Linguística Computacional Interativa

Projeto SGD-Br e pesquisas relacionadas

Aula de 21 de Agosto de 2012

- **Geral do SGD-Br**
  - **O que é raciocínio computacional**
  - **Por que é importante aprender**
- **Sobre o AgentSheets**
- **Nossas pesquisas**
- **PoliFacets**

Projeto Scalable Game Design Brasil (SGD-Br)
Clique para a Computação

SCALABLE GAME DESIGN Brasil

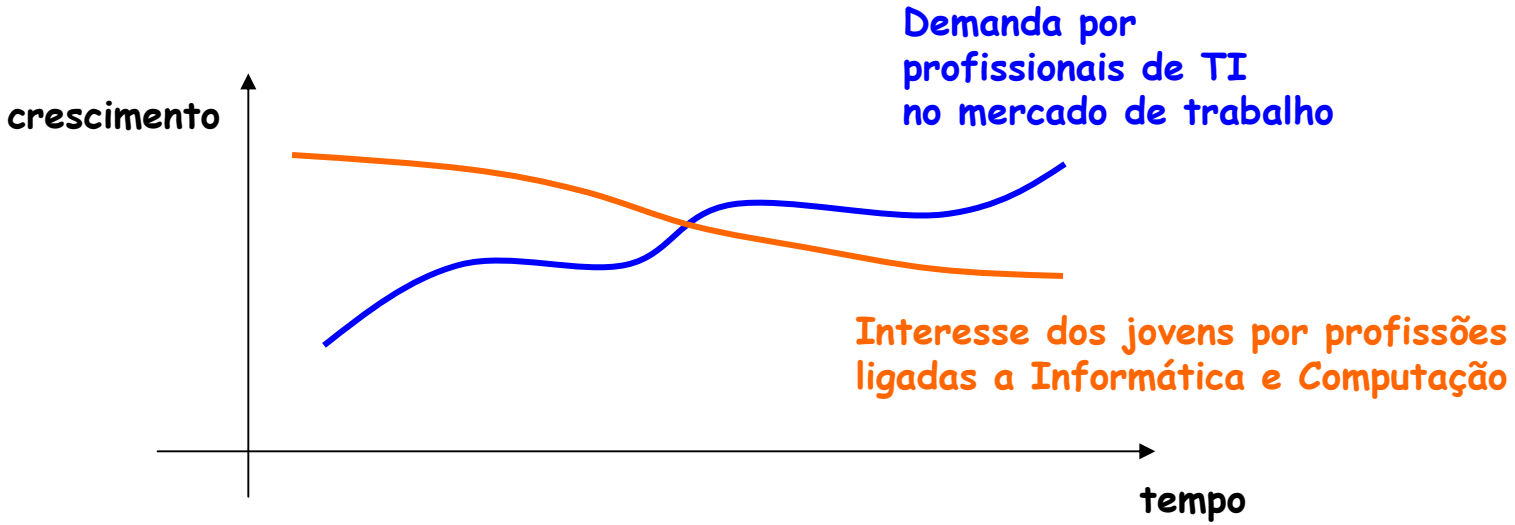
CLIQUE para a COMPUTAÇÃO

ADDLabs / UFF
SERG / PUC-Rio
L3D / Colorado University – Boulder
AgentSheets, Inc.

PUC RIO

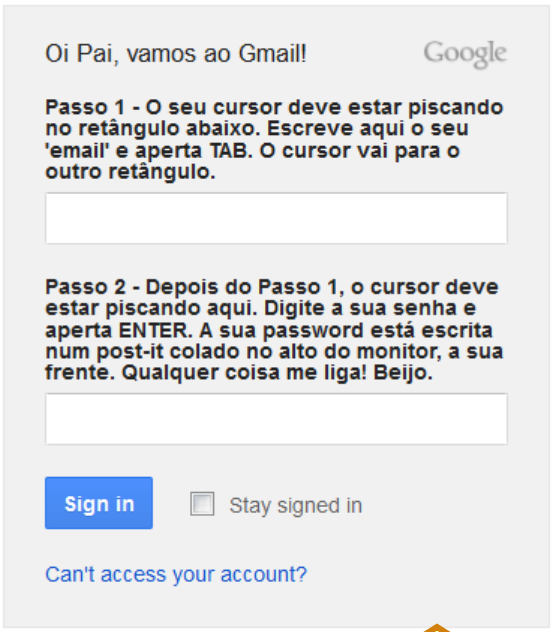
As motivações para o projeto nos EEUU

- Inovar o ensino de Matemática, Ciências & Tecnologia
- Aumentar o interesse dos jovens (de ensino fundamental e médio) pela Informática & Comutação



