GamesCrafters

Undergraduate Game Theory Research and Development Group
Faculty Advisor: Dan Garcia (Lecturer SOE)

Graphical representation of the Tic-Tac-Toe game tree
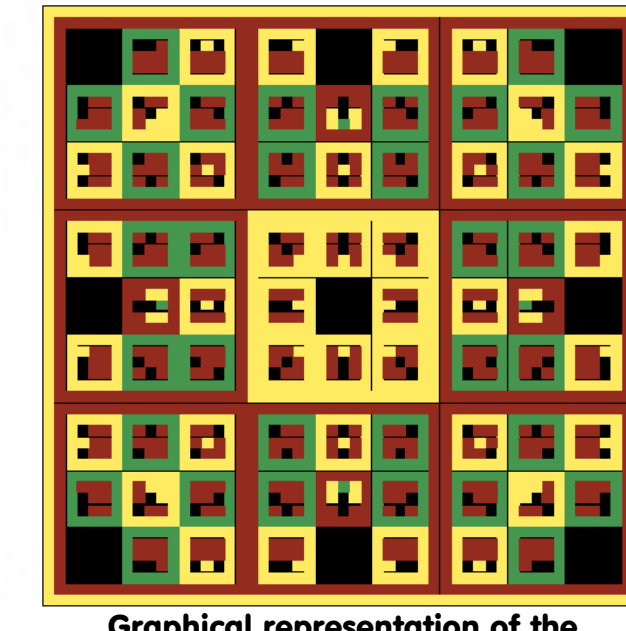
Graphical representation of the Misere Tic-Tac-Toe game tree

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GamesCrafters
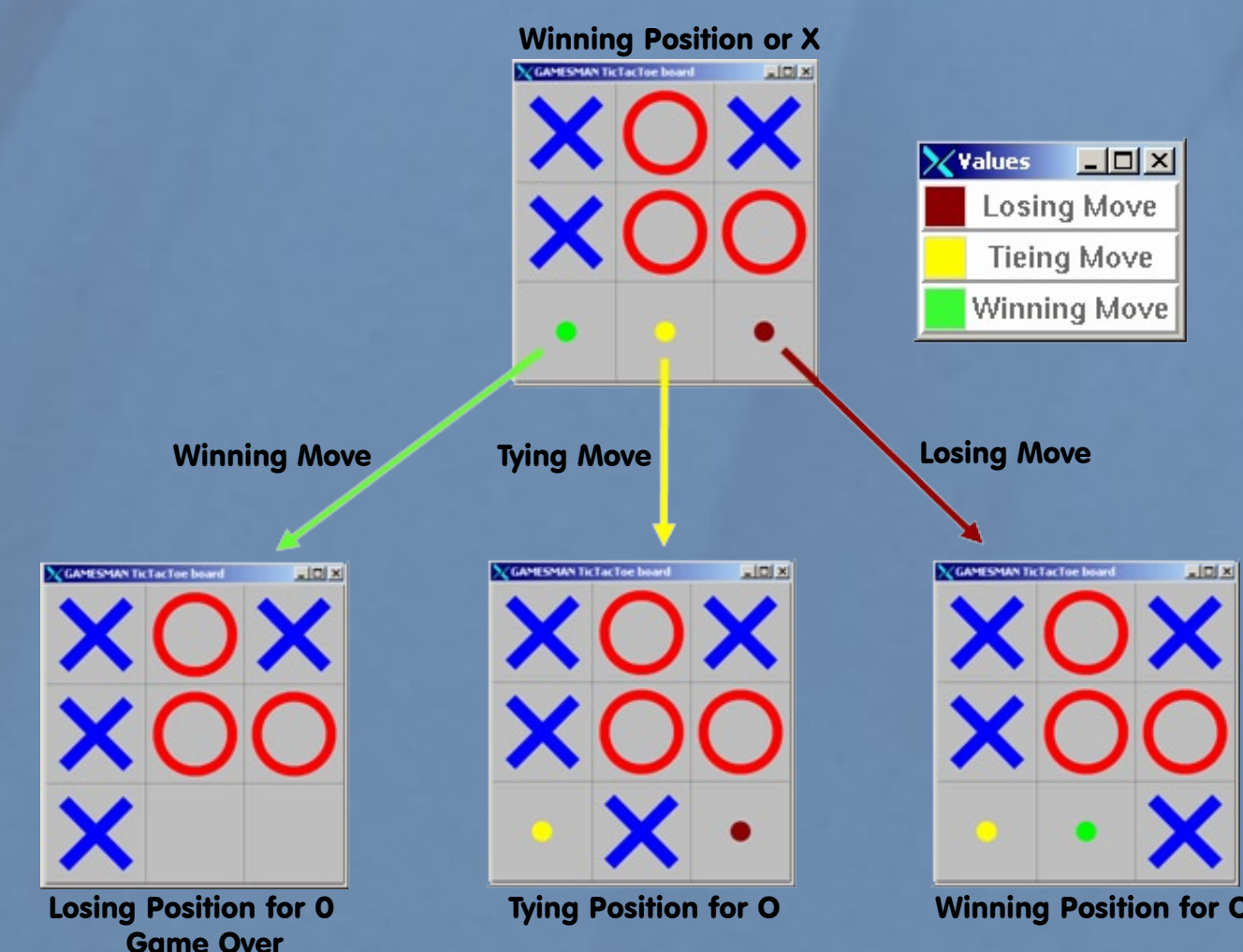"Giving game trees the Axe...one Big Game at a time!"

