simulated game
- the result of this game is backpropagated in the tree

- selection function controlls balance between exploitation and exploration

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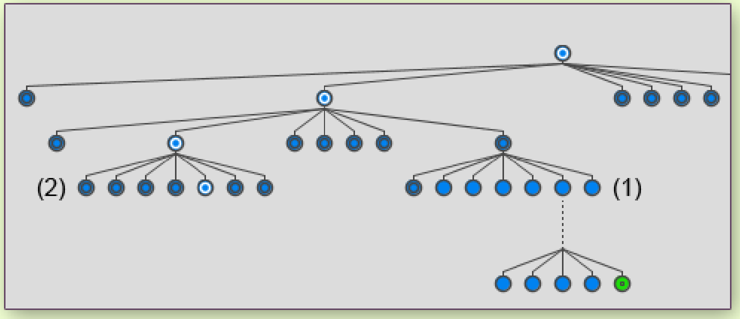
(1) selection function prefers unexplored nodes

(2) if all children nodes are explored select a node with the highest UCT value



$$\text{UctValue} = \text{node value} + \text{CONST} * \sqrt{\frac{\ln(2 * \text{parentAttendCount})}{\text{nodeAttendCount}}}$$

Example

$$100 + 50 * \sqrt{\frac{\ln(2 * 500)}{5000}} = 101{,}85846$$

$$0 + 50 * \sqrt{\frac{\ln(2 * 500)}{1}} = 131{,}41304$$

...May the force be with us

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# Thank you!

- Kocsis, Szepesvari: Bandit Based Monte-Carlo-Planning, http://zaphod.aml.sztaki.hu/papers/ecml06.pdf
- Schiffel, Thielscher: Fluxplayer, http://www.fluxagent.org/download.php
    ?file=07-SchiffelThielscher-AAAI.pdf