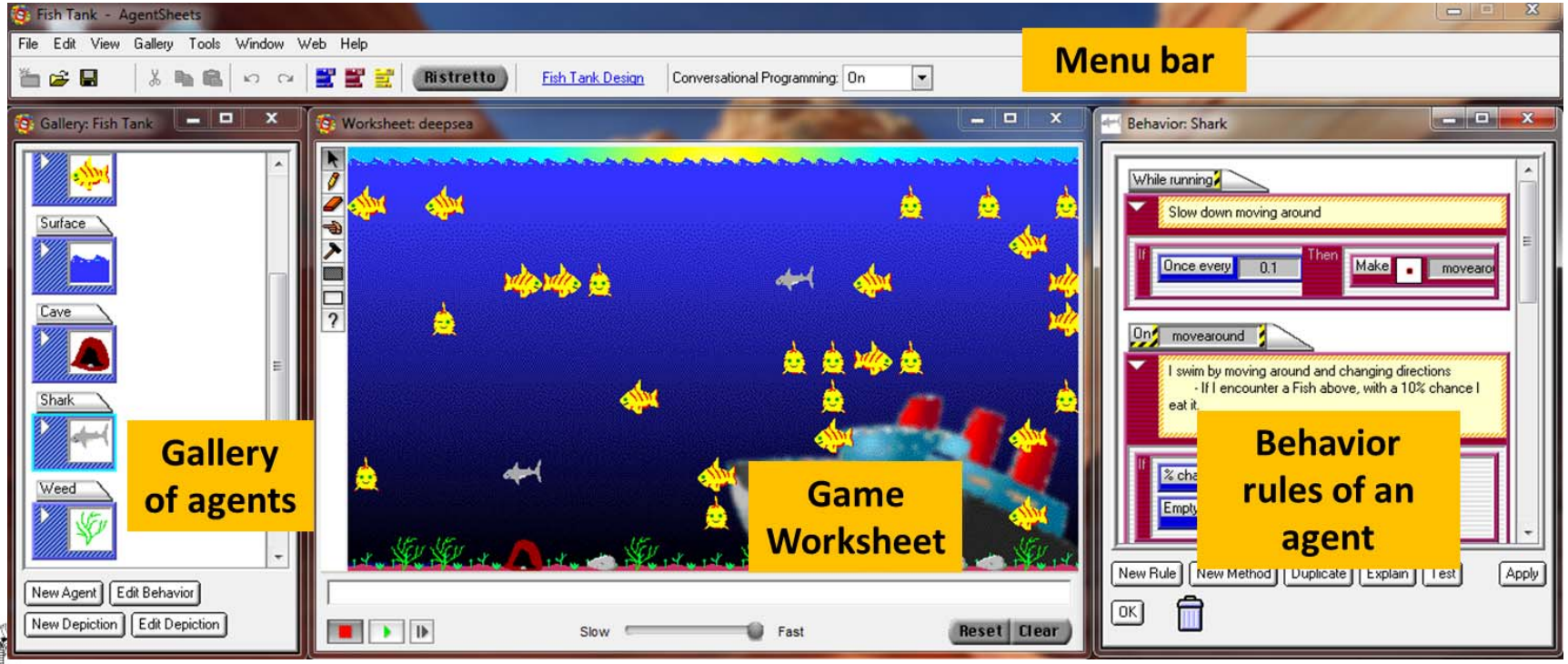
A nossa motivação

‘Alfabetismo Computacional’: novo requisito para a participação social plena do cidadão do século XXI



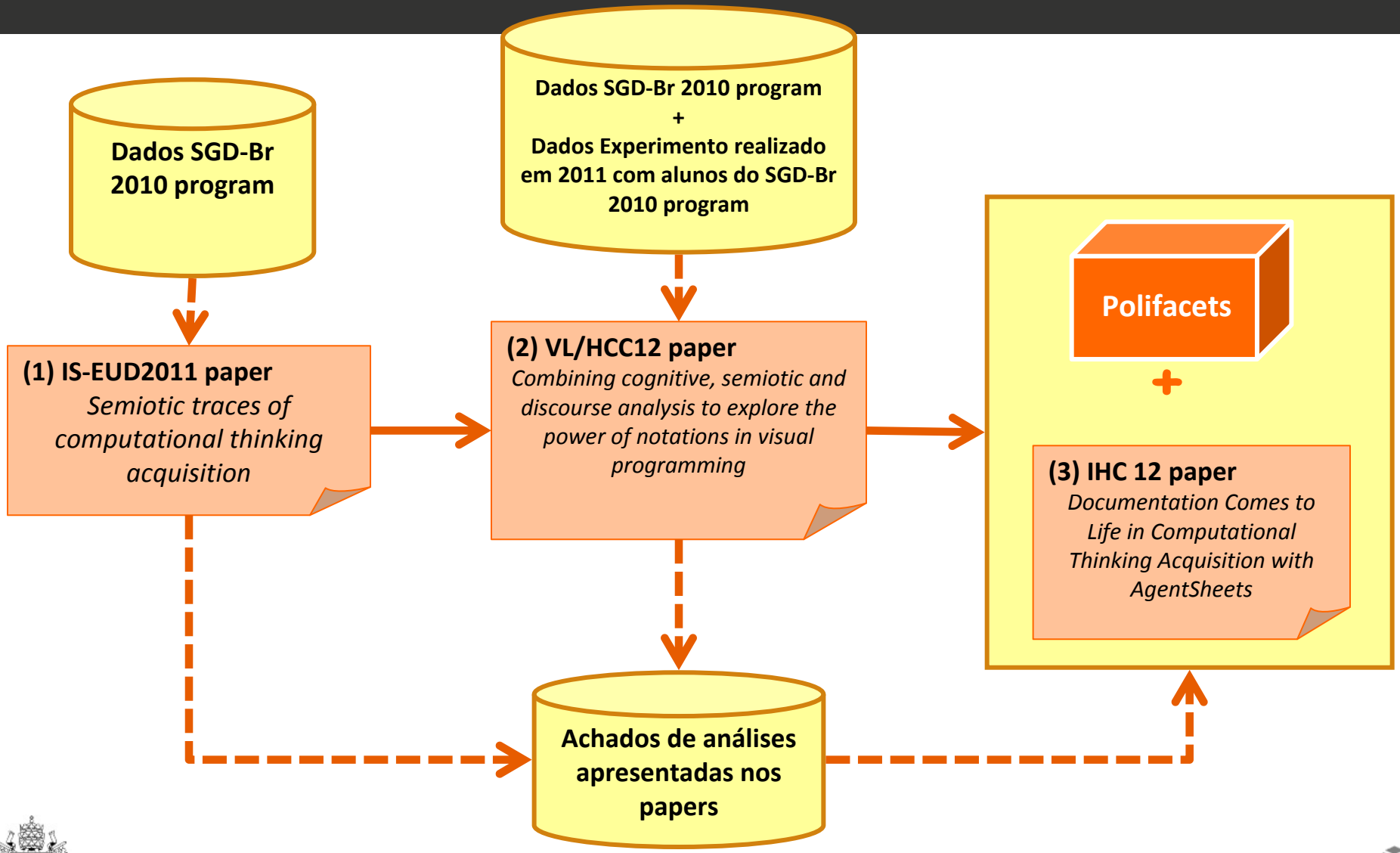
O AgentSheets

- Ambiente de desenvolvimento de jogos e simulações que usa uma *linguagem visual de programação*



