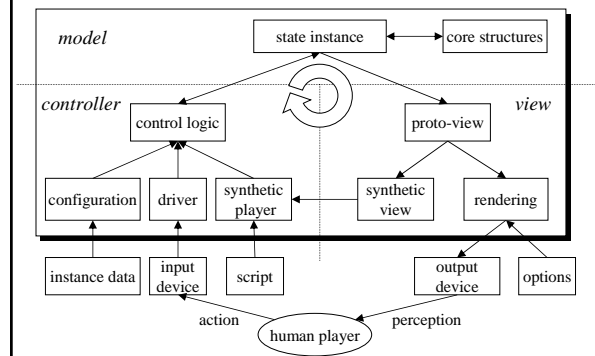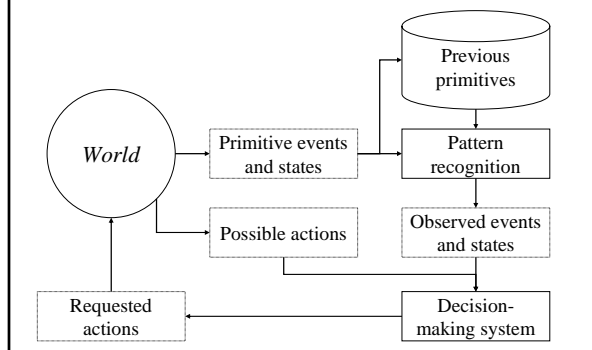## §5 Decision-Making

- decision-making and games
  - level of decision making
  - stance towards the player
  - use of the modelled knowledge
- example methods
  - influence maps
  - flocking algorithms
- this will not be a comprehensive guide into decision-making

MVC (revisited)

AI system

Three perspectives for decision-making in computer games

- level of decision-making
  - strategic, tactical, operational
- stance towards the player
  - enemy, ally, neutral
- use of the modelled knowledge
  - prediction, production

Level of decision-making

- strategic
  - what should be done
- tactical
  - how to actuate it
- operational
  - how to carry it out

Strategic level

- long-term decisions
  - infrequent → can be computed offline or in the background
- large amount of data, which is filtered to bring forth the essentials
  - quantization problem?
- speculative (what-if scenarios)
- the cost of a wrong decision is high

Tactical level

- medium-term decisions
- intermediary between strategic and operational levels
  - follow the plan made on the strategic level
  - convey the feedback from the operational level
- considers a group of entities
  - a selected set of data to be scrutinized
  - co-operation within the group

Operational level

- short-term decisions
  - reactive, real-time response
- concrete and closely connected to the game world
- considers individual entities
- the cost of a wrong decision is relatively low
  - of course not to the entity itself

Stance towards the player

- enemy
  - opponent
- ally
  - teammate, wingman
- neutral
  - referee, observer

Enemy

- provides challenge
- must demonstrate intelligent (or at least purposeful) behaviour
- cheating
  - quick and dirty methods
  - when the human player cannot observe enemy's actions

Ally

- augmenting the user interface
  - hints and guides
- aiding the human player
  - reconnaissance officer
  - teammates
- should observe the human point of view
  - provide information in an accessible format
 - consistency of actions

Neutral

- commentator
  - highlighting events and providing background information
- camera director
  - choosing camera views, angles and cuts
- referee
  - judging the rule violations
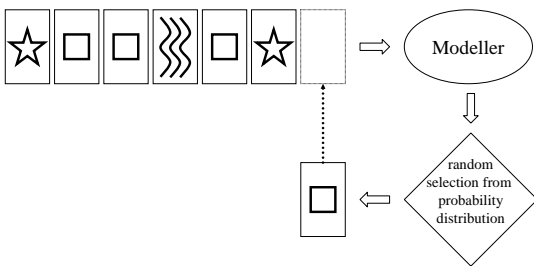- should observe the context and conventions

Use of the modelled knowledge

- time series data
- world = a generator of events and states, which can be labelled with symbols
- prediction
  - what the generator will produce next?
- production
  - simulating the output of the generator

Prediction
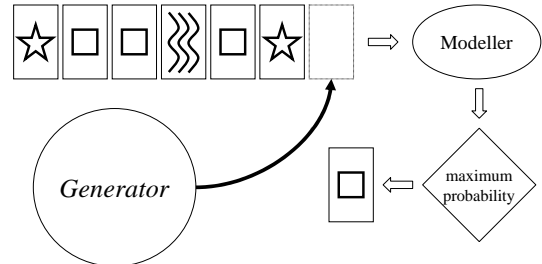
Production

Influence maps

- discrete representation of the synthetic player's knowledge of the world
- strategic and tactical information
  - frontiers, control points, weaknesses
- influence
  - type
  - repulsiveness/alluringness
- recall path finding

Assumptions

- a regular grid over the game world
- each tile holds numeric information of the corresponding area
  - positive values: alluringness
  - negative values: repulsiveness

Construction

1. initialization
   - assign values to the tiles where the influence exists
2. propagation
   - spread the effect to the neighbouring tiles
   - linear or exponential fall-off
   - cut-off point

Aggregation

- influence map can be combined
  - the same (or compatible) granularity
- example
  - map 1 = my troops
  - map 2 = enemy's troops
  - map 3 = map 1 + map2 = battlefield
- aggregation
  - operator: sum, product
  - weights: to balance the effects

Evaluation

- static features: compute beforehand
- periodical updates
  - categorize the maps based on the rate of change
  - lazy evaluation