Programming Control Structures in Active Objects Model

Dorian Gorgan
Computer Science Department
Technical University of Cluj-Napoca
E-mail: Dorian.Gorgan@cs.utcluj.ro
Contents

- Introduction
- Visual Programming
- Active Objects Model
- Programming Control Structures
- Experiments
- Results
- Conclusions
Program Development Issues

- Description along a linear address space
- N-dimensional parallel evolution
- Concurrency
- Cooperation
- Adaptive behavior
- Visual programming techniques
  - Graphical presentation
  - Application entities manipulation
  - Complex space navigation
  - Dynamic relationships
  - Data structures
  - Programming control structures
Linear address space

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>45A62</td>
<td>$A = \cos(\alpha \times \sqrt{m+n})$;</td>
</tr>
<tr>
<td>45A62</td>
<td>mov ax,...</td>
</tr>
<tr>
<td>45A63</td>
<td>shr dl,...</td>
</tr>
<tr>
<td>45A65</td>
<td>add al,...</td>
</tr>
<tr>
<td>45A67</td>
<td>jmp 45A63h</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

Program Counter
Value Space Mapping

- Attribute value space is mapped into 2D/3D virtual space
- **Trajectory** = mapping the evolution throughout the value space into the evolution throughout the virtual space
- **Position** = explicit value space position where/particular functionality is achieved
Active Objects Model - AOM

- Active Objects Model
- Virtual Space Modeling
- Visual Programming

AOM
AOM Entities

- Active Entities:
  - Active object (agent)
  - Variable

- Passive Entities:
  - Behavior
  - Trajectory
  - Explicit trajectory position (ETP)
  - Rule
  - Action
  - Expression
  - Presentation: graphics, audio, video
AOM – Entity Relationships
AOM – Development Environment
AOM – Development Environment
AOM Functional Levels

<table>
<thead>
<tr>
<th>AOM Language</th>
<th>AOM Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AOM Platform</th>
</tr>
</thead>
</table>

| Basic Software Functionality |

- AGML (Agent Modeling Language) - application program description
- AOM Model – executable application model
- AOM Platform – active objects based basic functionality
Programming Paradigms

- Task modeling
- Data flow
- Programming control structures
- Rule based programming
- Object orientation
- Data structures definition
Control Structures

- Mapping control structures into AOM
- Consistent set of control structures
- Visual programming techniques
- Mapping the control structures at different levels:
  - Model
  - Active entity
  - Behavior
  - Trajectory
  - Trajectory position
  - Rule
Control Structures

- Control structure types
  - Sequential
  - Alternative
    - If
    - Case
  - Repetitive
    - While-do
    - Repeat-until
    - For
Sequential Structures
Alternative Structures
Repetitive Structures
Conclusions

- Multiple solutions
- Task modeling
- Flexibility
- Complexity
- Completeness
- Modularity
- Hyperstructures
- Hyperspace