



Mixing Human and Virtual Players

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1



This work

- This work was developed during my doctorate at Escola Politécnica - Universidade de São Paulo (USP).
- My advisor: Prof. Dr. Jaime S. Sichman.

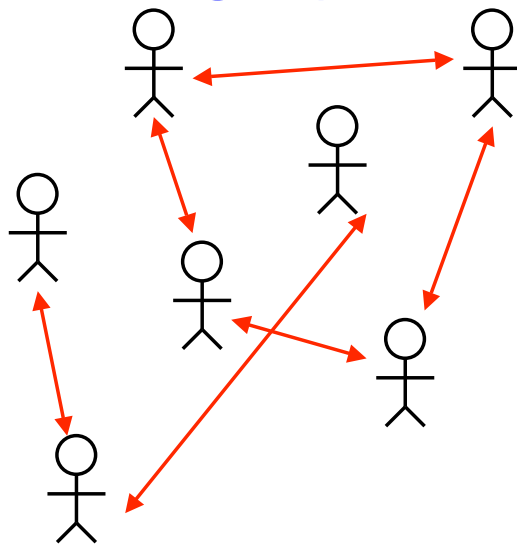
Topics

- RPG e MABS
- GMABS Methodology
- JogoMan Prototype
- ViP-GMABS Architecture
- ViP-JogoMan Prototype
 - Virtual Players
 - Tests
- Conclusions

3

Introduction ⁽¹⁾

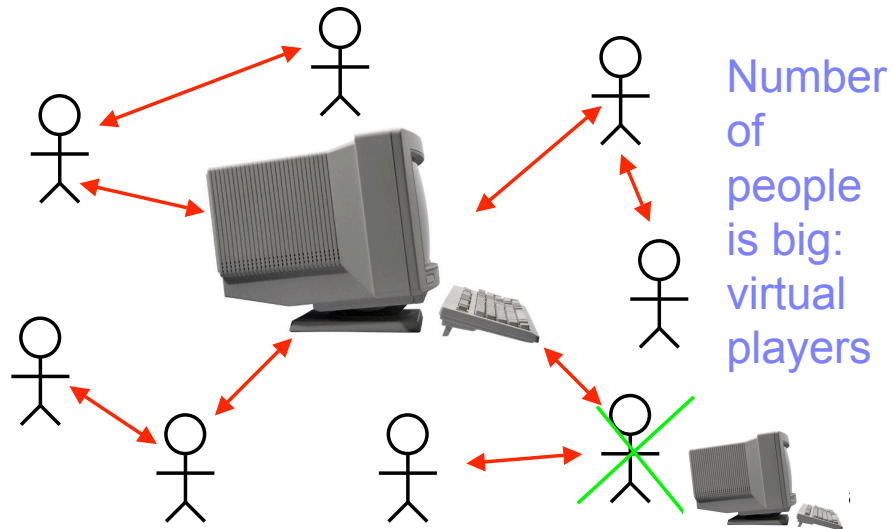
- Negotiation in groups



4

Introduction (2)

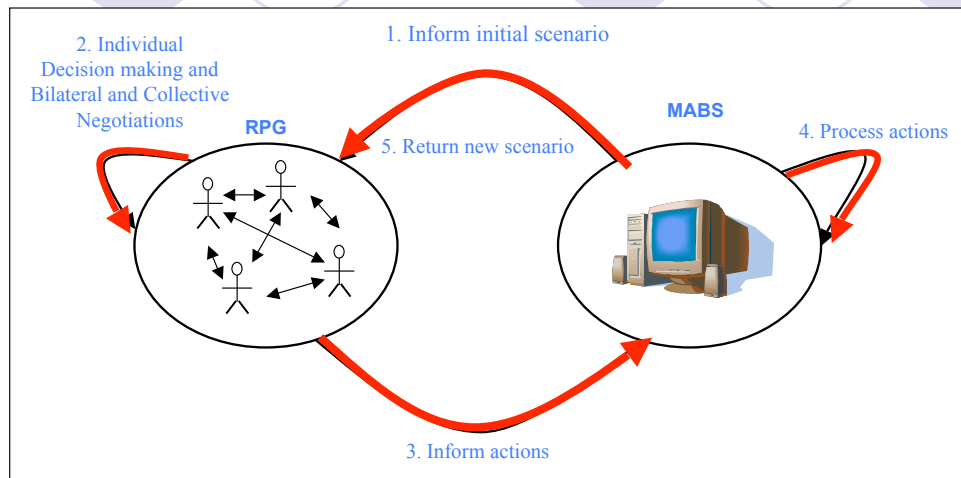
- The computer can help in this activity



