

Virtual Humans in Serious Games



Kickoff Contextproject 2014-2015

Tygron Serious Games for Urban Planning



- Tygron is an online 3D multiplayer gaming platform for urban communities.
- Communities can generate and maintain their realistic multiplayer games to experiment, plan and negotiate better solutions for city designs and development projects.

Client asks:

Can we replace human players by virtual humans?

Serious Game (Tygron Engine)



Connector (Web2EIS):
Percepts & Actions



Virtual Human 1

Connector:
Percepts & Actions



Virtual Human 2

Etc....

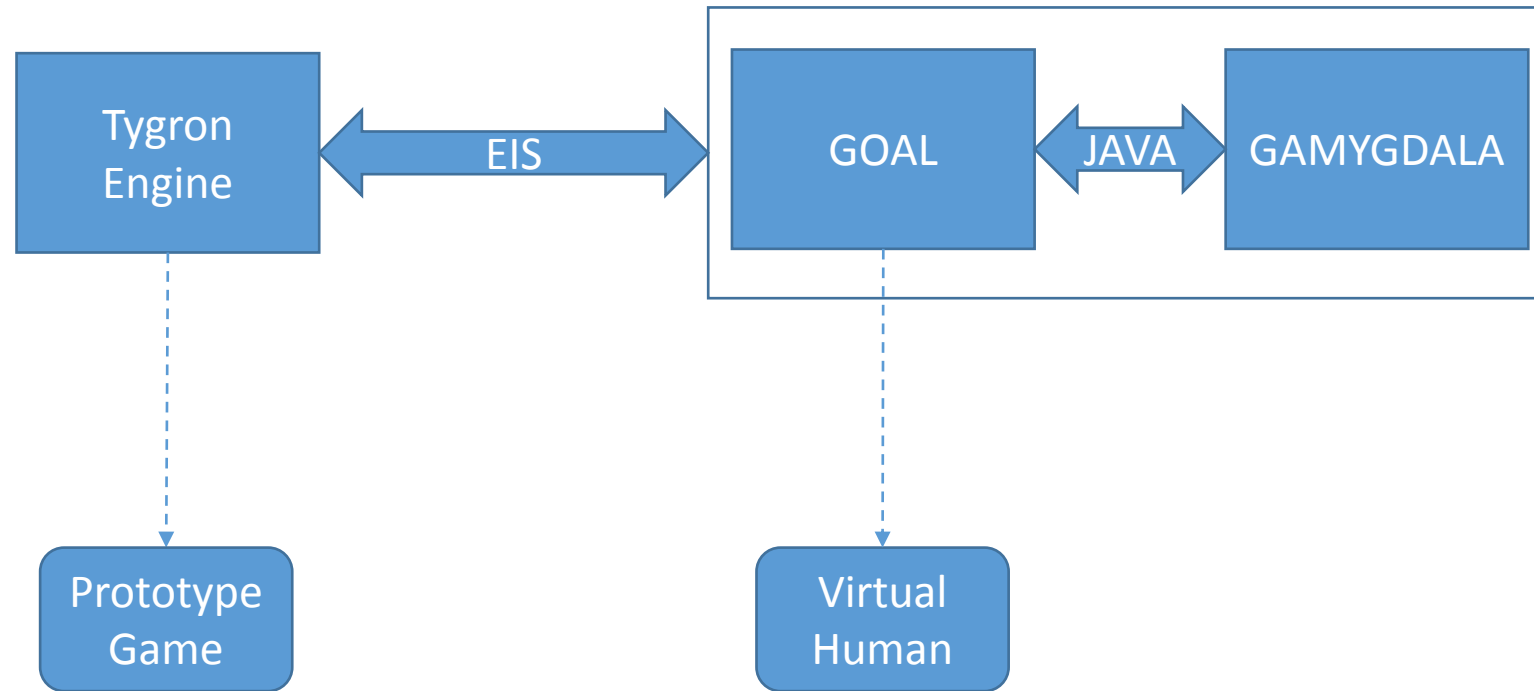
Implementing a Mind

Decision Making
(GOAL)

