# Application of artificial intelligence in a videogame for development of cognitive and motor skills

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Light

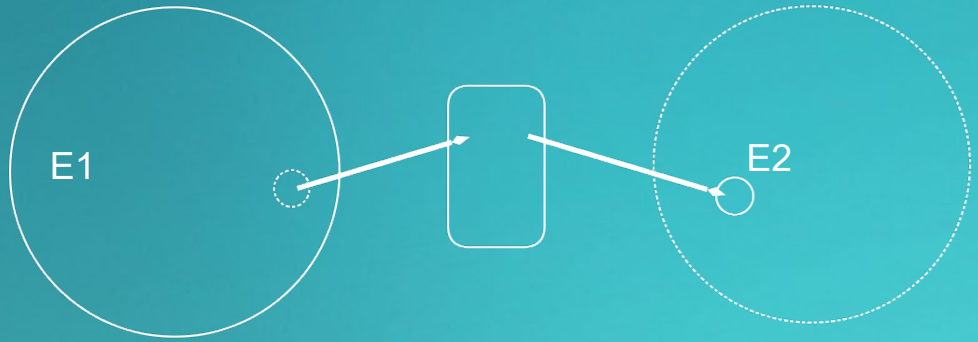
ТУ - СОФИЯ

# Defining artificial intelligence (AI)

*Artificial intelligence is the characteristic of a computers and machines to mimic human capabilities like problem-solving and decision-making.*

1. Based on capabilities (ANI, AGI and Super AI)
2. The four types definition by Arend Hintze

# Define artificial intelligence (AI)



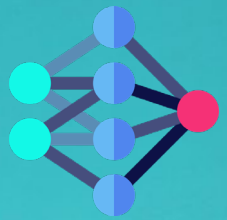

Minimal requirements for defining an AI phenomenon

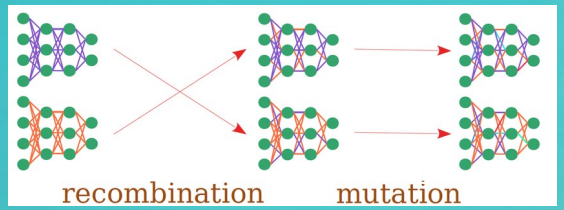
1. environment (or environments)
2. reason
3. goal
4. act of observation
5. act of effect
6. observable phenomenon
7. AI phenomenon