Motivation:

- Games have been played for a millennia.
- Wall paintings over 5000 years old have been found in Egypt.
- People are playing the same games now they were back then, but only now, are we able to strongly solve them.
- The GamesCrafters research and development group was formed to explore the fertile area of combinatorial and computational game theory.
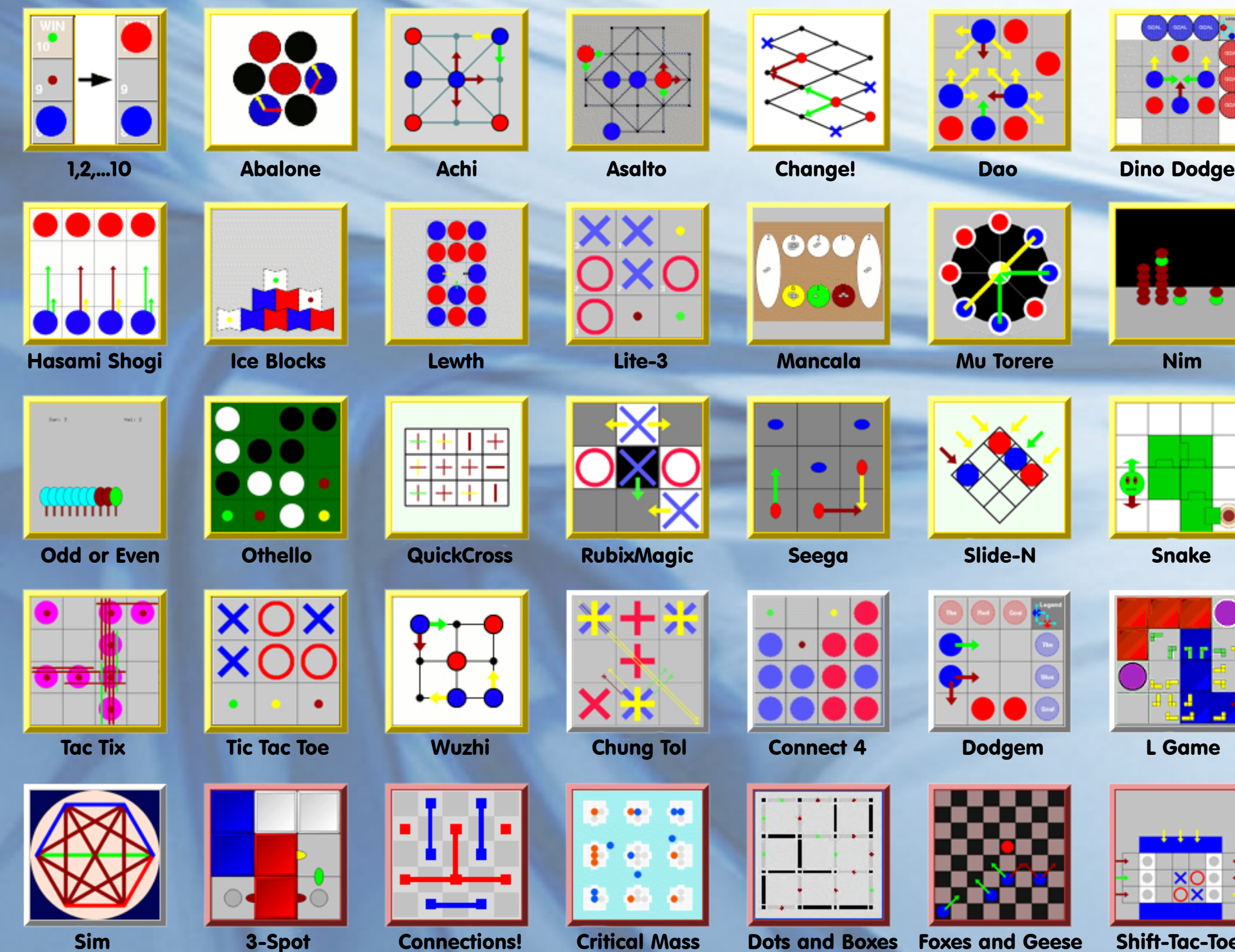
Moves / Positions:

