REAL TIME STRATEGY GAME

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Real Time Strategy Game

- Sub-genre of strategy video games
- Allow for all players to simultaneously play the game in "real-time"
- Position structures and maneuver units to secure areas of map and destroy opponent's assets
- Complexity games, both in terms of state space size and number of actions available at each decision cycle is very large

RTS genre features

- Resource-gathering
- Base-building
- In-technological development
- Indirect control of units

Gameplay

- Screen is divided into a map area displaying the game world and terrain, units, and buildings, and an interface overlay containing command and production controls and often a "radar" or "minimap" overview of the entire map.
- The player is usually given an isometric perspective of the world, or a free-roaming camera from an aerial viewpoint for modern 3D games
- Gameplay generally consists of the player being positioned somewhere in the map with a few units or a building that is capable of building other units/buildings
- Usually, RTS games require the player to build an army (ranging from small squads of no more than 2 units, to literally hundreds of units) and using them to either defend themselves from a virtual form of Human wave attack or to eliminate enemies who possess bases with unit production capacities of their own

AGE OF EMPIRE UI

Playstyle

Micromanagement

- Manage and maintain individual units and resources on a fine scale
- Involves the use of combat tactics involved in the present

Macro management

- Management of economic expansion and large-scale strategic maneuvering, allowing the player time to think and consider possible solutions
- Considers the greater scale of the game to predict the future

Popular RTS Games

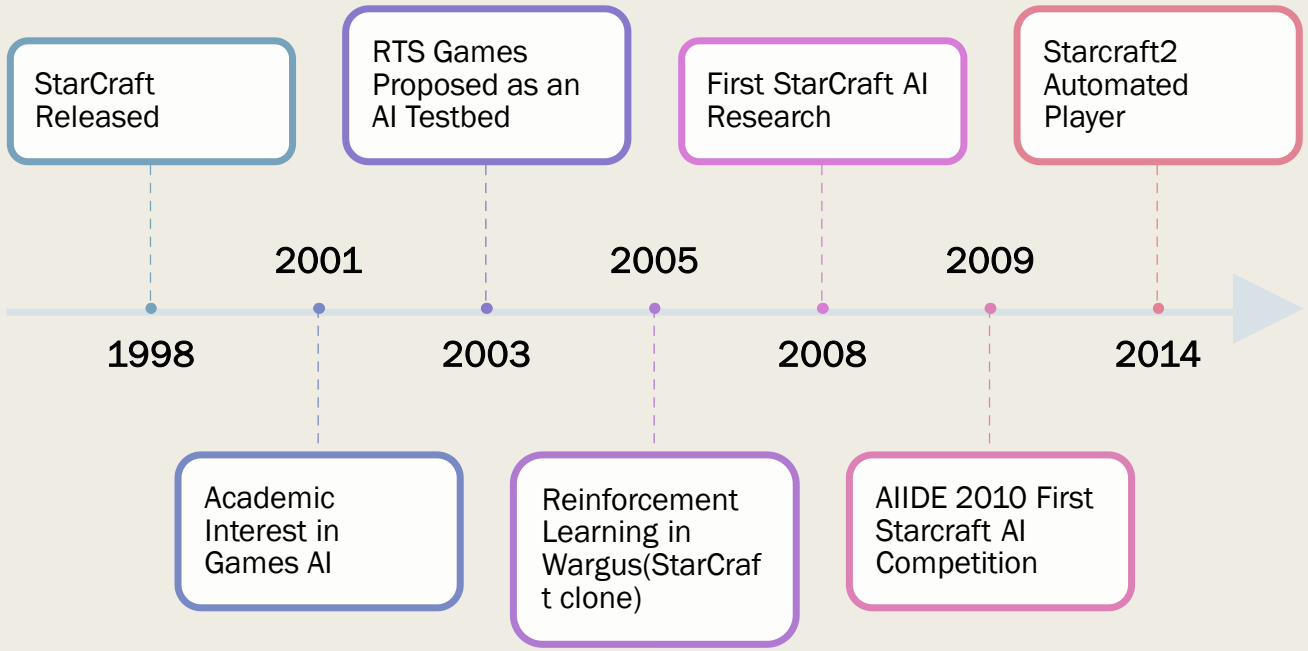
- Age of Empires
- StarCraft
- Command and Conquer
- Company of Heroes
- *Shadow Tactics*
- *Tropico*