# Machine learning

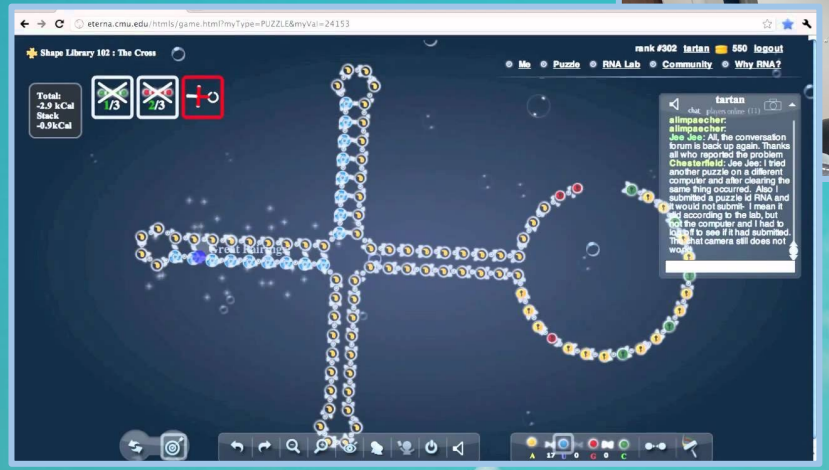
Genetic algorithm

Neural networks



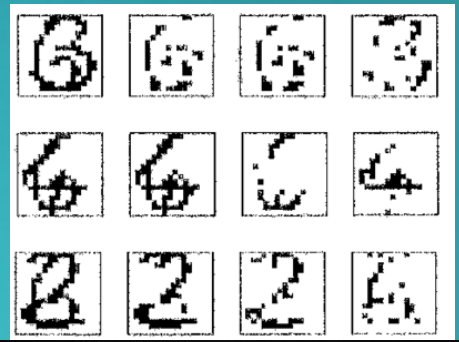


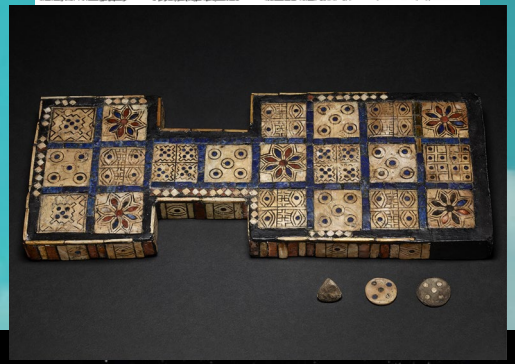
# Serious games and AI

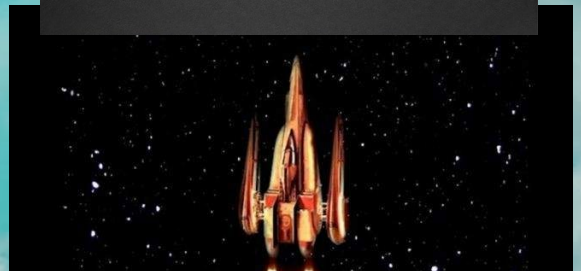


# Inspiration from studies

- Selective visual attention
- Visual-motor coordination
- Reaction time decrease (without accuracy decrease)
- “Learning to learn” - Speed in learning new tasks
- Metacognitive skills
- Task switching (flexibility)
- Cognitive bias mitigation
- Visuospatial competencies - spatial reasoning, mental rotation
- Controlling paranoid symptoms through neurofeedback
- Preventing dementia







Do games have an impact on evolution if they have existed for more than 4000 years?

Personification games

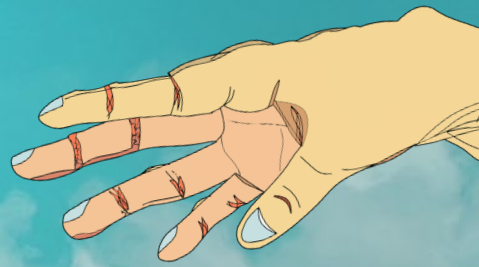
Theater games

# Digital Trainer Game

*Serious game that has the purpose of cognitive and motor skills development, through exercises combining digital and physical ideas.*