- **Winning Move**: Either wins the game, or leaves opponent with losing moves.
- **Losing Move**: Either loses the game, or leaves the opponent with winning moves.
- **Tying Move**: Either makes a tie, or leaves opponent with tying and losing moves.
- Using these definitions:
  - **Win**: A position in which there exists a winning move.
  - **Lose**: A position in which all moves are losing moves.
  - **Tie**: A position in which all moves are tying and losing.

Winning Position or X

Values
- Losing Move
- Tieing Move
- Winning Move

Winning Move   Tying Move   Losing Move

Losing Position for O
Game Over

Tying Position for O

Winning Position for O

Games We Solve:

- Two players (Left & Right)
- No chance, such as dice or shuffled cards
- Both players have perfect information
  - No hidden information, as in Stratego & Magic
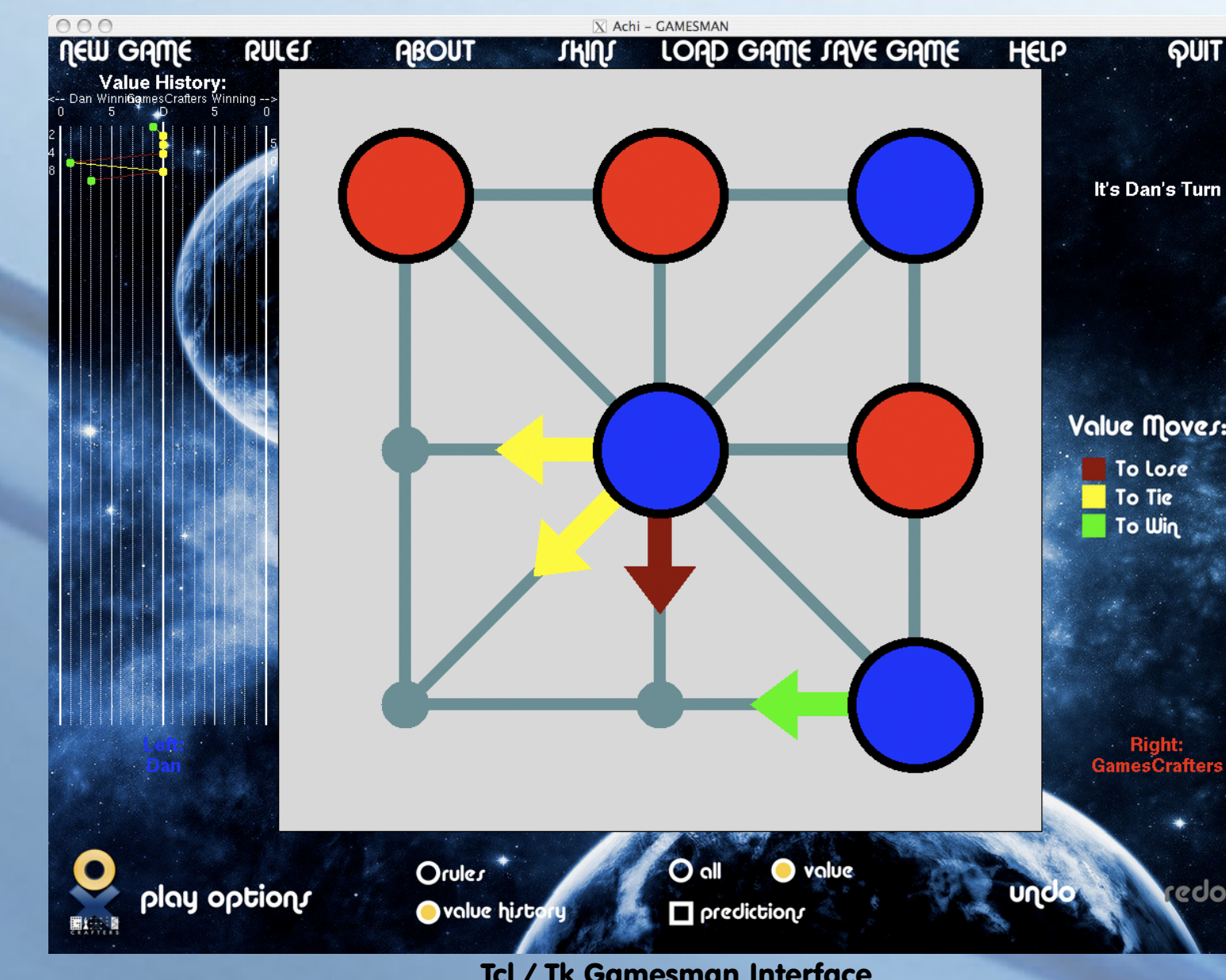- The game must be finite - it must end

1,2,...10	Abalone	Achi	Asalto	Change!	Dao	Dino Dodgen
Hasami Shogi	Ice Blocks	Lewth	Lite-3	Mancala	Mu Torere	Nim
Odd or Even	Othello	QuickCross	RubixMagic	Seega	Slide-N	Snake
Tac Tix	Tic Tac Toe	Wuzhi	Chung Toi	Connect 4	Dodgem	L Game
Sim	3-Spot	Connections!	Critical Mass	Dots and Boxes	Foxes and Geese	Shift-Tac-Toe

How We Do It:

