Domain-Specific Modeling

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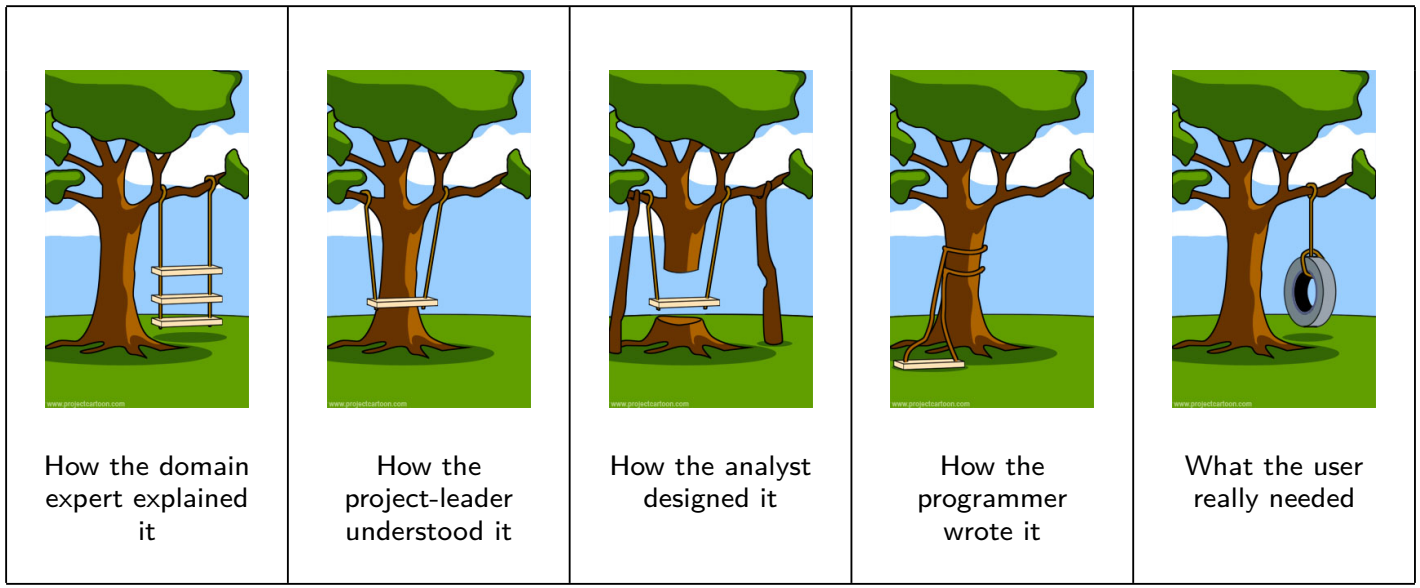
10.02.17

Contents

Motivation

Problem:

- error-prone communication between stakeholders
- general purpose languages hard to learn



Solution:

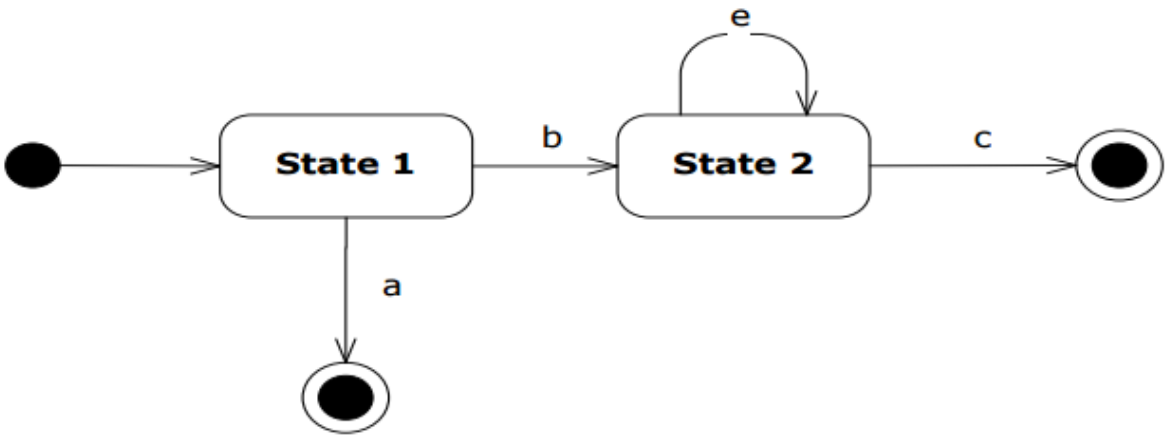
- let domain experts create their own “programs”
- use well-understood terms and concepts for representation