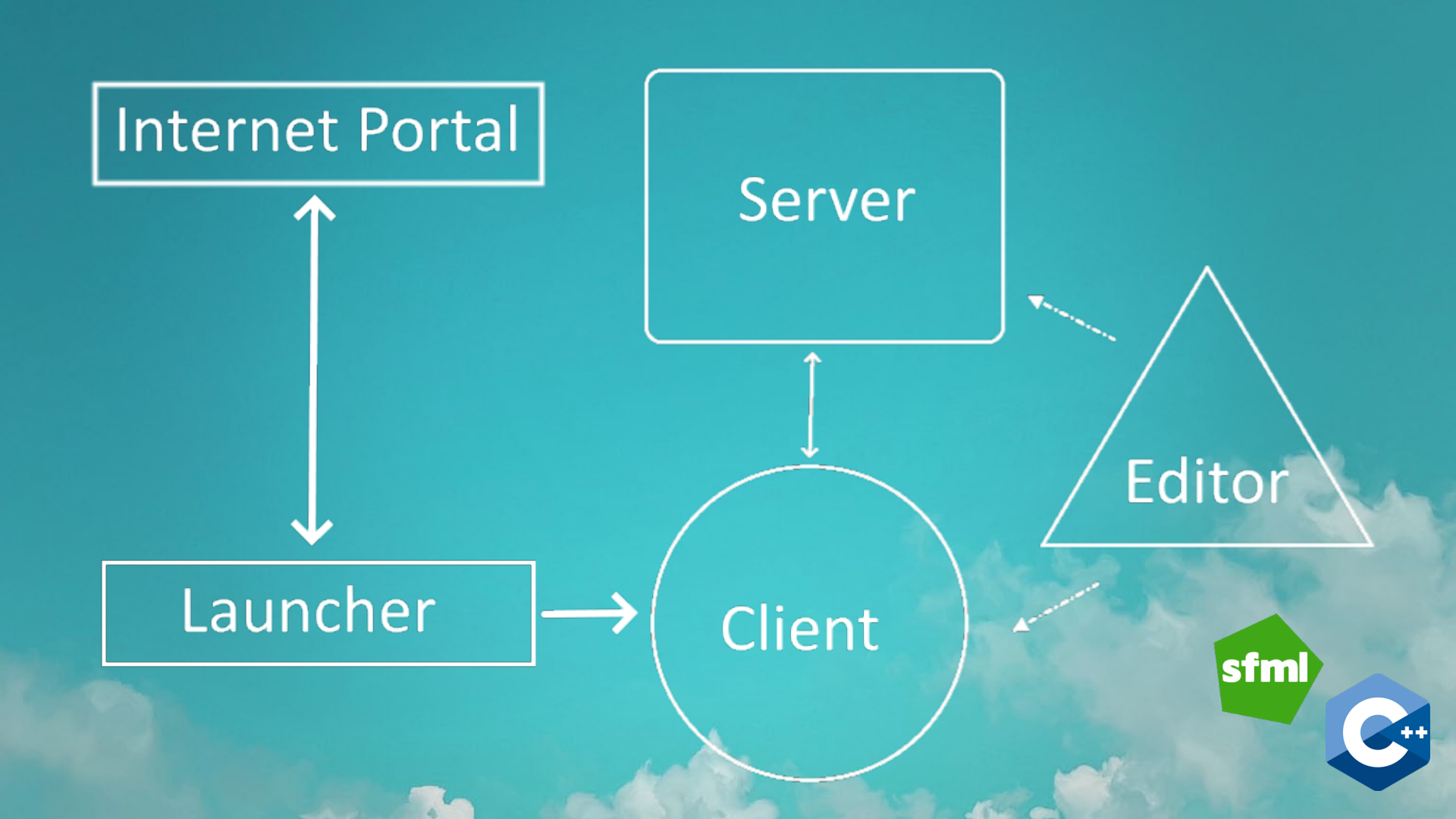
# Goals of the game software

- To inspire
- Competitive environment
- Exercises for personal development

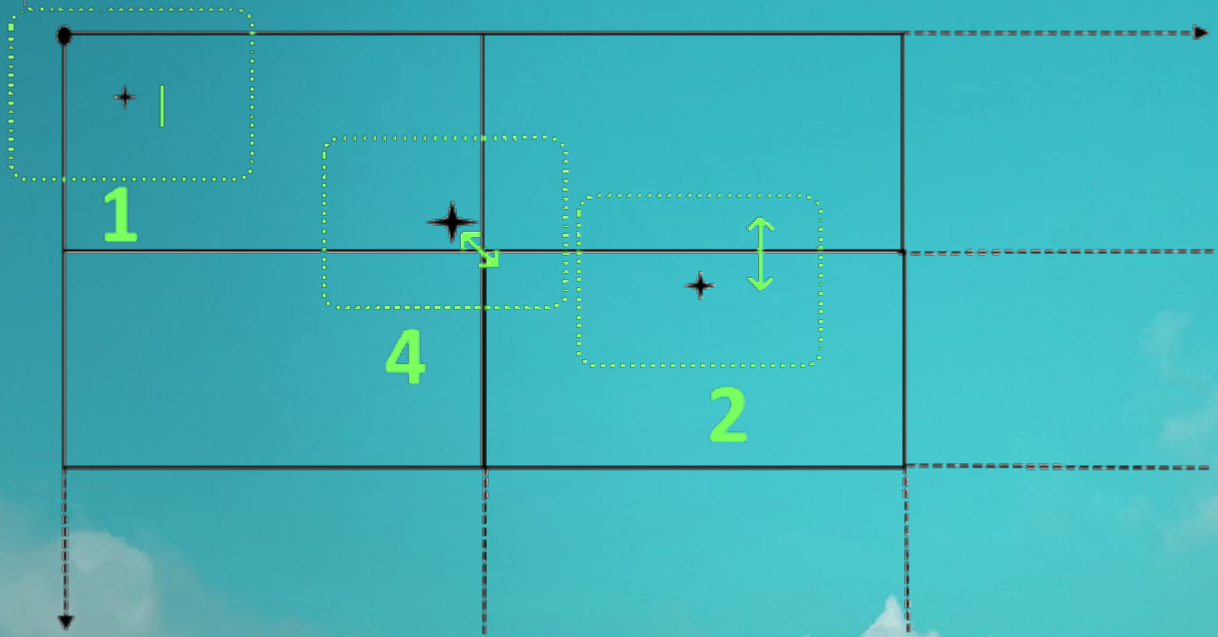



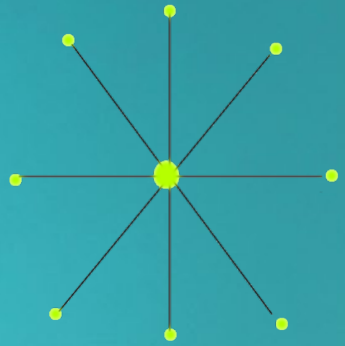
# Goals of the Hram Light Project

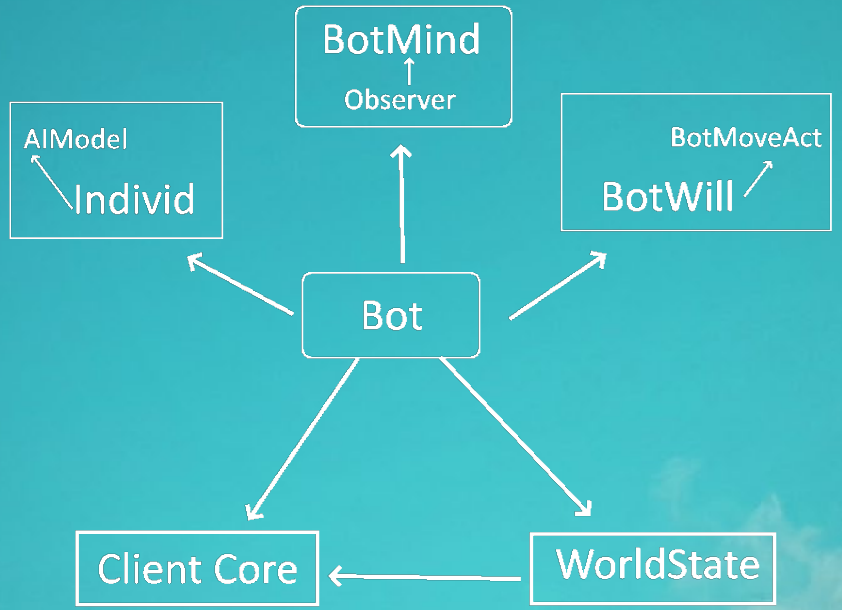
- Neurofeedback with EEG headset.
- Defining Sensorimotor rhythm in terms of the game environment
- “Bot coach” with AI for cognitive skills development.
- Applying the “Metacognitive learning approach” for “learning to learn”.
- Forming a system of definitions and assumptions for the “phenomenon of conscious establishment”.
- Research experiments on the effects of training with the game.