Used Techniques

- MABS (*Multi-Agent-Based Simulation*):
 - Computational simulation + multi-agent systems
- RPG (*Role Playing-Games*):
 - Games + theater
 - Try COOPERATION, no competition

GMABS Methodology



This methodology was proposed by [Barreteau *et. al.*, 20

7

JogoMan Prototype ⁽¹⁾

- The JogoMan prototype simulates the management of a particular peri-urban catchment, located at Bacia do Alto Tietê, in São Paulo, Brazil ¹ .
- It represents a simplification of the real phenomena of interaction between the several actors, used as a means of learning and analysis.

1. Part of Project Negowat: *Facilitating Negotiations Over Land and Water Conflicts in Latin American Peri-Urban Upstream Catchments: Combining Multi-Agent Modeling with Role-Playing Games*

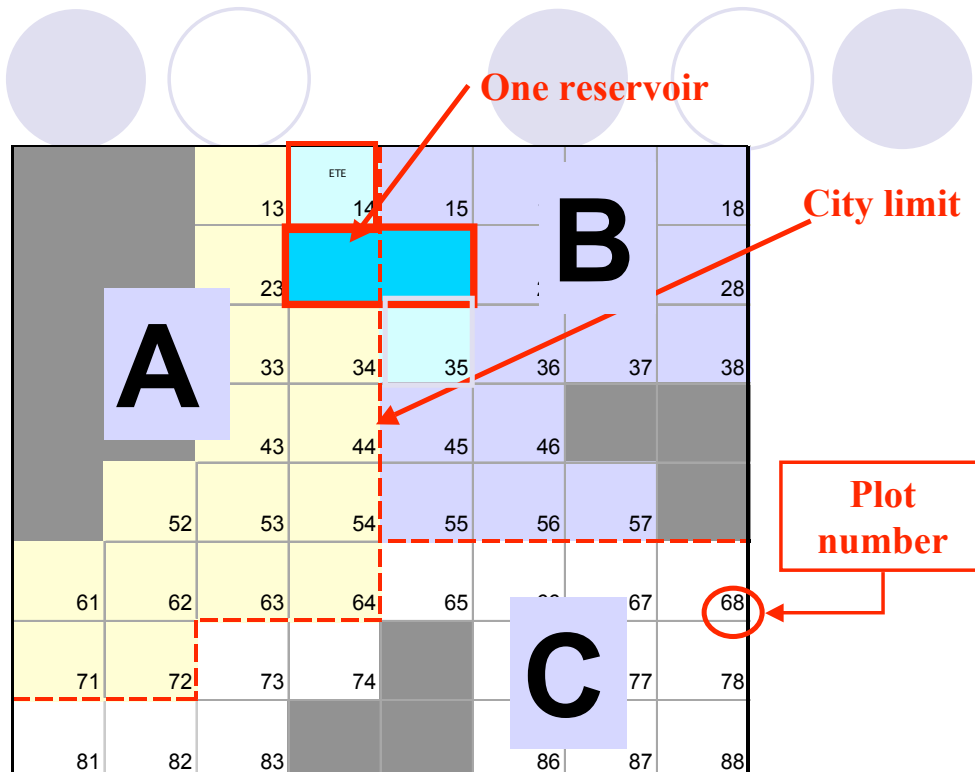
8

JogoMan Prototype (2)

- **Game Roles:**

- Land Owner: owns some portions of space, with a land use type and an infrastructure. Owners can sell or buy private areas;
- Mayors: can invest on public infrastructure as portable water, sewerage (sanitation) net, schools, hospitals or police stations.
- AguaPura Company Administrator: can invest on public infrastructures to water quality (portable water and sewerage net);
- Migrant Representative: must allocate a number of new families, and this families can be allocated in settlement or in slums.