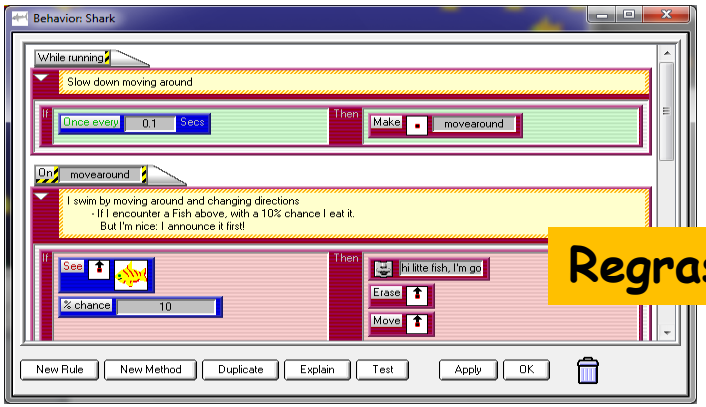
Nossa pesquisa

Nossa pesquisa

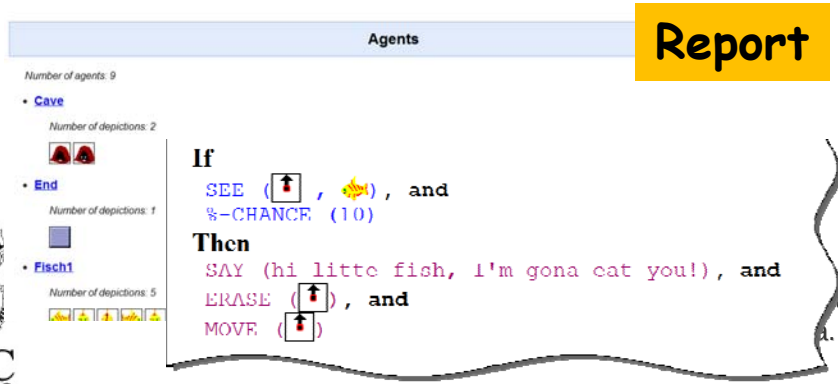


“Partes” do Jogo no AgentSheets

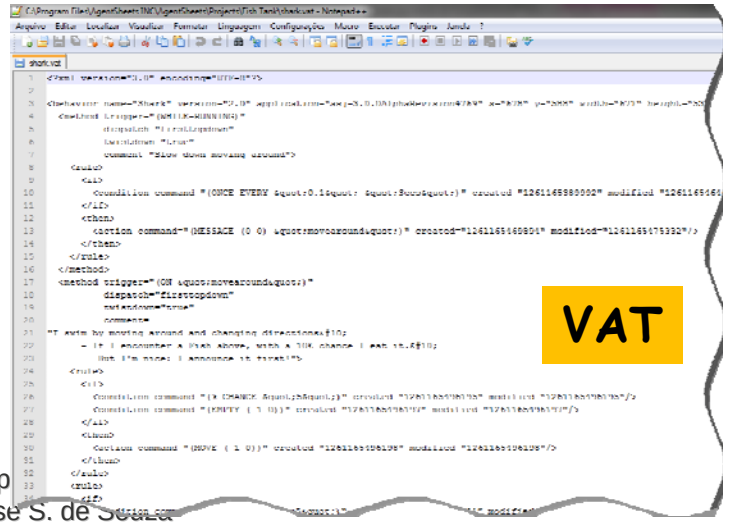
Worksheet



Regras



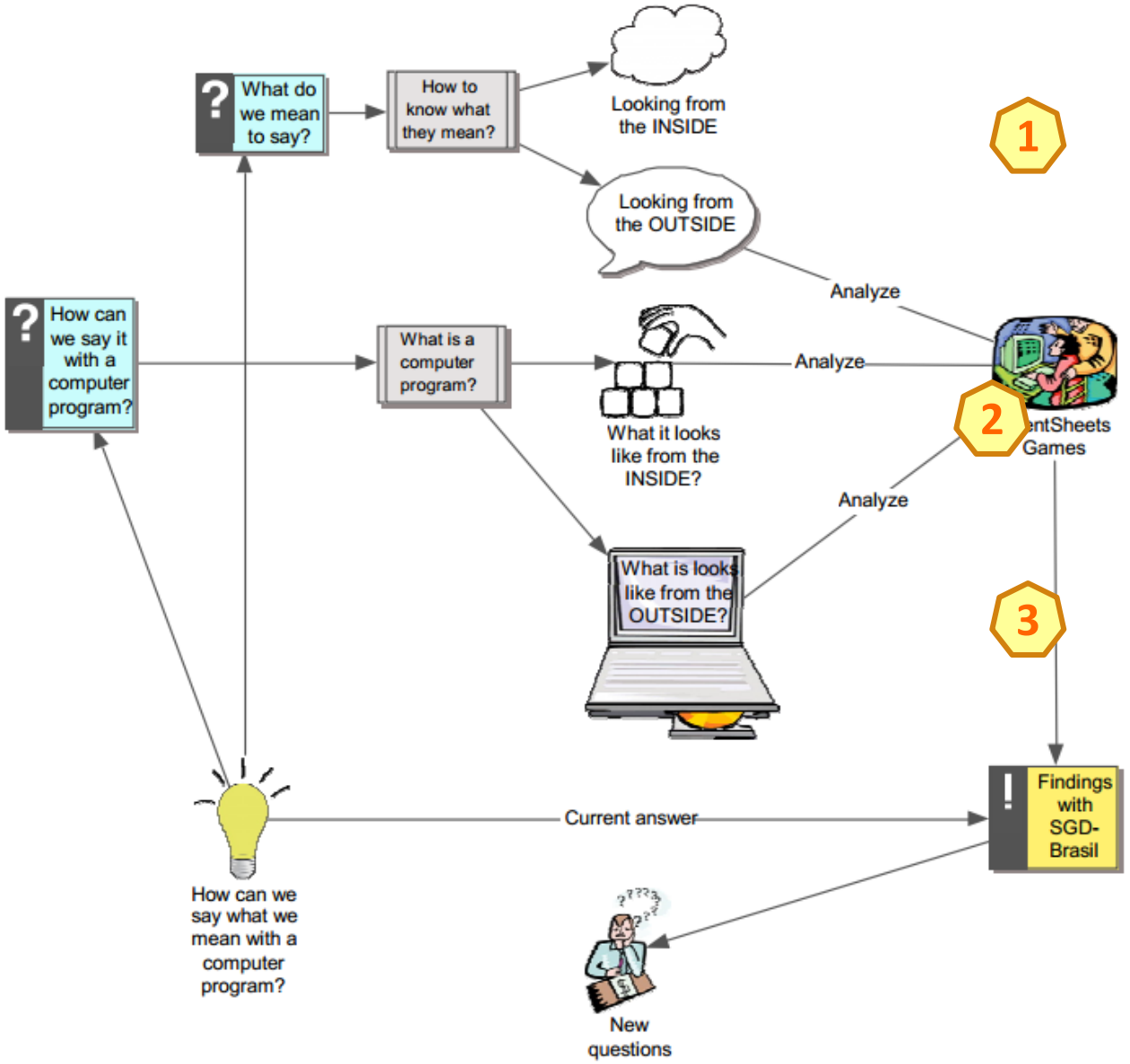
Report