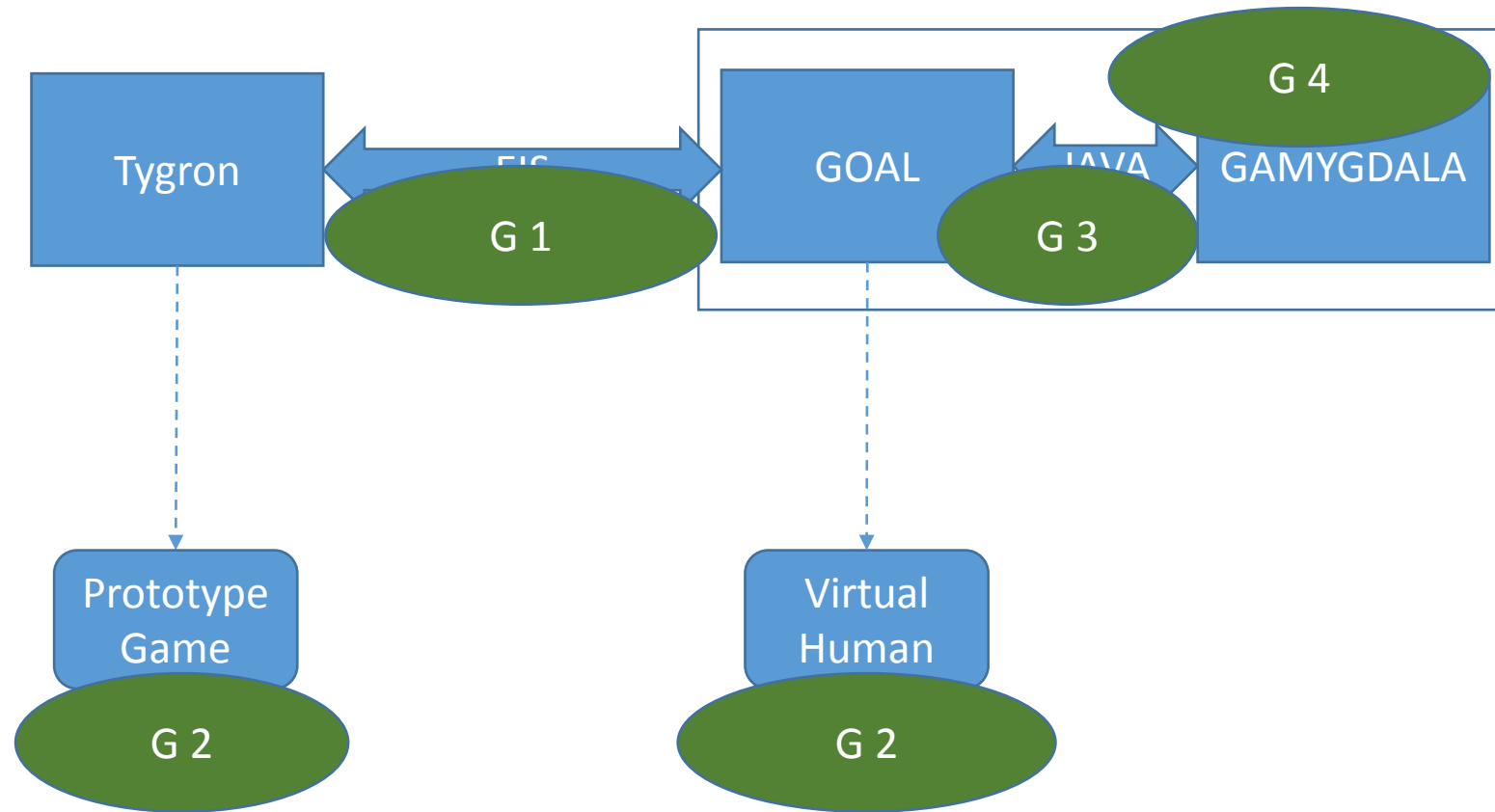


Emotion
(Gamygdala)