9



10

JogoMan Tests

- PROCAM (October/2004);
- Faculdades Integradas Guarulhos (November/2004);
- FSP (February/2005);
- Universidade de Mogi das Cruzes (May/2005).

Evaluation: questionnaires

Pre-game:

- Players did not know RPG, but they knew the problem (natural resources management);

Post-game:

- Players had difficulties to understand the game and they thought the decision-making process complex.
- Players liked to learn with RPG technique.

13

ViP-GMABS Architecture⁽¹⁾

● Requirements:

○ MABS Element:

- Supply the system data, as initial scenario

○ Communication Layer:

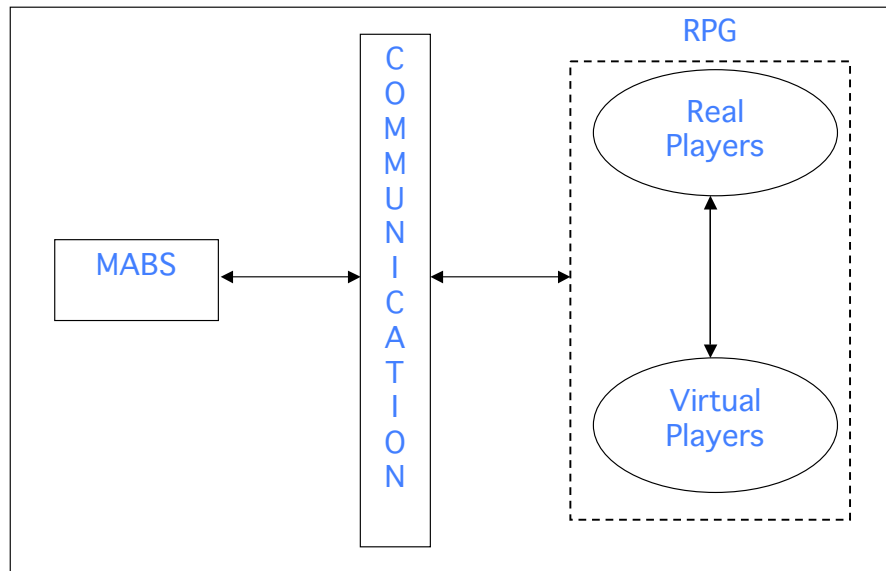
- Communication between MABS and Players (Real and/or Virtual)

○ Virtual Players:

- λ Communication between Real and Virtual Players
- Making-decisions

14

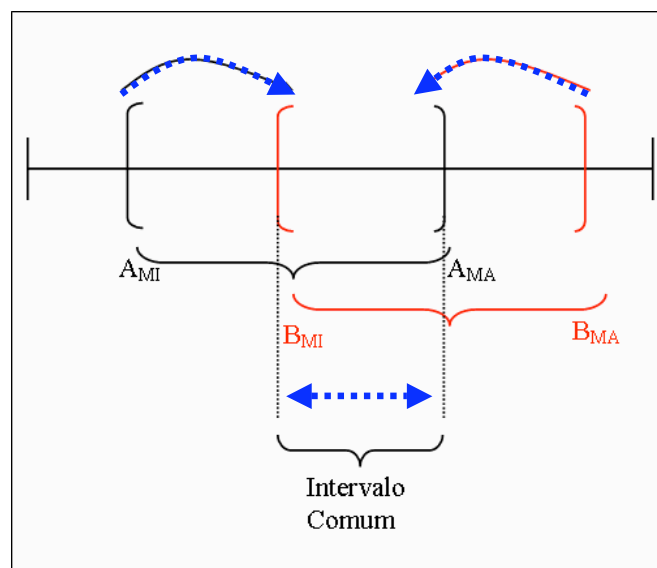
ViP-GMABS Architecture⁽²⁾



15

Negotiation/Communication

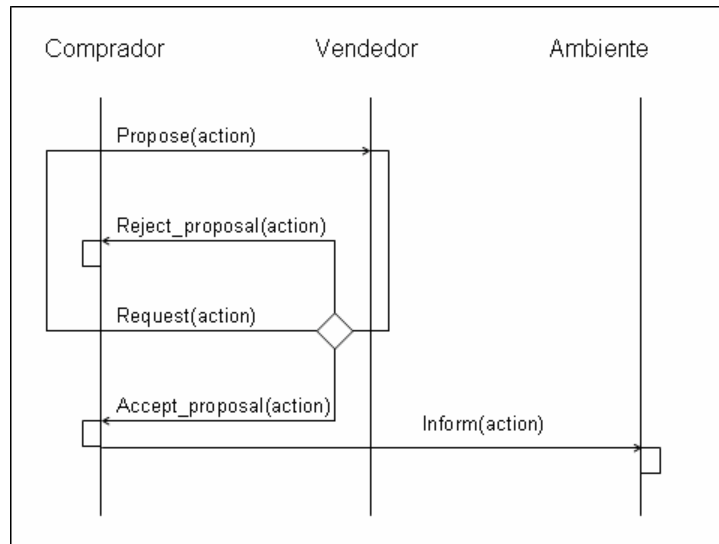
- Raiffa Negotiation Protocol



16

Negotiation/Communication

- We defined a negotiation protocol based in ACL-FIPA:



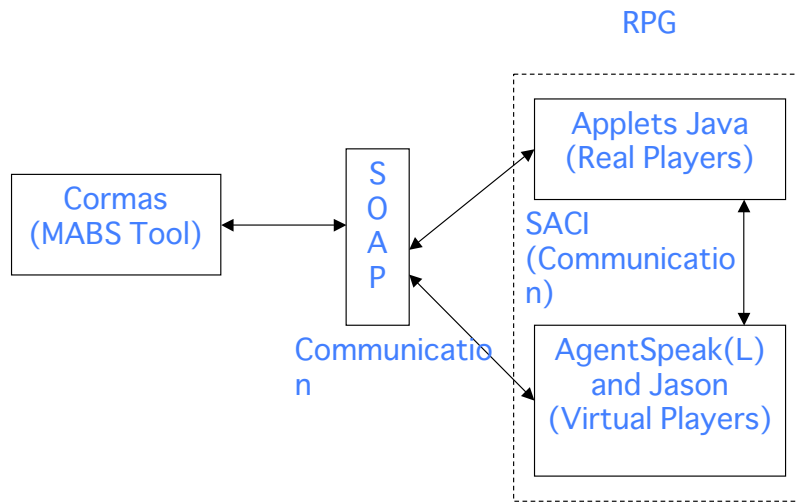
17

ViP-JogoMan Prototype

- The same roles and rules of JogoMan Prototype;
- Implemented using ViP-GMABS architecture.

18

ViP-JogoMan: Selected Tools



19

Virtual Players

- We have mapped all the real players actions during the JogoMan prototype session tests.
 - to discover their objectives and strategies, aiming to build the virtual players knowledge data base.
- We have analyzed and discovered a **sequence of actions** that each real player executed.

20

Behavioral Profiles⁽¹⁾

Player	Behavioral Profile	Objective
Land Owner	Economic	must save and earn money
	Ecologic	must improve the ecological situation of region
AguaPura Administrador	Rational	must improve water and sanitation networks with a rational use of money
	Ecologic	must improve water and sanitation networks
Migrant Representative	Economic	must allocate families without worrying about the social conditions of these families
	Social	must allocate families in good places
Mayors	Social	must improve the life quality of
	Economic	must improve the life quality of people if he has money to do it
	Ecologic	must improve the ecological situation

21

Behavioral Profiles⁽²⁾

Economic Land Owner (strategies):

- If the player has plots near to urban areas, he changes their use to Settlement to be able to sell to Migrant Representatives, since Migrant Representatives always want plots near to the urban areas;
- If the player has plots where the land use is not Forest, he changes to Agriculture or Irrigated Agriculture, because these land uses have a low investment and a fast prot of money, comparing of the other land uses, as Industry;
- If the player has plots where the land use is Forest, he changes to Plantation, to receive the suppression prot to cut the trees.