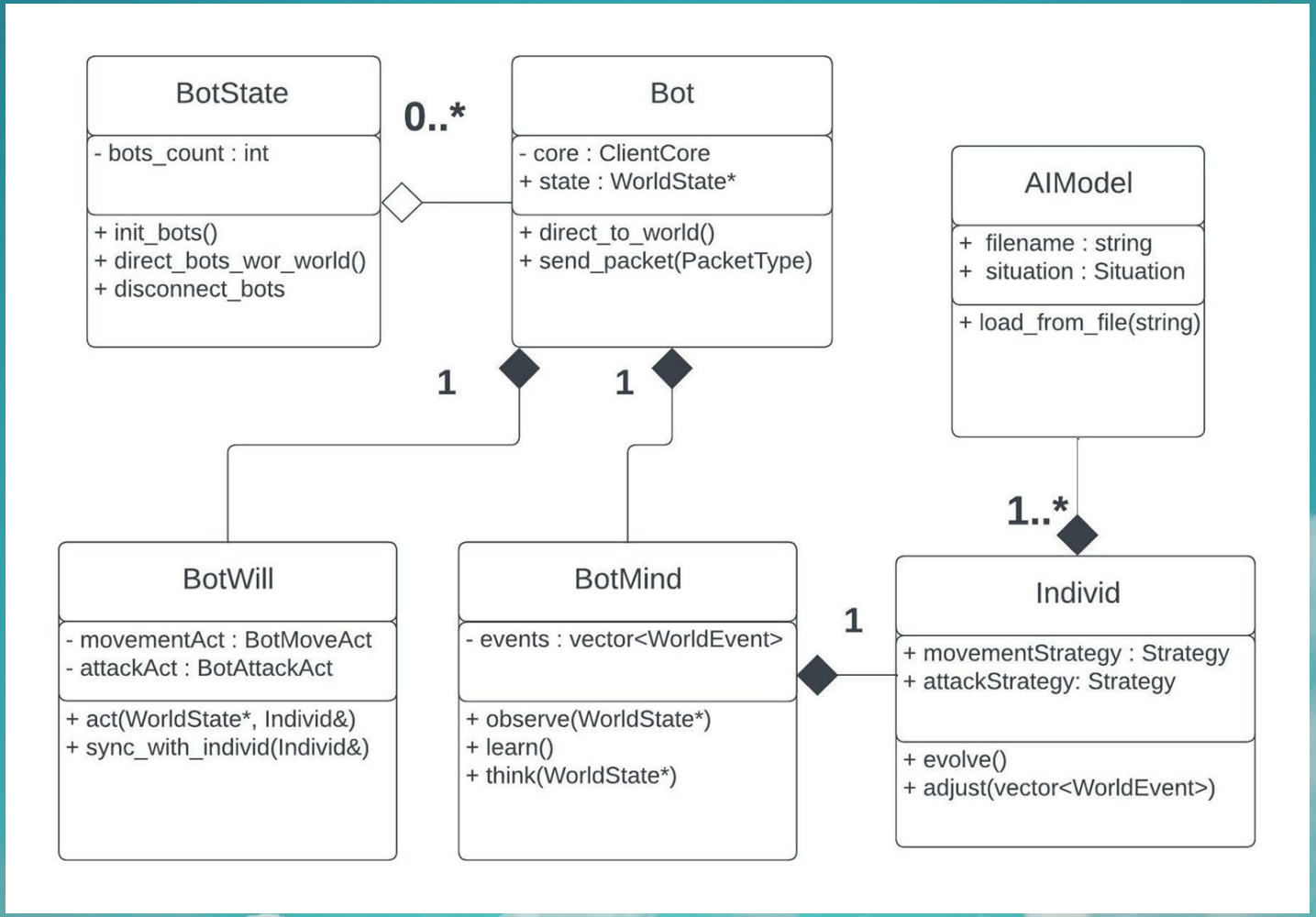

Internet Portal
Server
Editor
Launcher
Client
sfml
C++

# Hram Utility Framework

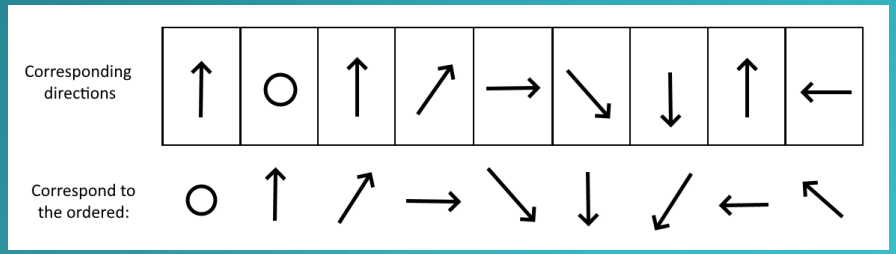


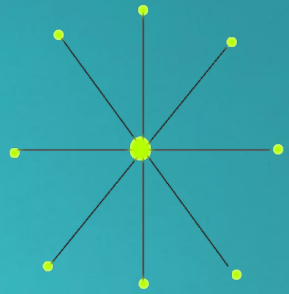



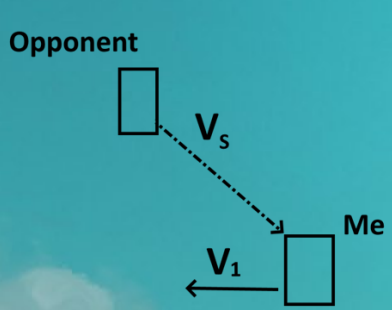

BotMind
Observer
AIModel
Individ
BotMoveAct
BotWill
Bot
Client Core
WorldState

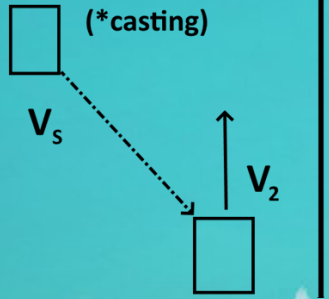

BotState
- bots_count : int
+ init_bots()
+ direct_bots_wor_world()
+ disconnect_bots
0..*
Bot
- core : ClientCore
+ state : WorldState*
+ direct_to_world()
+ send_packet(PacketType)
AIModel
+ filename : string
+ situation : Situation
+ load_from_file(string)
1
1
1..*
BotWill
- movementAct : BotMoveAct
- attackAct : BotAttackAct
+ act(WorldState*, Individ&)
+ sync_with_individ(Individ&)
BotMind
- events : vector<WorldEvent>
+ observe(WorldState*)
+ learn()
+ think(WorldState*)
1
Individ
+ movementStrategy : Strategy
+ attackStrategy: Strategy
+ evolve()
+ adjust(vector<WorldEvent>)

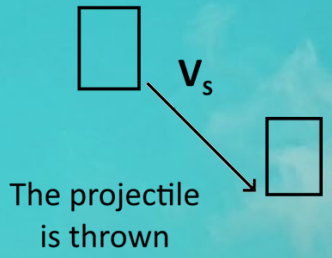
# The “star genes”