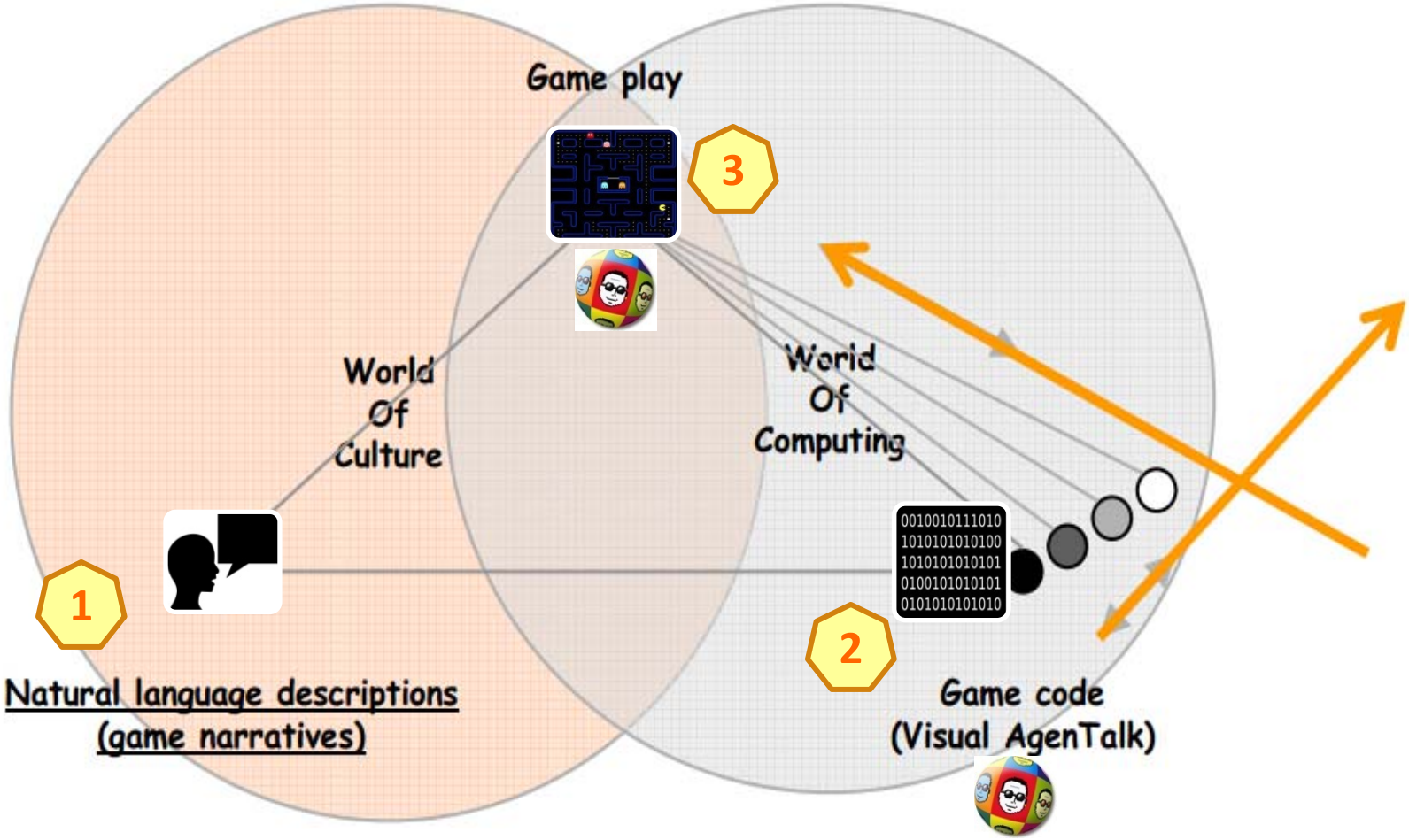
VAT

PUC RIO

Nossa pesquisa - IS-EUD2011



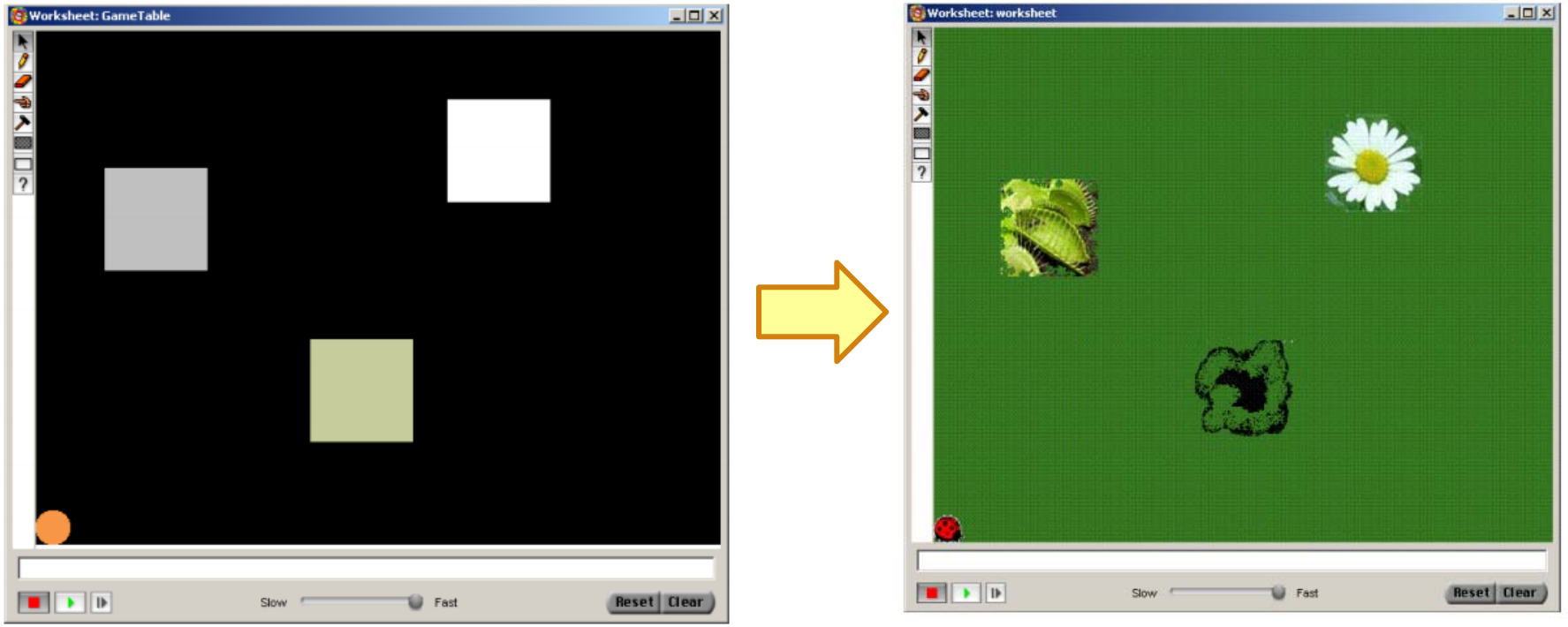
Nossa pesquisa - IS-EUD2011



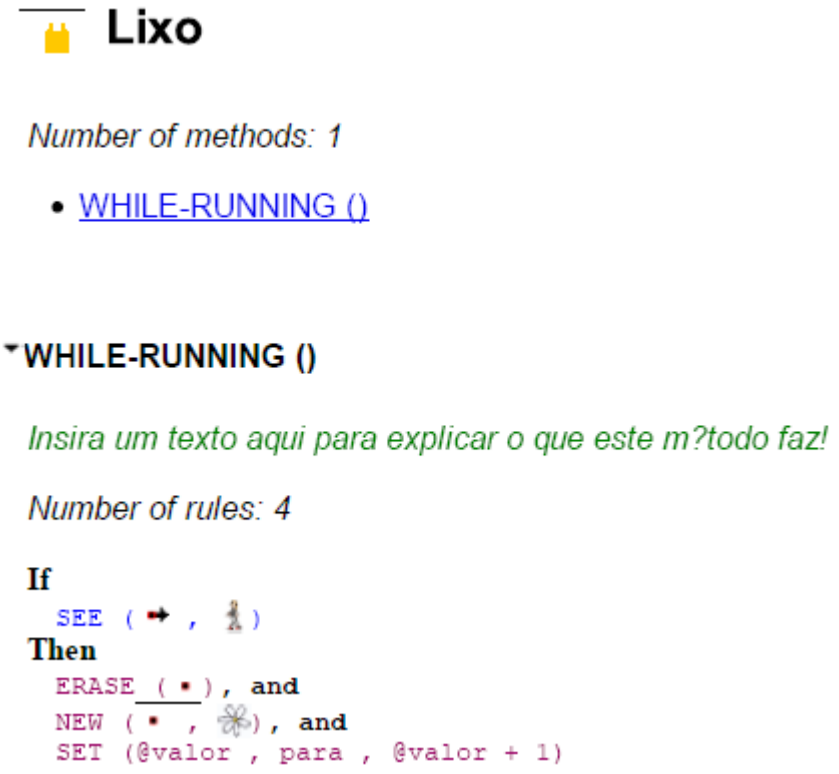
Nossa pesquisa - IS-EUD2011

Lembrando da aula passada...