Important Terms

- **Model**
  - formal representation (abstraction)
  - certain correspondence (homomorphism)
  - purpose (pragmatics)
- **Domain knowledge**
  - common knowledge of the requirements, concepts and functionality in a field of application
- **Domain-Specific Modeling Language**
  - textual or graphical representation of concepts, entities and relationships (only those relevant for the application)

Domain-Specific Modeling Languages

Graphical



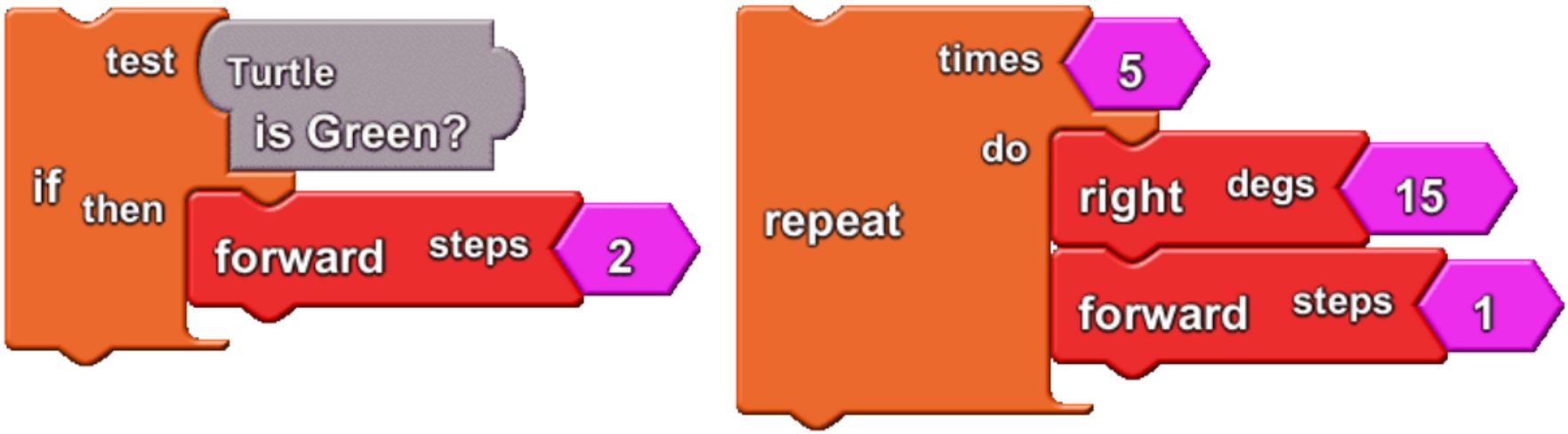
Textual

```
STATES
   State 1, State 2, Start(start), Stop 1(stop), Stop 2(stop)
TRANSITIONS
   Start->State 1, State 1 -b-> State 2, State 2 -e-> State 2,
   State 2 -c-> Stop 1, State 1 -a-> Stop 2
```

Graphical Modeling Languages

StarLogo TNG

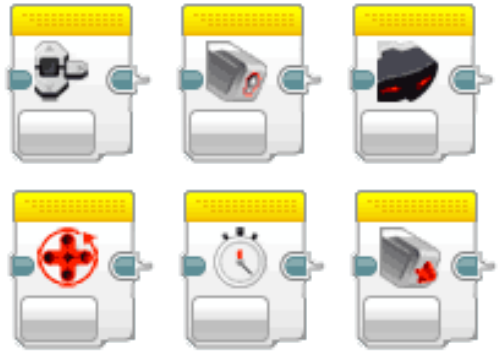
- Simulation of complex Systems without Programming Skills
- puzzle-piece blocks:
  shapes only allow syntactically correct constructs
- color based on function