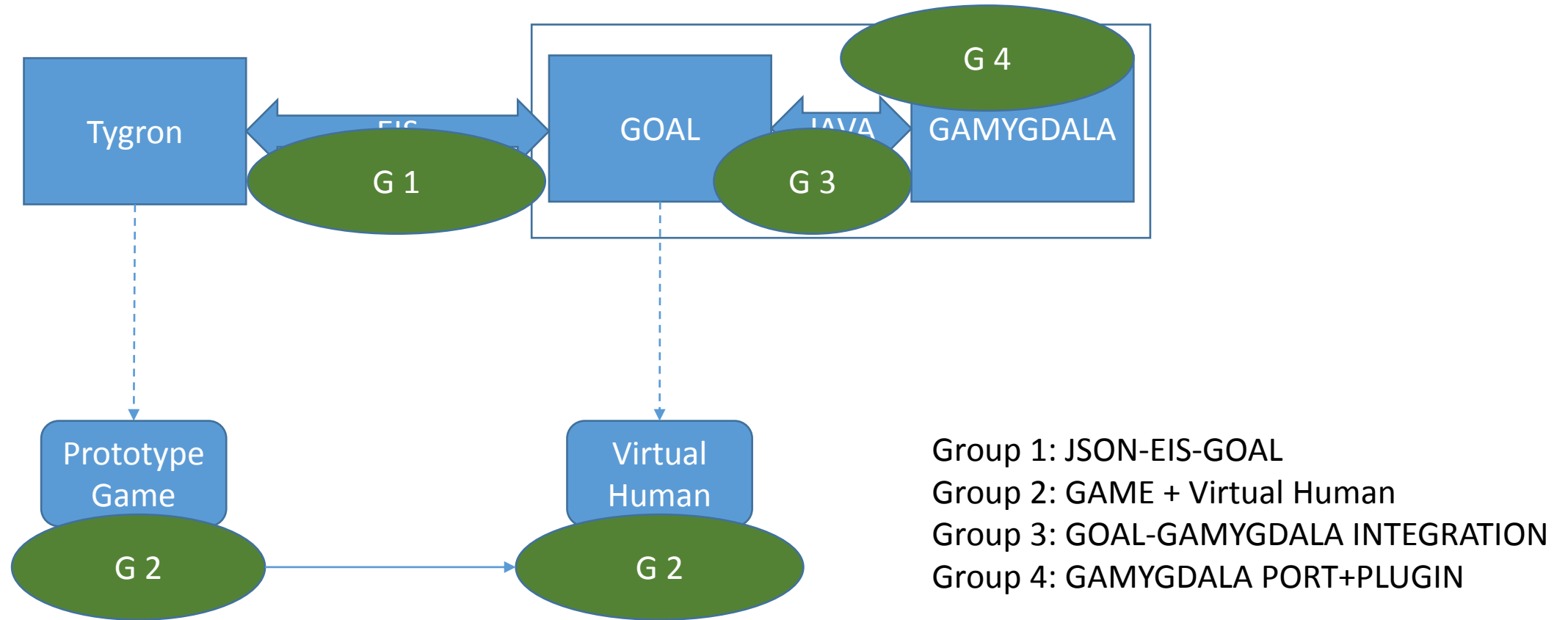
Project overview



Project overview



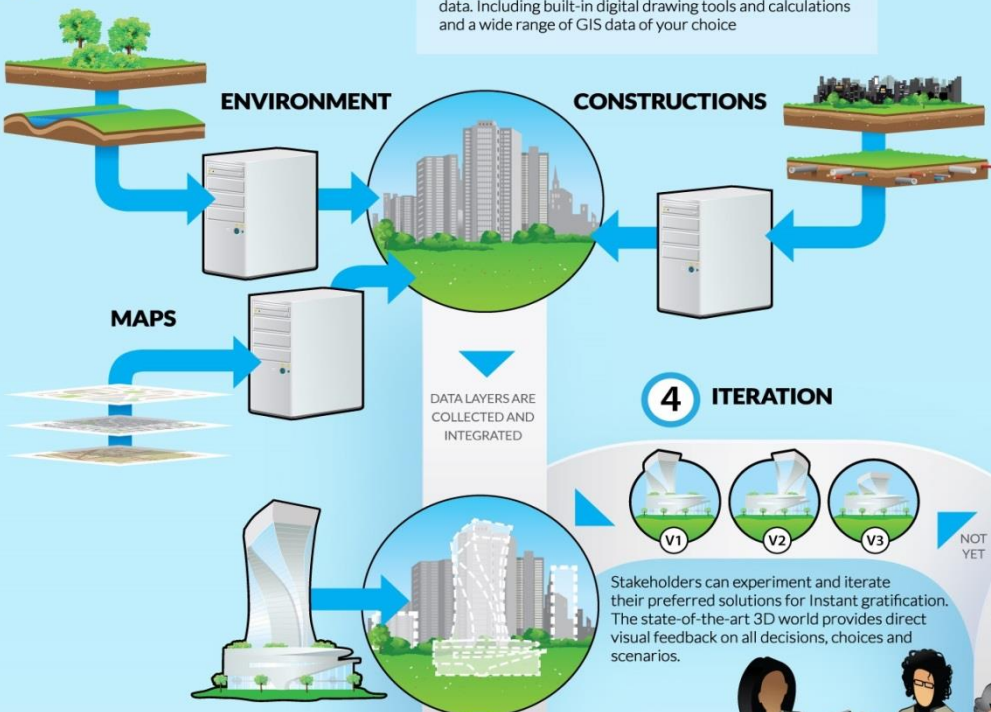
Project overview



Tygron Engine

1 START YOUR OWN PROJECT

Procedural: Tygron Engine uses our parametrical model to generate a realistic 3D world based on different types of geo data. Including built-in digital drawing tools and calculations and a wide range of GIS data of your choice



2 CITY PLANNING ARCHITECT

The Tygron Engine helps me

- to examine 3D designs
- to redesign surroundings
- to coordinate team and client

FIRST CITY PLAN IS DESIGNED

- 1 This building looks amazing (aesthetic value)
- 2 The client will be happy (Satisfying client needs)
- 3 This design will be profitable (Feasibility and context)

PLANNER

The Tygron Engine helps me with

- direct feedback of legal constraints
- instant gratification Charrette sessions
- a living document for planning process

- 7 This building might not fit into the current zoning plan (zoning and regulation)
- 8 Stakeholders will be pleased with this design (stakeholder engagement)
- 9 This building will improve the neighbourhood (Impact assessment)

CONSTRUCTIONS

4 ITERATION



Stakeholders can experiment and iterate their preferred solutions for Instant gratification. The state-of-the-art 3D world provides direct visual feedback on all decisions, choices and scenarios.



5 IMPLEMENT YOUR PROJECT

3 CONSENSUS BUILDING

Your Tygron project supports mediation, collaboration and negotiation of different stakeholder needs to urban design, planning policies, infrastructural needs and financial viability.

Multiplayer gaming technology: Designed to function within or between teams, experts and stakeholders in city planning, allowing all parties to interact with other individuals, whether in partnership, competition or rivalry. Provide stakeholders not only data but also social communication