Sistemas de representação e significação distintos comunicam mensagens distintas.



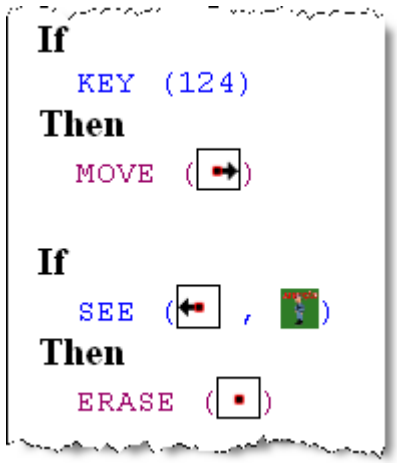
Active (NL) – Passive (VAT) Transformation



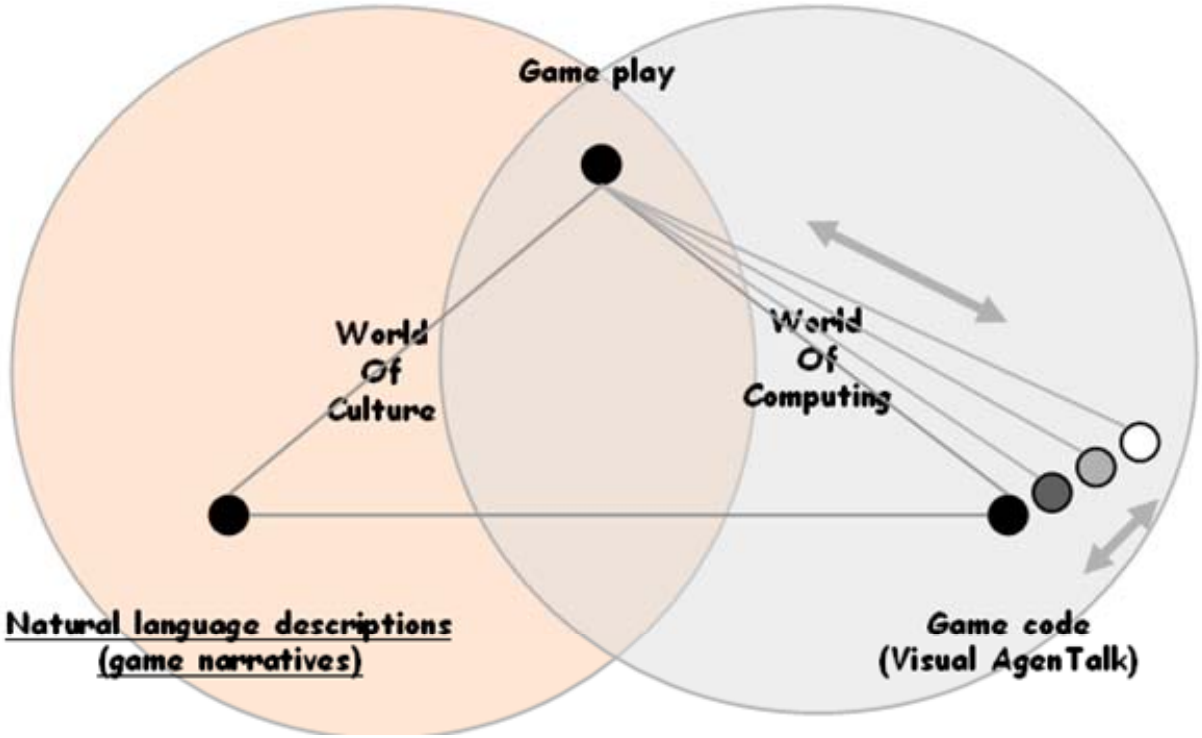
"Look: you move this fellow with the arrows. And he collects all the garbage."