History of RTS games

- Origins
  - Utopia(1981)
- Seminal Titles
  - *Dune II: The Building of a Dynasty* (1992)
  - Age of Empires(1997)
  - *Warcraft: Orcs & Humans* (1994)
  - Starcraft (1998)

- Refinement and Transitoin to 3D
  - Rather than innovations to the game concept, new games generally focus on refining aspects of successful predecessors
  - *Dungeon Keeper* (1997), *Populous: The Beginning* (1998) 3D
  - *Warcraft III* (2002) and Ensemble Studio's *Age of Mythology* (2002) being built on a full 3D game engine.
- Specialization and evolution
  - Multiplayer online battle arena games (MOBA) have originated as a subgenre of real-time strategy game

Brief History of AI in RTS



Tournaments

- RTS World tournaments have been held for both *StarCraft* and *Warcraft III* since their 1998 and 2002 releases.
- Some players have earned over $200,000 at the *Warcraft III World Championships*.
- Notable tournaments include MLG, GSL, and Dreamhack.

Challenges in RTS Game AI

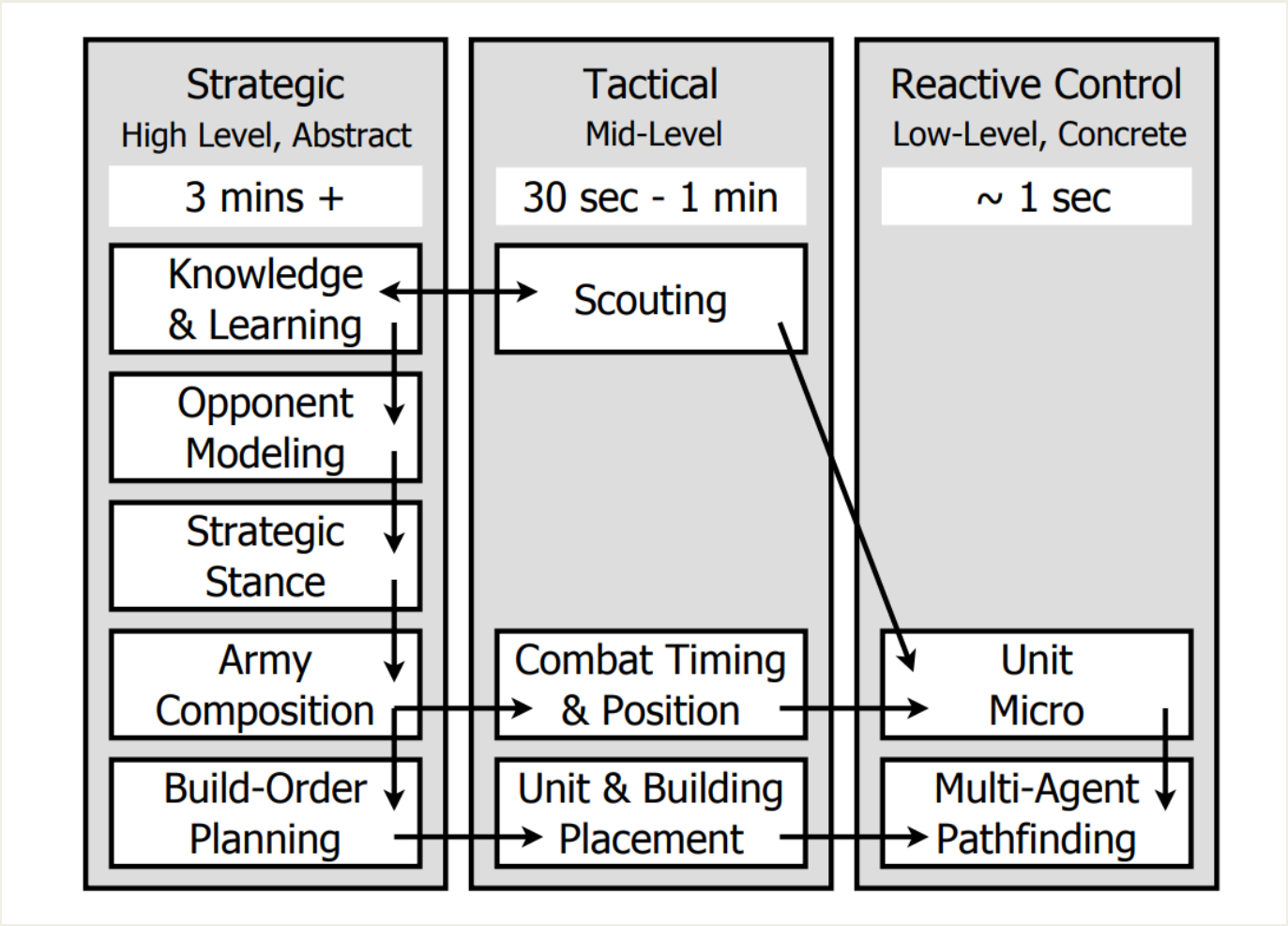
- Planning
- Learning
- Uncertainty
- Spatial and Temporal Reasoning
- Domain Knowledge Exploitation
- Task Decomposition

