

# Mobile Learning Games : An (almost) Ideal Use Case For Semantic Applications ?

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# Outline

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# Why Mobile Learning Creates so Much Interest?

## Cognitive psychology shows **learning to be an active process**

- **Rich interactions** between peers (learners) is fundamental
- **Learning by doing** is very effective both for **understanding and memorization**
- **Context of learning situations** strongly impact engagement of learners

## TEL research “**outside classroom**” has been limited by **practical reasons** until recently

- **Rich communications, actual interaction relevant for learning** are unlikely to take place in a “computer classroom”
- Untold assumption : “**learners are interacting with computational representations**” was reasonable
- Leaving the classroom revealed a need **for new representation given the complexity of outdoors situation**

# Illustration : two learning situations



## Frequency 1550

Team's of 4 students

- 2 Students man the control center
- 2 Students work around the town



1x Video phone  
1x 'Game Phone'

# Some Consequences in TEL

## Consequences in research practice

- Mobile learning remains **largely unexplored**, there is **no ready to use toolbox**
  - ▶ Rise in interest for Android/iOS development :-(
    - ▶ Rise in interest concerning the web development through **reactive website, Web app, Service workers, Browser sensors events..**

## Consequences in research orientation

- Increase in interest towards **Semantic Web applied to Mobile Learning systems** [Vesin & al, 2016]
- **Collaborations between different fields** for the design of **pedagogical ontologies** [Imran & al, 2016]

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# ReVeRIES Project

## Project Context

- ANR funded project, 2016-2020
  - Focused on investigating technology that highlight Natural Heritage
  - Collaboration between departments of Agrocampus, University of St Etienne, University of Savoie and various industrial partners
- 
- Two main software deliverable
  - Reveries-Game and ReVeRIES-Flore

# Mobile Game Authoring Software

## ReVeRIES-Game : An authoring system for mobile game development

- Principle :
  - ▶ Almost no solution for **designing** (non-trivial) **mobile learning game** without expertise
  - ▶ Our authoring systems is based on **shareable and reusable building block** (compatible with W3C Web-component specification)
  - ▶ A secured **component repository** is planed to ease sharing process
- Semantic annotations :
  - ▶ **Semi-automatic semantic annotations** will be used to **characterize each block and its contexts of use**
  - ▶ These annotations will be use for query but also suggesting potential block of interest



# Illustration : Game authoring

## ReVeRieS

Login/logout

## My media

## My games elements

### Free text questions

Multiple choice question

## My activities

ReVeRieS 1.0

Free text questions are questions where the answer is not limited to a set of choice. The user can give any string as an answer. It can be usefull for open question for instance. In this section :

- you can generate free text questions, associate a correct answer, and an optionnal media file

Question

Response field label

Response

Correct answer message

Wrong answer message

SET IMAGE

SAVE

RESET

DUMMY FILL

VALIDATE

DISMISS

REMOVE QUESTION

Make question public 

# Plant identification

## ReVeRIES-Flore : Ease plant identification for amateur in a citizen science perspective

- Principle :
  - ▶ **Plant identification** is based on the classic pattern of **Floras**
  - ▶ User is assisted by **directing his investigation on relevant subpart of the plant**
  - ▶ **User is actively looking for characters** fastening identification
  - ▶ **If the user cannot identify or is not confident**, he can take a photo of an organ (e.g Leaf)
    - ★ Botanical features (ex. Leaf nervation) will be extracted from the photo
    - ★ Using a specific aggregation algorithm, these features are used to give the user the most likely solutions together with a degree of confidence
- Citizen science perspective :
  - ▶ Knowledge regarding **area of distribution** are fundamental in ecology
  - ▶ **Depending on the accuracy of amateur identification**, the cost of identification could be reduced

# Illustration/demonstrator

Try it : <http://ontologies.reveries-project.fr:8000>

Organes et parties à  
caractériser

Ecorce

Fruit ou graine

**Feuille**

Fleur ou chaton

Liste des plantes candidates

Plante possible : 6 over 50

Reveries-Florae Demo !This website can be unstable!

## Identification à l'aide de Feuille

Caractéristique des feuilles

lobée, à lobes obtus

Description du pétiole

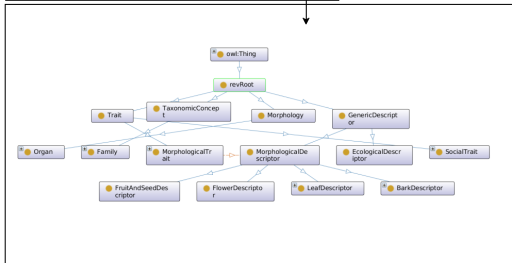
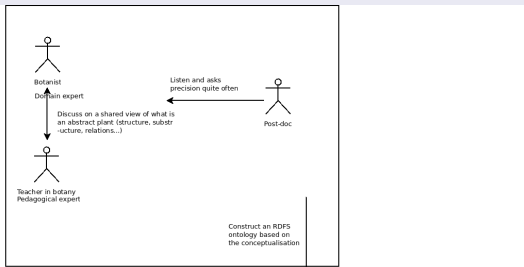
Aspect des feuilles

Couleur du dessus

couleur

# Construction of Core Ontology

## From Nothing to a bit more than Nothing



# Constructing/Importing a Botanical Knowledge Base

## Difficulties Specific to the Field of Botany

- **DELTA-intkey** an evil 1990 standard for key representation
  - ▶ Existing interactive keys for plant identification should be reusable (in principle)
  - ▶ Almost all existing sources are described in DELTA-intkey format
  - ▶ To my knowledge there is no DELTA-intkey -> RDF
- A more fundamental issue is that **there is no well defined standard botanical ontology** for representing plants
  - ▶ Various KB exists based on **Plant Ontology** which describes plant at a microbiology level
- The first version of the ReVeRIES KB results from manual extraction from floras