Indeterminate Subject (NL) – Reversed roles in VAT x Game

"The little guy has to cross to the other side, […] he cannot touch the raccoons and the monkeys. If he touches them, **the ranger will appear and he will die**. So, he must get to the other side alive, see?"



Some related concepts and phenomena



- Naming strategies
  -- identifiers, arrays, structured data (compositions)
- Token/Type relations
  -- classes of objects, specialization (replicas)
- Transitivity
  -- aspects and views, default values, code reuse, performance optimization

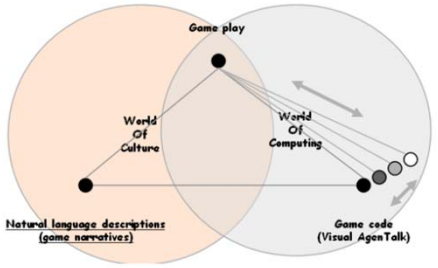
What is a computer "model"?

In conclusion: why should we care?

– *Computing literacy*
  - It is not only about algorithmic thinking, but also (and importantly so) about how you can express your thoughts using computer representations (including algorithms)

– Exploring 3 kinds of content-expression relations
  - Iconic – the significance of perceptual resemblance
  - Indexical – the significance of contiguity
  - Symbolic – the significance of logic and convention

  What kinds of computational models are created depending on which signs are chosen?

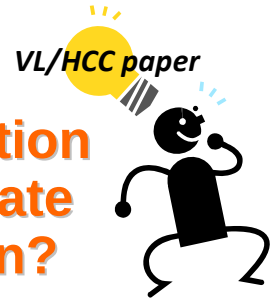


– Pedagogical possibilities for computing literacy education

Next steps in view

Long shot question: what will these answers mean to **computer scientists?**

- The meaning of computation
  - What do the kids think computation is depending on what kinds of computational signs they learn to use?
- Scaffolds for computational thinking acquisition
  - **What kinds of additional interface signs and interaction possibilities could we have in AgentSheets to facilitate different levels of computational thinking acquisition?**



- Tracing cultural (and cognitive) dimensions in computational thinking
  - Do kids from different countries, using different languages, use significantly different patterns of expression for related meanings?

Nossas pesquisas - VL/HCC12

(2) VL/HCC12 paper

Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Experimento com jogo Fish Tank

- *Estudantes de 2010 em 2011*
- *2 tarefas: Entender e modificar Fish Tank*

Nossas pesquisas - VL/HCC12

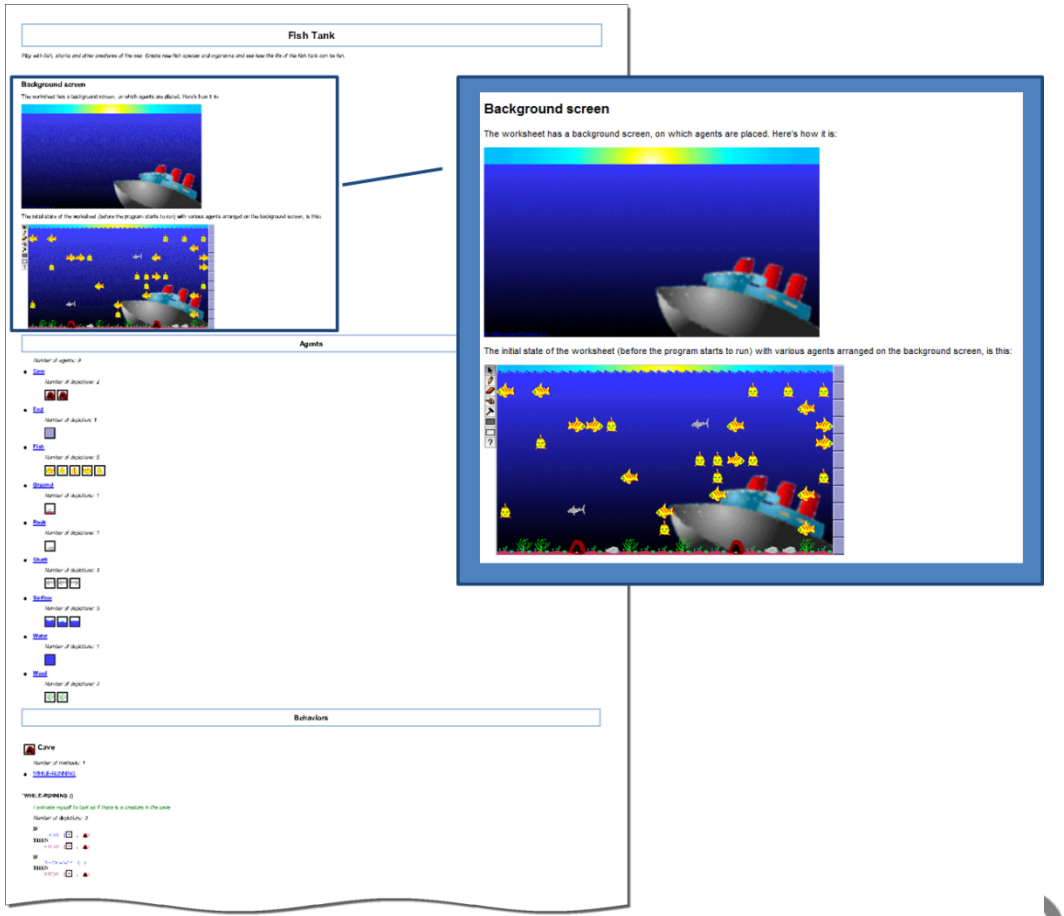
(2) VL/HCC12 paper

Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

- *Uso do report "turbinado" como nova representação do AS*
- *Design da modificação no report*

Representação adicional e extendida

Report "turbinado"