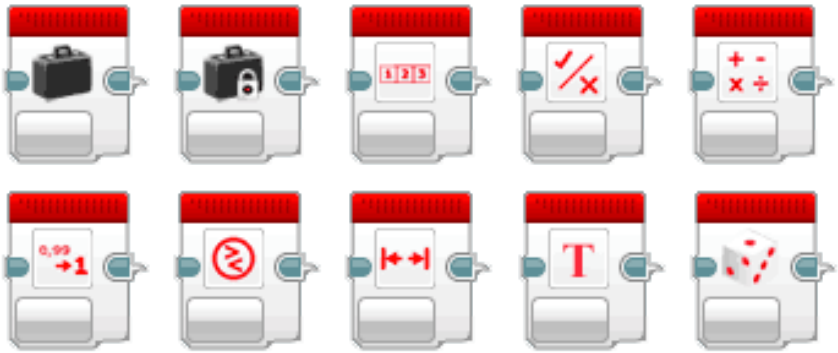
Graphical Modeling Languages

LEGO Mindstorms EV3

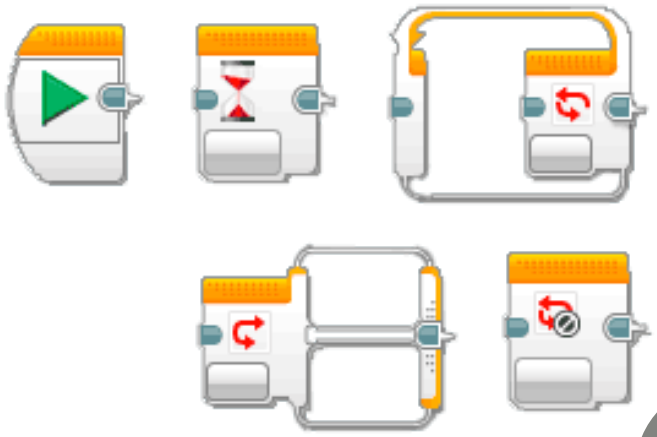
(a) action blocks



(b) sensor blocks



(c) operation blocks



(d) flow blocks

Textual Modeling Languages

PhyDSL

- create models for the game development domain
- fast prototyping of physics-based games
- text editor (syntax highlighting ; text completion)

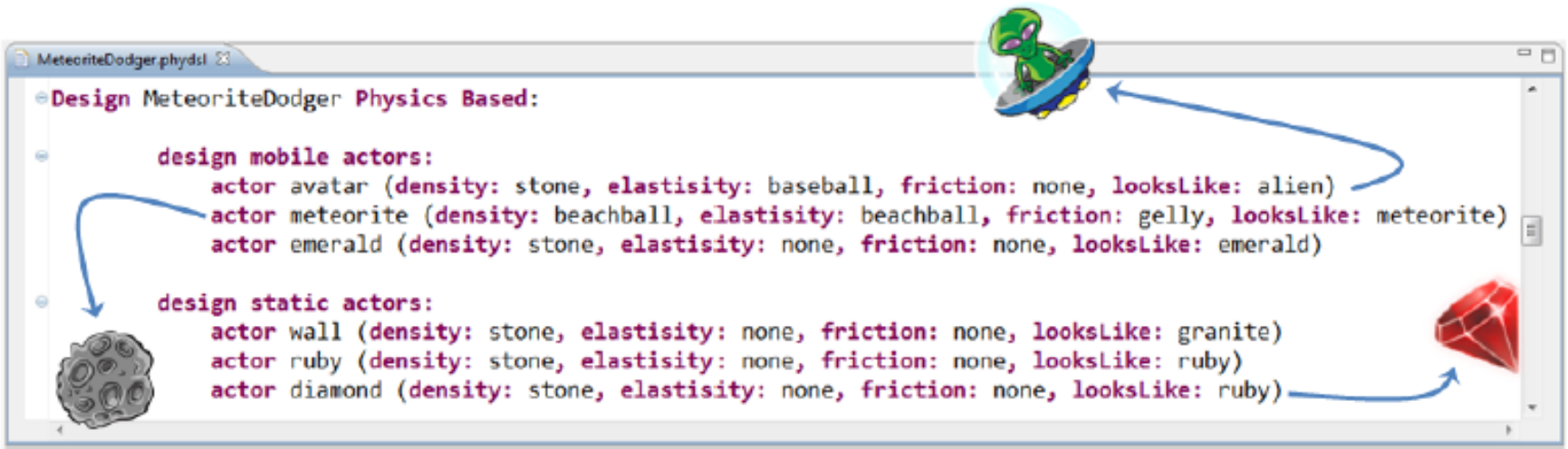


Figure: PhyDSL: Static Actor Definition

Creating Modeling Languages

Xtext

- Grammar Language (similar to EBNF)
- generates text-editor plugin for Eclipse
- features Syntax-Highlighting; Autocompletion