22

BDI: Jason and AgentSpeak(L)

Second strategy implemented in AgentSpeak (L)

```

24 +plot(L,R): neighUrb(N,L) [source(percept)] & .myName(M) & owner(M,L,P) [source(percept)] & r
25   <- changeLandUse(L,settlement);
26   !nextPosition(L,R).
27
28 //quando tem lotes que nao sao floresta nem loteamento, muda para agricultura
29 +plot(L,R): not forest(L) [source(percept)] & not settlement(L) [source(percept)] &
30   not agriculture(L) [source(percept)] & .myName(M) &
31   owner(M,L,P) [source(percept)]
32   <- changeLandUse(L,agriculture);
33   !nextPosition(L,R).
34
35 //quando tem lotes que sao florestas, muda para plantacao
36 +plot(L,R): forest(L) [source(percept)] & .myName(M) & owner(M,L,P) [source(percept)] & not
37   <- changeLandUse(L,plantation);
38   !nextPosition(L,R).
  
```

23

The interface includes several sections:

- Player Information:** Nome do Jogador: prefeito_b, Numero da Rodada: 1, Dinheiro: 30000.0, Lotes: Urbano(1), Urbano(2), Floresta(3), Pasto(0).
- Action Section:** Contains buttons for "Comprar e Alugar de Lotes", "Modificação de Uso do Solo", "Colocar Infra-Estrutura", "Modificar Imposto Territorial", and "Transferir Dinheiro".
- Negotiation Section:** Includes a table for "APENAS Comunicação com outros jogadores - TODAS as ações devem ser selecionadas acima" with columns for Jogadores, Tipo Mensagem, Lote, Valor, and Justificativa da Ação. It also features "Mensagens Recebidas" and "Mensagens Enviadas" text areas, and an "Envia MSG" button.
- Information Section:** Includes buttons for "MAPA", "Custos e Ganhos", "Regras do Jogo", and "Ações Coletivas".

24

Tests and Preliminary Results⁽¹⁾

- We have conducted:
 - 3 test sessions;
 - By *Web*;
 - 22 people + virtual players;
 - Three forms to evaluate:
 1. pre and post questionnaires;
 2. analysis of the behavioral profiles variables;
 3. analysis of the message exchange ow between all players (virtual and/or reals) during the negotiation process.

25

Tests and Preliminary Results⁽²⁾

- The answers given by the real players in the pre and post questionnaires:
 - ViP-JogoMan prototype gave the players interaction, entertainment and learning feelings.
 - Real players did not discovery the virtual players easily in the game.
- The analysis of the behavioral profiles variables:
 - Virtual Players attended the proposed objectives.

26

Tests and Preliminary Results₍₃₎

- The analysis of the message exchange flow between players during the negotiation process:
 - _ All players interacted a lot with each other.

27

JM - Jogo-Teste 3 - Rodada 1					
	Comprador	Vendedor	Tipo	Lote	Valor
1	AguaPura	Proprietário2	propose	22	1.500
	AguaPura	Proprietário2	request	22	1.500
2	AguaPura	Proprietário5	propose	34	1.500
	AguaPura	Proprietário5	accept_proposal	34	1.500
3	AguaPura	Proprietário8	propose	47	2.500
	AguaPura	Proprietário8	accept_proposal	47	2.500
4	PrefeitoA	Proprietário8	propose	47	1.350
	PrefeitoA	Proprietário8	request	47	1.350
5	Proprietário9	Proprietário2	propose	22	4.000
	Proprietário9	Proprietário2	accept_proposal	22	4.000
6	Proprietário1	Proprietário2	propose	22	4.000
7	Proprietário9	Proprietário2	propose	23	4.000
8	Proprietário6	Proprietário2	propose	22	1.000
	Proprietário6	Proprietário2	request	22	1.000
	Proprietário6	Proprietário2	propose	22	1.500
	Proprietário6	Proprietário2	reject_proposal	22	1.500

Concluded negotiation of virtual players

28

Conclusions

- The use of GMABS methodology by *Web*:
 - Efficient and practical: the prototype becomes available in remote places and for a greater number of people.
- To use virtual players in GMABS methodology:
 - Behavioral profiles + BDI architecture: non trivial decision-making.

29

Reference in this Presentation

- BARRETEAU, O.; BOUSQUET, F.; ATTONATY, J. Role-playing games for opening the black box of multi-agent systems: method and lessons of its application to Senegal River Valley irrigated systems. JASSS, v. 4, n. 2, March 2001. [Http://www.soc.surrey.ac.uk/JASSS/4/2/5.html](http://www.soc.surrey.ac.uk/JASSS/4/2/5.html).

30