The value of a game is determined by a brute-force exhaustive search of the game tree. The value of a particular board configuration, or position is based on the values of its children, i.e., the positions that are one legal move away. A position has a value of either Win, Lose, or Tie. Moves are also labeled with one of these three values.

Research Projects:

- **Maximization**: An iterative, parallelizable, retrograde solver, which can use optimized level files of actual positions visited to optimize the search
- **ODeepaBlue**: A parallelization architecture that utilizes cluster computing and Map-Reduce programming paradigm
- GUI high-resolution resizeable skins, delta remoteness, visual value history, game tree traversal, solving progress bar, true game size, redo, and load and save games
- Network play with eHarmony pairing and network database server
- Bit-perfect and zero memory DB access
- Open positions and analysis database, with game graph visualizations
- Generic game libraries and GUI language
- Game histories and taxonomies researched, and an auto-updated web site with current analysis results
- **Goldification**: GUI upgrade to Change!, Ice Blocks, Wuzhi, Mancala, Mu Torore, Nim, Queensland, Tac Tix, Rubik's Magic, Dino Dodgem, Lite-3, Chung Toi, Othello

Tcl / Tk Gamesman Interface

Fall 2002
Spring 2003
The Fall 2003
Spring 2004
Fall 2004
Spring 2005
Fall 2005
Spring 2006
Fall 2006
Spring 2007