AI in RTS

STRATEGY

Tactics

Reactive Control



Strategy

Hard-Coded Approaches

Planning

Machine Learning

Case-Based Reasoning

Scouting

Tactics

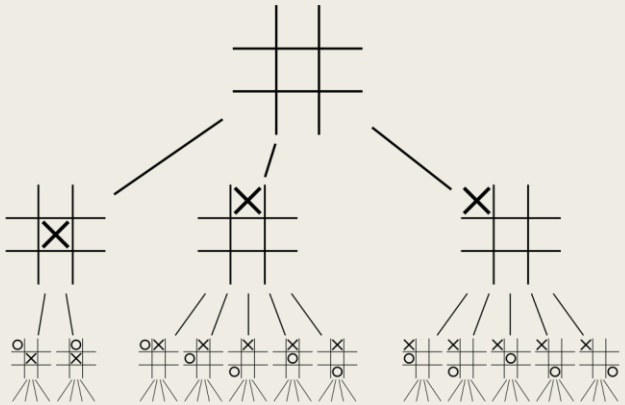
Spatial Reasoning

Machine Learning

Game tree search

Spatial Reasoning

- Category of **reasoning** skills that refers to the capacity to think about objects in three dimensions and to draw conclusions about those objects from limited information
- Used for terrain analysis and walling
- Terrain analysis supplies the AI with structured information about the map
- Walling is the act of intentionally placing buildings at the entrance of your base to block the path and to prevent the opponent’s units from getting inside



Game Tree Search

- Directed graph whose nodes are positions in a game and whose edges are moves
- Important in artificial intelligence because one way to pick the best move in a game is to search the game tree using any of numerous tree search algorithms, combined with minimax-like rules to prune the tree
- ABCD(Alpha-Beta considering Durations), Mone-Carlo Tree Search, Greedy Portfolio Searc algorithm