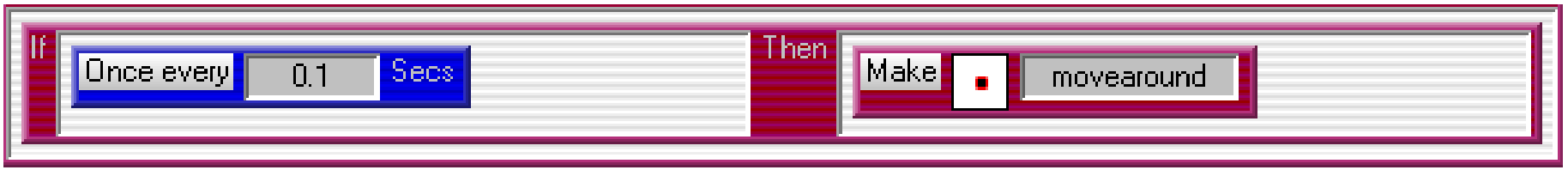
(2) VL/HCC12 paper

Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Interesting findings...

❖ *Recollections of difficulties*

"This was where I was testing with multiple agents ... the movement frequency ... I tested it first putting 1 second for him to move randomly, it was quite slow. Then I lowered it to 0.5 seconds, but it was still slow ... So, I kept on lowering it [till it was OK]... At the time of the [2010] project it was something that I had a hard time mastering.



Nossas pesquisas - VL/HCC12

(2) VL/HCC12 paper
Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Interesting findings...

- ***"Aha! Moments"***
  - Breakthrough in understanding
  - Wrong understandings got corrected

"The shark has a will of its own and the little fish too...nobody wants to obey me. "

"Hmm... so this is what happens!".

"Oh! So, I have this [other] possibility to compose the background of the game... I built all my background with agents, which sometimes caused a lot of trouble."

The combination of the dynamic and static representations of the complete program promoted new levels of comprehension

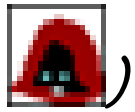
Nossas pesquisas - VL/HCC12

(2) VL/HCC12 paper
Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Interesting findings…

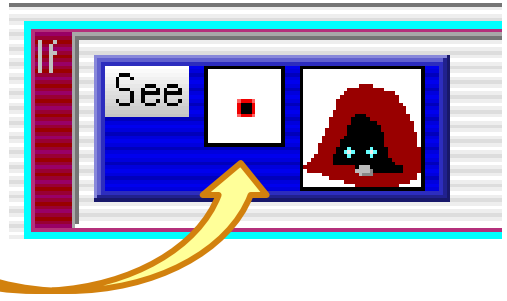
❖ ***More "Aha! Moments"***

❖ **Led to reinterpretation of the dynamic representations**

"the cave () … seems to have a little pair of eyes in it ()".

❖ **Led to confrontations with one's own gaps in the learning process.**

*"What is this **dot**?"*



- ***Visual notation for self-reference***
- *Learned that the dot <u>mattered</u> in AgentSheets rules.*

Nossas pesquisas - VL/HCC12

(2) VL/HCC12 paper
Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Interesting findings…

❖ ***More "Aha! Moments"***

❖ **Led to confrontations with one's own gaps in the learning process (cont.)**

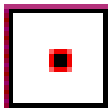
- The Fish Tank made a extensive use of the "dot" (Visual notation for self-reference)
- The student depended on the "dot" meaning to make sense of the Fish Tank program

(2) VL/HCC12 paper
Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Interesting findings...

❖ ***More "Aha! Moments"***

What does it mean? What can I do with it?...

❖ **More about the "dot"** 

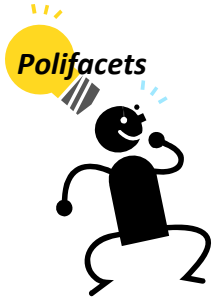
- Difficulties in dealing with inverted semantic transitivity
- The functional use of self-reference did not always correspond to the semantics of self-reference in reality

"When the carrot saw the rabbit next to it, the carrot deleted itself." (description of the 2010 program student's game)

(2) VL/HCC12 paper
Combining cognitive, semiotic and discourse analysis to explore the power of notations in visual programming

Concluding remarks

- *The benefits of the complete program structure and content that is the report*
- *Theacher's testimonial about the program report as another "representation tool" for teaching computational thinking*



"Orienting the learners without this report was confusing, because the student needs to click on one agent, visualize its rules, many times doing the same thing many times. In general they cannot remember the whole set of rules for every agent. So, using the report gives us a broad view of all agents and how each one is programmed."

Nossas pesquisas

(3) IHC 12 paper
Documentation Comes to Life in Computational Thinking Acquisition with AgentSheets

- Artigo sobre o uso de documentação ativa no contexto de ensino de raciocínio computacional com o AgentSheets

- O PoliFacets é uma ferramenta para explorar as múltiplas facetas de jogos

PoliFacets

Motivação

- Documentação é um componente crítico
- Estudos anteriores indicam a necessidade de novas representações do jogo

O PoliFacets

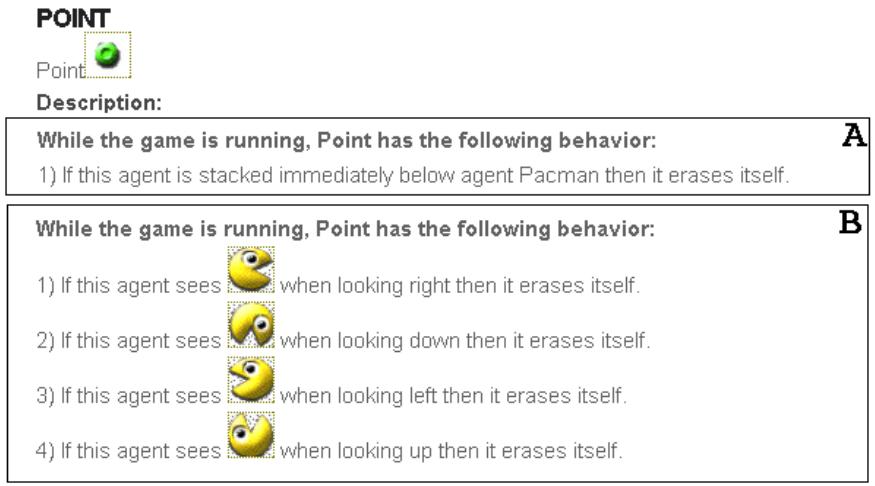
- É um mediador entre os usuários, o AgentSheets e as múltiplas representações dos jogos
- Enriquecimento dos significados existentes
- Descoberta de novos significados
- Espaço de reflexão
- Permite ‘conversar’ com o jogo e suas representações

Experimento

- Participantes/procedimento
  - Instrutores do AgentSheets
    - Apresentação do PoliFacets
    - Questionário com questões abertas
    - Conversa final
  - Professores que participariam do SGD-Br
    - Tarefa de modificação de um jogo (parte 1)
    - Apresentação do PoliFacets
    - Tarefa de modificação de um jogo (parte 2)
    - Conversa com o grupo

Resultados

- Dificuldades de aprendizado
  - Agente (sujeito) da ação
  - Relações AND e OR
- Abstração
  - Classe Vs Instância
- Lógica de execução do programa
  - Ordem das regras (ideia de conflito?)