BENEFITS



SATISFACTION

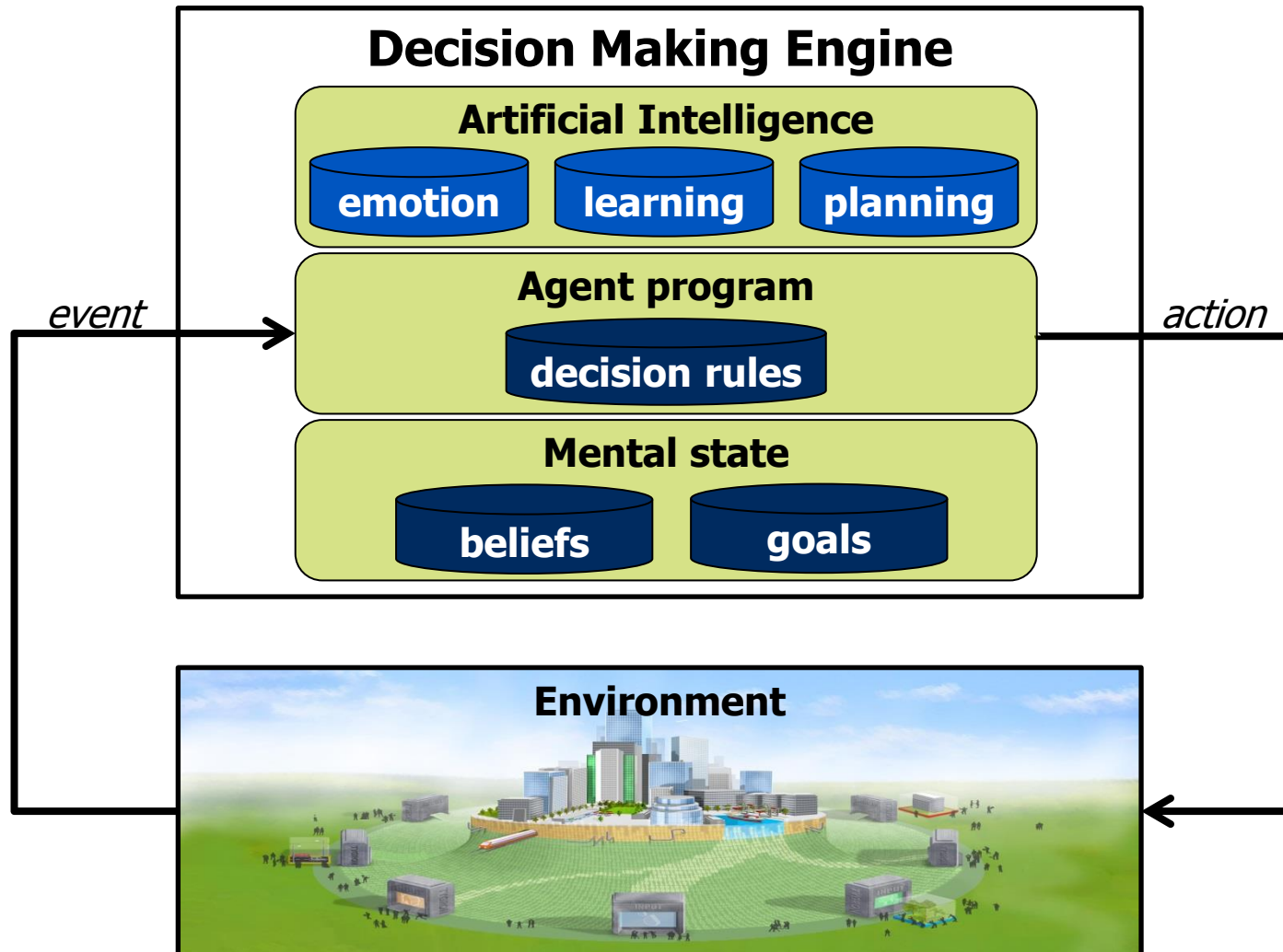


The Tygron Engine is an online 3D project software for urban planners, architects and engineers: a tool that streamlines the planning process and substantially reduces the time and costs involved in urban projects.

Parametric: City projects drawn in Tygron Engine are vector-based, parametric 3D worlds; Parametric modelling captures the true essence of interrelationships between stakeholders in cities. Every point in the 3D world can be enriched with data, each with its own relevance for different disciplines.