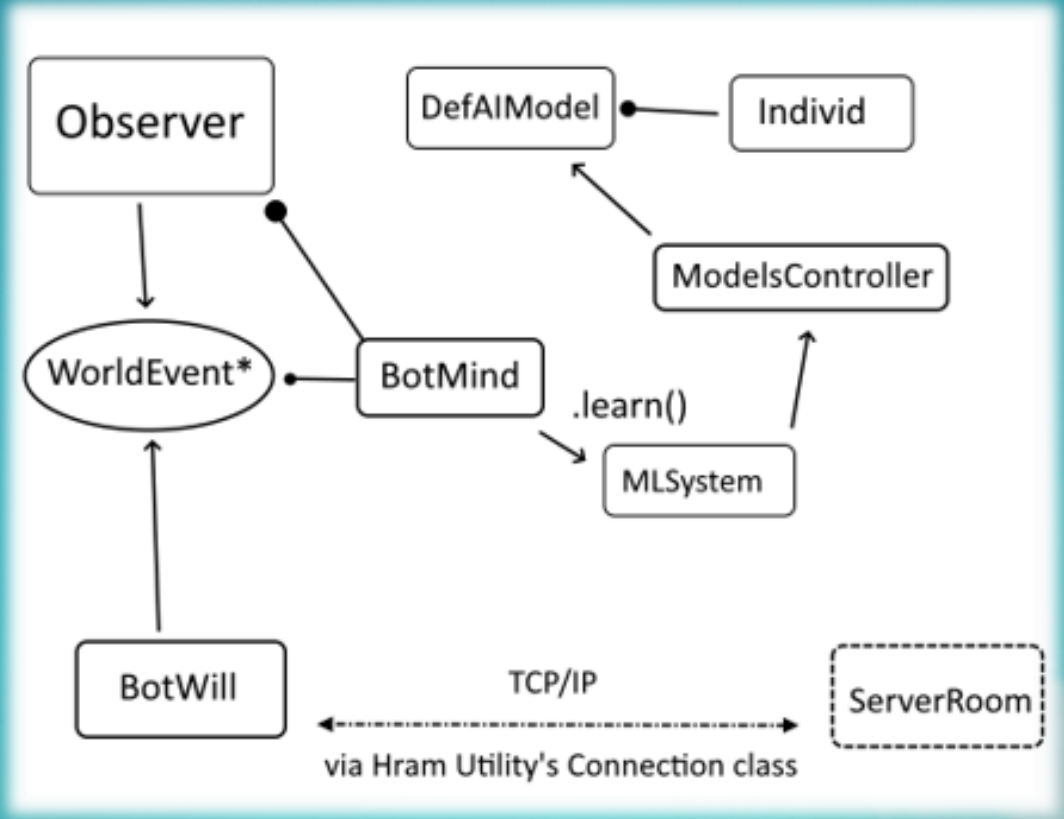




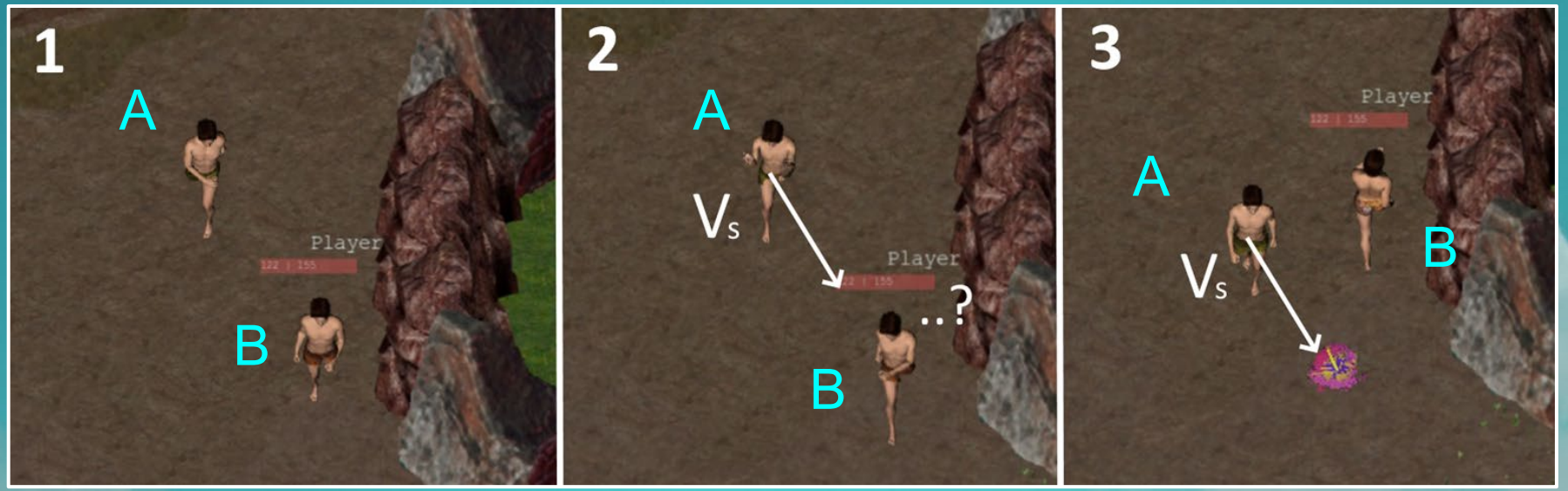

Observer
DefAIModel
Individ
ModelsController
WorldEvent*
BotMind
.learn()
MLSystem
BotWill
TCP/IP
ServerRoom
via Hram Utility's Connection class

1) WorldState::logic() - Frame logic

1) BotMind::observe(state) - Produces AI events
2) BotMind::learn() - Evolution
3) BotMind::think(state) - Based on the AI events, sets up strategy classes of Individ

1) BotWill::sync(BotMind::Individ) - Sets up act classes via the strategies from Individ
2) BotWill::act(BotMind::Individ) - Applies bot's decisions

# Relative striving



# Thank you for your attention!

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