# Data sources and transformation

## Data Sources

	A	B	C	D	E	F	G	H
1	<b>Nom français</b>	<b>Disposition</b>	<b>Forme</b>	<b>Nervation</b>	<b>Taille</b>	<b>Bord</b>	<b>Pétiole</b>	<b>Pilosité</b>
2	Érable champêtre	opposées	lobée, à lobes obtus	palinée	petite	entier	long	glabre
3	Érable plane	opposées	lobée, à lobes aigus	palinée	moyenne	entier	long	glabre
4	Érable sycomore	opposées	lobée, à lobes aigus	palinée	moyenne	denté	long	glabre
5	Aulne glutineux	alternes	ovale	pennée	moyenne	denté	moyen	glabre
6	Bouleau agréolé	alternes	losange	pennée	moyenne	denté	moyen	glabre
7	Bouleau pubescent	alternes	losange	pennée	moyenne	denté	moyen	glabre dessus, pubescent dessous
8	Charme	alternes	ovale	pennée	moyenne	denté	moyen	glabre dessus, pubescent dessous
9	Châtaignier	alternes	cordée	pennée	grande	denté	moyen	glabre dessus, pubescent dessous
10	Cornouiller sanguin	alternes	ovale	pennée	moyenne	entier	moyen	glabre dessus, pubescent dessous
11	Holétier	alternes	cordée	pennée	grande	denté	moyen	pubescent
12	Aubépine épineuse	alternes	lobée, à lobes obtus	pennée	moyenne	denté	moyen	glabre dessus, pubescent dessous
13	Aubépine monogyne	alternes	lobée, à lobes obtus	pennée	moyenne	denté	moyen	glabre
14	Fusain d'Europe	opposées	lancéolée	pennée	moyenne	denté	court	glabre
15	Hêtre	alternes	ovale	pennée	moyenne	entier	court	glabre
16	Bourdaïne	alternes	ovale	pennée	moyenne	entier	court	glabre
17	Frêne commun	opposées	composée, folioles à lobes aigus	pennée	grande	denté	moyen	glabre
18	Houx	alternes	lobée, à lobes aigus	pennée	moyenne	entier	court	glabre
19	Noyer noir	alternes	composée, folioles à lobes aigus	pennée	grande	denté	moyen	glabre dessus, pubescent dessous
20	Noyer commun	alternes	composée, folioles à lobes obtus	pennée	grande	entier	moyen	glabre
21	Troène	alternes	lancéolée	pennée	moyenne	entier	court	glabre
22	Pommier sauvage	alternes	ovale	pennée	moyenne	denté	court	glabre
23	Néflier	alternes	lancéolée	pennée	grande	denté	court	glabre dessus, pubescent dessous
24	Platané	alternes	lobée, à lobes aigus	palinée	grande	entier	long	glabre dessus, pubescent dessous
25	Peuplier blanc	alternes	lobée, à lobes obtus	pennée	moyenne	entier	court	glabre dessus, pubescent dessous
26	Peuplier noir	alternes	losange	pennée	moyenne	denté	court	glabre
27	Peuplier tremble	alternes	losange	pennée	moyenne	denté	moyen	glabre
28	Merisier	alternes	ovale	pennée	moyenne	denté	moyen	glabre
29	Laurier cerise	alternes	lancéolée	pennée	grande	entier	court	glabre
30	Prunellier	alternes	ovale	pennée	moyenne	denté	moyen	glabre dessus, pubescent dessous
31	Poîrier sauvage	alternes	ovale	pennée	moyenne	denté	long	glabre
32	Chêne sessile	alternes	lobée, à lobes obtus	pennée	moyenne	entier	moyen	glabre
33	Chêne pédonculé	alternes	lobée, à lobes obtus	pennée	moyenne	entier	court	glabre
34	Chêne rouge	alternes	lobée, à lobes aigus	pennée	grande	entier	court	glabre
35	Nerprun purgatif	opposées	ovale	convergente	moyenne	denté	moyen	glabre
36	Robiniér	alternes	composée, folioles à lobes obtus	pennée	grande	entier	moyen	glabre
37	Sauze blanc	alternes	lancéolée	pennée	moyenne	denté	court	pubescent
38	Sauze roux	alternes	lancéolée	pennée	moyenne	denté	moyen	glabre dessus, pubescent dessous

# Transformation process

## From Raw Sources to SPARQL Endpoint

- XLS, CSV, XSLT are the main format of raw sources
- Using **LODRefine** (former Google Refine), tabular data can be easily transformed into RDF triples
- In this case, **RDF triples represent instances of Species together with their characteristics**
- Our Botany ontology permit rdfs rules to infer the existent of blank nodes assuring consistency
- The SPARQL endpoint is one more step away : downloading **Apache Joseki** and uploading the triples

## References

- Imran, A. S., & Kastrati, Z. (2016, July). Pedagogical Document Classification and Organization Using Domain Ontology. In International Conference on Learning and Collaboration Technologies (pp. 499-509). Springer International Publishing.
- Vesin, B., Klašnja-Milićević, A., & Ivanović, M. (2016). Application of Semantic Web Technologies to Facilitate Use of E-Learning System on Mobile Devices. In Smart Education and e-Learning 2016 (pp. 473-484). Springer International Publishing.
- Source code :