- **GROUP 1:** Interface Tygron Engine 2.0.0 Beta
http://support.tygron.com/wiki/Version_2.0.0_BETA
- **GROUP 2:** How to design a serious game? See:
http://support.tygron.com/wiki/Where_to_Start

GOAL agent programming language



GOAL:

High-level programming language for programming **decision** logic of **cognitive agents** that derive their choice of **action** from their **beliefs** and **goals**.

- **GROUP 2:** How to design a virtual human? Implement virtual human in GOAL. See: <http://ii.tudelft.nl/trac/goal>
- **GROUP 3:** How to integrate GOAL with GAMYGDALA in the GOAL cycle. See: <http://ii.tudelft.nl/trac/goal>
<https://github.com/broekens/gamygdala>

GAMYGDALA emotion simulation

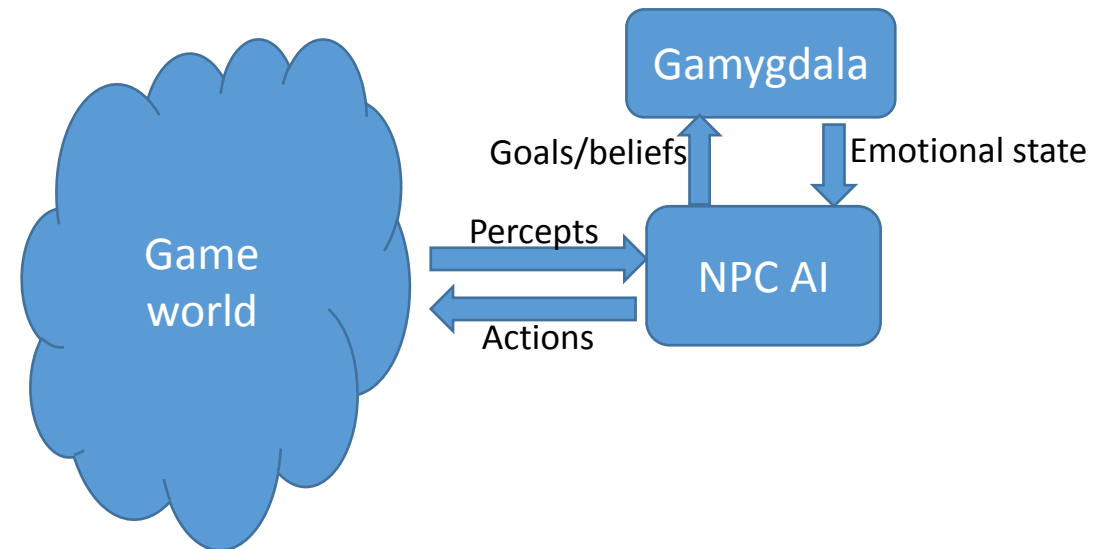
- Pluggable emotion engine for NPCs
- Black-box scalable emotional assessment
- AI-independent module
- Based on emotion psychology

```
adding goal: village destroyed, utility = -0.9,
  owner = self
adding belief: village surrounded, likelihood =
  0.6

Decaying...
Updating...
Recalculating...
recalculating belief: village surrounded
affected goal: village destroyed, valence = 1
desirability: -0.9 <- 1 x -0.9
goal likelihood: 0.8 <- (1 x 0.6 + 1) / 2
delta goal likelihood: 0.8 <- 0.8
emotion intensity: 0.72 <- abs(-0.9 x 0.8)
adding FEAR: 0.72
```

- **GROUP 4:** How to provide a GOAL with an emotion plugin based on GAMYGDALA. See:

<https://github.com/broekens/gamygdala>
<http://ii.tudelft.nl/trac/goal>



Project overview

Group 1: JSON-EIS-GOAL

- Develop simple EIS game (e.g. pacman)
- Define game interface
 - What GOAL actions/percepts are needed?
 - RQ: What additional logic is needed to enable these?
- Implement JSON-EIS-2-GOAL
 - Start with basic actions
 - Follow up with actions that need additional game logic
 - ...repeat iteratively

