



Laboratoire d'Informatique Le Mans Université

Mapping Facts to Concrete Game Elements for Generation Purposes: A Conceptual Approach

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Overview

- Research context
 Declarative knowledge training games
- Research object **Generator of varied activities**
- Research problem How to design these generators?

Paper focus

A domain-independent mapping approach of questioned facts and gameplays at an implementation level

Declarative Knowledge Training Games

• Training = action of questioning facts repetitively

i.e., sort of Retrieval Practice (Roediger et Pyc, 2012)

- What are the **needs** for such **training**?
 - **Repetition** is required for DK memorisation, generalisation (Kim et al., 2013)
 - Variety to reduce boredom caused by repetition (Smith, 1981)
- Expected game requirements
 - Repetition
 - Variety
 - Progression (\Rightarrow still a learning game)

⇒ Roguelite

Roguelite for Declarative Knowledge

A game level is a **dungeon** = set of interconnected rooms where training takes place in the form of task-oriented gameplays





Roguelite for Declarative Knowledge



AdapTABLES project

• Objective: **design** of a **game** for long-term acquisition of **multiplication tables**

- Research method
 - **user-group** composed of ~10 mathematics experts
 - exploratory study in 2021 (Laforcade et al., 2022)
 - experts are **involved** in the design process
 - development using a **prototyping** approach





Research problem & Related works

- Training/Learning game design requirement
 - mapping game elements with training/learning elements
- Existing methods
 - LM-GM framework (Arnab et al., 2015), MAPLET framework (Gosper et MCNeill, 2012),

(Hall et al., 2014), (Dondi et Moretti, 2007), etc...

- Observations
 - mostly analysis-oriented & high-level relations
 - **no machine-readable relations** or guidelines for definition of relations at an implementation level

Background & Research questions



Our proposal

⇒ a specific modeling of questioned facts and gameplays/elements

Generic Modeling of Questioned Facts

• Questions/Choices **values** are **different** based on didactic domains

Domain	Question	Set of choices
Maths	3 x 5 = ?	{15, 8, 12}
Judo	Ippon-seoi-nage is ?	{shoulder throw from one side, large outdoor wheel, floating hip}

• But the **concepts** of facts questioned are **common**



Gameplay Modeling

- Describe gameplays and elements through abilities
 ability = element behavior (i.e., a block can be pushed)
- Advantages
 - adding an element ⇒ adding a gameplay
 - more variety (algorithm chooses the game element)
- Describe gameplays components by there intention
 - for proposition (display proposition)
 - for statement (display statement)
 - o etc.



Example of possible generations



Real-Case Application

- Implemented within an extensible framework to guide the design of DK training activity generators
- Framework has been extended to **two domains**
 - <u>multiplication</u> tables (game prototype using generator currently available)
 - o judo facts (generator developed)
- A third extension in development
 - <u>history-geography</u> facts



Conclusion & Perspectives

• Contribution

- a generic way to model questioned facts
- a generic algorithm to generate concrete questioned facts-oriented gameplays

• Limits

- targets declarative knowledge
- application in the context of Roguelite games only

• Perspective

• application to a third didactic domain





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Thank you for your attention 😌

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