Reactive Control

Potential Fields

Holistic Approaches

Pathfinding

Machine Learning

Pathfinding

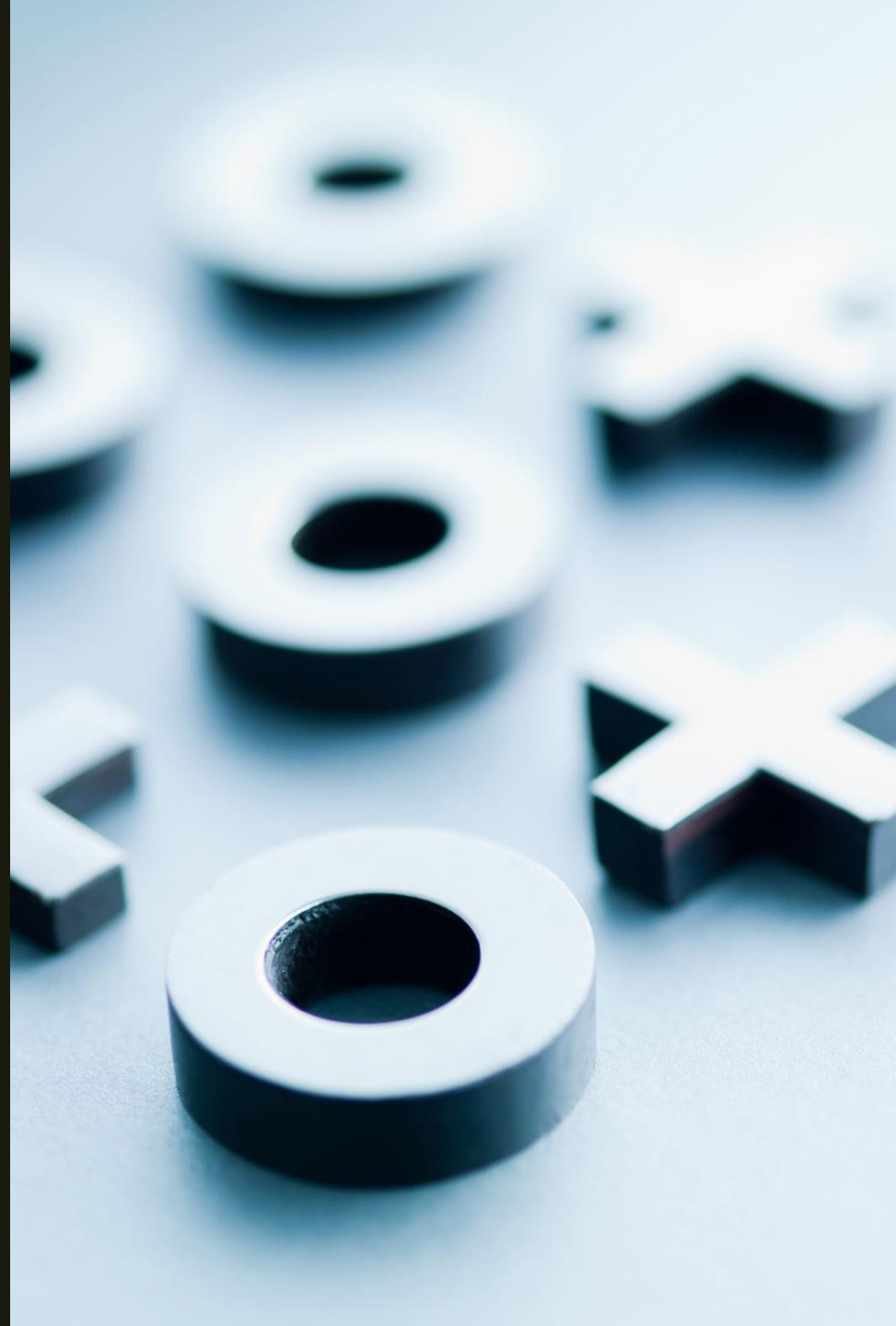
A* algorithm

Collision Detection

Terrain cost problem

Criticism of RTS gameplay

- Tactics vs Strategy
- Turn-based vs Real-time
- Console gameplay



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THANK YOU