Construction of a Knowledge Map-based System for Personalized Second Language Learning

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Introduction & Problem Statement

• Numerous Intelligent Computer-Assisted Language Learning (ICALL) and Intelligent Tutoring Systems (ITS) have been developed

• 1) Slavuj [1] says that ITS are “overrestricting the learning domain” and “focus on a single linguistic skill”

• 2) Slavuj: “an inability of an ITS to cater for learners with different levels of language proficiency”

• 3) Each system maintains its own domain and user modeling that is not exportable to another system

• RQ: how to model a L2 learner’s knowledge in a sufficiently fine-grained & flexible manner so it supports multiple skills and multiple CALL systems?
Graph Usage?

- Graphs are already in use in various knowledge modeling areas:
  - Pedagogy (concept-maps)
  - Web (Knowledge Graphs, semantic web, linked data)
  - Lexicography (lexical networks, linked data)
- Support heterogeneous data
- Easy extension
Concept Maps

• Pedagogical tool
• Created for hierarchical concept representation
• Have been used in L2 learning studies
• May or not make use of computers
Knowledge Graph

- Term coined by Google
- No agreed definition
- Aggregation of facts
- Magnitude of m/billions nodes & edges
- Created automatically
Lexical Networks

• Princeton Wordnet
• Derivatives in multiples languages
• Structured around synonymy: "synset"
Issue With Direct Use of Existing Graphs

• All:
  • Built for a given purpose, not for L2 teaching/learning

• Lexical networks
  • When translated, often made automatically => errors
  • Centered on synonymy/hyperonymy
Knowledge Map Design

- Differents layers corresponding to linguistics level
- Layers allows modeling multiple skills (intro. pt 1)
- Graph width: different level proficiency (pt 2)
Architecture

Knowledge Map Server

CALL
MALL
LRS

Graph Database

JSON

Learning Services

Vocabulary Recommendation
Tailored Examples for Grammar Point
Concept Map Image
Use Case Example #1

• One system: a dictionary application

• Issues:
  • Unknown words
  • Unknown grammar

• Applications:
  • Example sentences selection
    • No more than 1 unknown word
  • Example sentences ranking
    • Based on the learner knowledge
Knowledge Map Update

• Pre-existing content made from existing learning materials

• Data input update user profile

• Graph update if needed

KMS input:

```json
{
  Action: listened,
  Content: 今��はいい天気ですね。
}

{
  Action: read,
  Content: 天津飯たべた。
}
```
Use Case Example #2

• Three existing systems:
  1. BookRoll
  2. SCROLL
  3. Dashboard

• Data acquisition from 1 & 2
  • Reading analytics
  • Quiz results

• Pedagogical service to 2 & 3
  • Quiz generation
  • Knowledge map generation
References


• Full list (21) in the paper
ご清聴ありがとうございました

• Thanks for your attention
• Questions and Answers