Group 2: Virtual Human

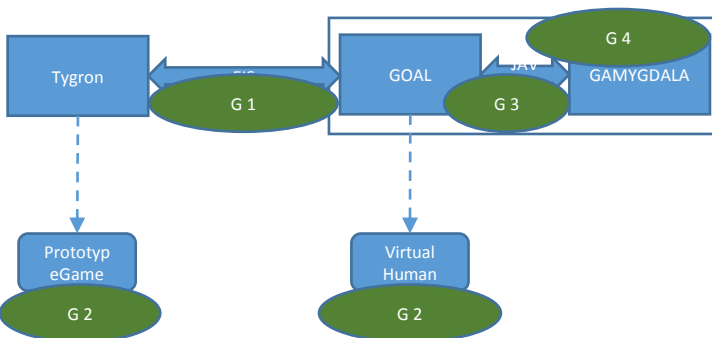
- Develop test game
- Define mental level abstractions
 - How do you play the game?
- Virtual Human Player
 - Define simple player strategy
 - Start with implementing simple reactive strategy
 - Then emotionally influenced reactive strategy

Group 3: GOAL-2-GAMYGDALA INTEGRATION

- Develop Jscript-based Emotional game.
- Develop GOAL-2-GAMYGDALA integration
 - Investigate GOAL cycle
 - GAMYGDALA goal binding
 - Then GOAL mental state 2 GAMYGDALA event binding (what is goal congruence)
 - Implement KB rules for congruency + link these rules to goals in goal (is a problem)

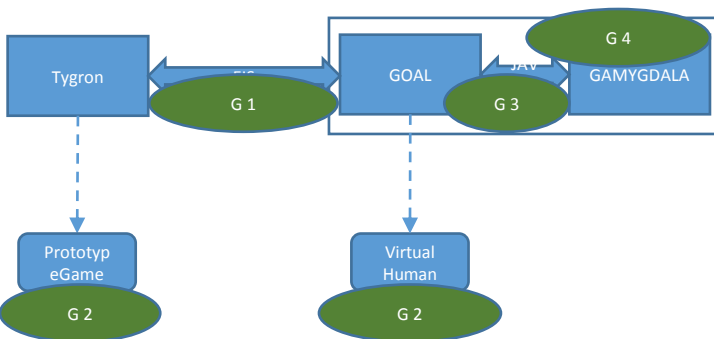
Group 4: GAMYGDALA JAVA PLUGIN

- Simple Goal Plugin usable from within a GOAL agent program (ex. calculator).
- Port GAMYGDALA to JAVA
- Develop GOAL-2-GAMYGDALA interface
 - Action/percepts based integration (similar to Jscript interface but in the action/percept interface of GOAL)
 - Simple appraisal module in GOAL
 - Advanced full GAMYGDALA appraisal module



Planning (SCRUM-BASED)

	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
Group 1	Seminars	Develop simple EIS game	First contact GOAL-EIS-JASON	Basic GOAL actions/percepts	Advanced actions	Advanced actions	...		
Group 2	Seminars	Develop test game	...	Simple reactive strategy Virtual Human	Advanced strategy	Advanced emotional strategy	...		
Group 3	Seminars	Develop Jscript emotional game	Investigate GOAL reasoning cycle	Implement Gamygdala -GOAL goal binding (e.g. on drop)	Implement simple EMO MENTAL STATE binding based on congruency	KB-based knowledge rules for goal congruency	...		
Group 4	Seminars	Develop simple action/percept based plugin	Port GAMYGDALA to JAVA	action/percept based integration of gamygdala	Simple appraisal module in GOAL based on actions/percepts	Full gamygdala appraisal module.	...		