Resultados (2)

- Reconhecimento do valor do PoliFacets
  - Espaço na web FAQ/Envio de perguntas
  - Detalhes sobre a planilha
- Aplicação do PoliFacets
  - Documentação
  - Ensino
  - Depuração de erros
- Novas funcionalidades para o PoliFacets
  - Batalha Naval
  - Malha de interação entre os agents
  - Fórum

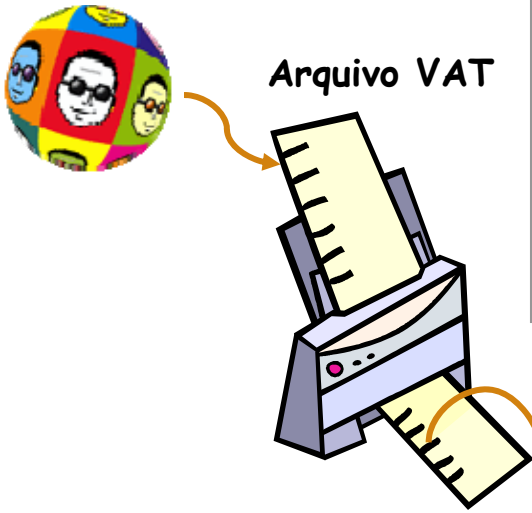
Considerações finais

- Resultados indicam que estamos no caminho certo
- Ainda é preciso melhorar
  - Mas os participantes já começaram a ter *insights* sobre o ensino e aprendizado do raciocínio computacional, além de esclarecerem dúvidas ou mal entendidos
- Trabalhos futuros
  - Pesquisas sobre o uso do PoliFacets durante o projeto
  - Tese da Marcelle

Sobre a ‘Lógica do Jogo’

Módulo do **PoliFacets** Ligado à
Pesquisa de Doutorado de
Marcelle Mota

O que o módulo está fazendo atualmente?




```
<?xml version="3.0" encoding="UTF-8"?>

<behavior name="Animal2" version="2.0" application="asj-3.0.1b" x="350" y="85" width="632" height="400">
  <method trigger="(WHILE-RUNNING)"
          dispatch="firsttopdown"
          twistdown="true"
          comment="Insira um texto aqui para explicar o que este mÈtodo faz!">
    <rule>
      <if>
        <condition command="(SEE (0 1) &amp;quot;animal5&amp;quot;)" created="1289418605250" modified="1289418611390"/>
      </if>
      <then>
        <action command="(ERASE (0 1))" created="1289418614203" modified="1289418616781"/>
      </then>
    </rule>
```

ANIMAL2

O agente **Animal2** aparece assim:

Animal2 

Texto Automaticamente Gerado em 'Português'

Descrição:

Enquanto o jogo está rodando, Animal2 tem o seguinte comportamento:

1) Se este agente vir  ao olhar para a direita então ele apaga o agente que ele vir quando olhar para a direita.

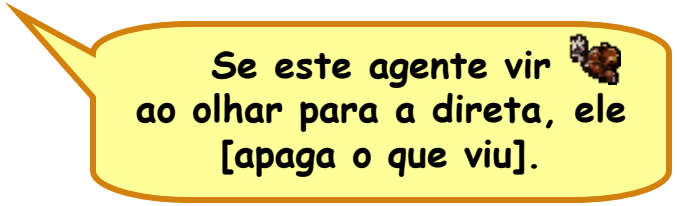
Texto ‘em fase de aprimoramento’

1) Se este agente vir  ao olhar para a direita *então ele apaga o agente que ele vir quando olhar para a direita.* 

```
<rule>
<if>
<condition command="(SEE (0 1) &amp;quot;animal5&amp;quot;)"
    created="1289418605250" modified="1289418611390"/>
</if>
<then>      <action command="(ERASE (0 1))" created="1289418614203"
    modified="1289418616781"/>
</then>
</rule>
```

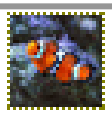
Texto ‘em fase de aprimoramento’

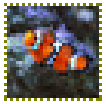
1) Se este agente vir ao olhar para a direita então ele apaga o agente que ele vir quando olhar para a direita.

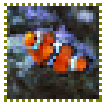


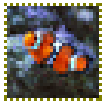
<rule>
<if>
<condition command="(**SEE (0 1)** "animal5")"
created="1289418605250" modified="1289418611390"/>
</if>
<then> <action command="(**ERASE (0 1)**)" created="1289418614203"
modified="1289418616781"/>
</then>
</rule>

Onde gostaríamos de chegar

2) Se este agente vir  ao olhar para a direita então ele move-se para esquerda.

3) Se este agente vir  ao olhar para a esquerda então ele move-se para direita.

4) Se este agente vir  ao olhar para baixo então ele move-se para cima.

5) Se este agente vir  ao olhar para cima então ele move-se para baixo.

- Se este agente vir  ao olhar para a direita, esquerda, para baixo ou para cima, ele move-se **na direção oposta**.

Por que gostaríamos de chegar lá

- Porque imaginamos que se os aprendizes pudessem 'brincar' com as diferentes representações verbais e visuais do jogo, produzidas pelo sistema ou por eles próprios, ganhariam habilidades expressivas relevantes e diferenciadas.

Se o sistema não acertar,
o aprendiz 'manda a narrativa' certa.
[Incentivo à expressão escrita]

- Porém, **não sabemos se isto é verdade**. Daí estarmos 'pesquisando' e querendo encontrar professores parceiros para nos orientarem.