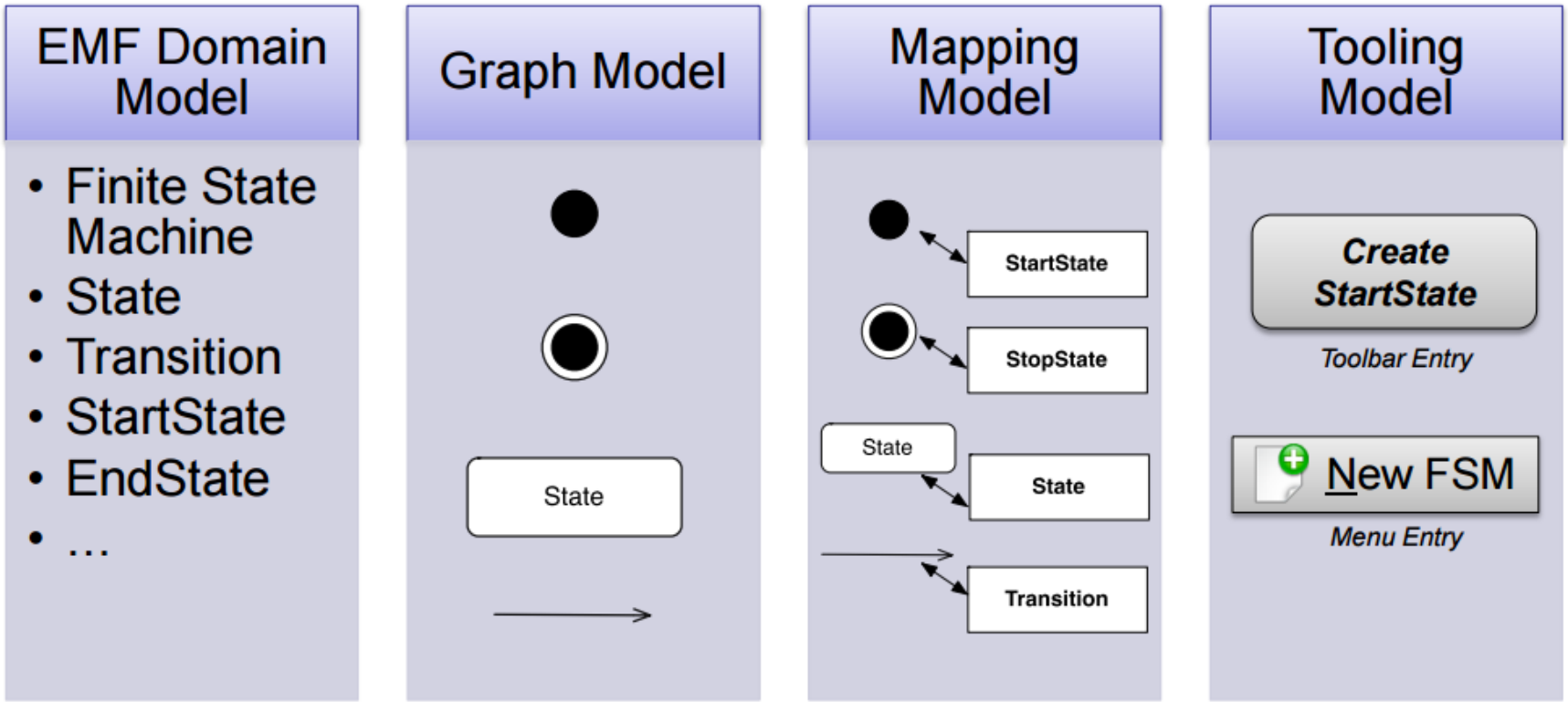
```
FSM: "States:" (states+=State (",")?)*
"Transitions:" (transitions+=Transition (",")?)*;
State: id=ID isStart?="(start)" isStop?="(stop)";
Transition: fromState=[State] "-" (input)? "->"
    toState=[State];
```

Figure: Xtext: Grammar for modeling finite state machines

Creating Modeling Languages

Graphical Modeling Framework (GMF)

- User defines Mapping: Graphical Shapes → Model-Elements
- GMF generates graphical-editor plugin for Eclipse
- features Drag & Drop; Tooling (add/delete elements via menus)



Summary

- support domain experts in creating models easily
- overview over some modeling languages
- textual $\leftrightarrow$ graphical modeling languages
- Tools for creating modeling languages (Xtext & GMF)

Questions?