Approach

- SCRUM-based ...
 - Every Monday weekly deliverables
 - Every Friday *review meetings* per group
 - Client asks for functions
 - You decide what to implement when.
- Management
 - **You are responsible**
 - One manager per group (decide TODAY in class)
 - One overall project manager (decide TODAY in class)
 - Weekly *progress meetings* with clients (Koen, Joost and SA), and project managers

Roles

- Client
 - Koen is the GOAL stakeholder
 - Joost is the GAMYGDALA stakeholder
 - SA (tba) represents Tygron stakeholder
- Project manager: (Tom Harting)
 - Represents all of you and
 - manages client expectations
 - Voices concerns / unclarities
- Group managers
 - Represents interest of group and make sure
 - GROUPS TALK TO EACH OTHER WHEN NEEDED!!
 - Project manager has all info he/she needs.
 - Leads weekly *review meeting*
 - Provides relevant input for weekly *progress meeting*
 - Group 1 (JSON-EIS-GOAL): BB groep 2 (Paul v d Knaap)
 - Group 2 (Virtual Human): BB groep 1 (Paul Verkooyen)
 - Group 3 (GOAL-GAM-INT): BB groep 4 (Yannick Verhoog)
 - Group 4 (GAM-PORT-PLUGIN: BB groep 3 (Tom Harting)

Agenda

- Coming Friday 9:00 at Tygron in The Hague
- Back at 11:45 for seminar Serious Gaming (Michael Bas) in Delft
- Planned client meetings:
 - Thursday April 30 10:00-11:30
 - Friday May 22 10:00-11:30
 - Friday June 5 10:00-11:30
 - Friday June 19 10:00-11:30
- Every Friday: mail to Joost and Koen with **brief progress summary**. In case any important decisions need to be made, consult client!

Notes and info

- Work + seminars in INSY lab at 2nd floor AT LEAST during the scheduled slots
- Koen (n.a. week 4.3) and Wouter (12th) will be available for questions about GOAL
- Joost is available for questions about GAMYGDALA
- Maxim Kneplé will be available for questions about serious games
- Student Assistant and first line support: Erwin van Eyk
- Communication is always through group manager.
 - Which means the group manager must UNDERSTAND THE ISSUES!!!
 - Important issues known already:
 - Usefull level of abstraction for GOAL actions/percepts for a Tygron game
 - Binding of GOAL goals and mental state to GAMYGDALA goals and events

Product Vision

Group 1: JSON-EIS-GOAL

- Which actions and percepts are needed by virtual human?

Group 2: Game & Virtual Human

- How to design a virtual human for a serious game?

Group 3: GAM-GOAL-INTEGRATION

- How to integrate emotions in the GOAL reasoning cycle?

Group 4: GAM-PORT-PLUGIN

- How to provide goal with emotion plugin support?

And: how does it all come together?

Look for literature that can help you answer these questions

Material and sources

- Github:
 - <https://github.com/broekens/gamygdala>
 - <https://github.com/goalhub>
 - <https://github.com/eishub>
- Papers and websites (see BB for all):
 - Alexandru Popescu, Joost Broekens, and Maarten van Someren (2014). [GAMYGDALA: an Emotion Engine for Games](#) . *IEEE Transactions on Affective Computing*, 5(1), 32-44
 - Hindriks, Koen V. "Programming rational agents in goal." *Multi-Agent Programming*:. Springer US, 2009. 119-157.
 - GratchEtAl2002 Creating Interactive Virtual Humans - Some Assembly Required
 - Hindriks, K., van Riemsdijk, B., Behrens, T., Korstanje, R., Kraayenbrink, N., Pasman, W., & de Rijk, L. (2011). Unreal Goal Bots. In F. Dignum (Ed.), *Agents for Games and Simulations II* (Vol. 6525, pp. 1-18): Springer Berlin Heidelberg.
 - www.joostbroekens.com/gamygdala
 - <http://ii.tudelft.nl/trac/goal/>
 - <http://www.tygron.com/>