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Edugame an Android game for teaching children

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ABSTRACT: This paper presents the project "edugame" whose objective is to provide an educational game which introduces a series of activities such as the construction of words, the recognition of letters or mathematical operations for teaching children. We chose to follow, for this project, a methodological approach which begins with a design phase, using UML, followed by an implementation phase using the Android platform. This allowed us to make available to children of 3 to 7 years an interactive game for independent learning.

KEYWORDS: learning game, pedagogical scenario, autonomous learning, Android.

1 INTRODUCTION

Conventional educational games have emerged in the 1970-1980 years and are aimed at children and adolescents. The most classic essentially allow improving logic or lexical and syntactic skills. Simulation games are defined as "software toys", representing a "world", and they lack clear goals that allow the user to win. Serious games offer, in turn, a real training not only aimed to children but to a much larger target.

Since the design phase of a serious game, a utility dimension is covered and a utility or lesson plan is linked to that based on a ludic video. This distinguishes the serious game, of simulation game in which the user does not have a specific goal to achieve.

Julian Alvarez [1] defines serious games as "a computer application, whose original intention is to combine with consistency, the serious aspects such as teaching, learning, communication, or information with ludic springs from the video game. Serious games have main purpose is to teach, to inform, to experiment, to work out while playing. They can be applied in many fields, for example, military, educational and health care. The first significant title of serious games was America's Army, launched July 4, 2002. This game offers features simulation of military training exercises and combat missions for recruitment in the American army.

2 RELATED WORKS ON SERIOUS GAMES

Several studies have shown that serious games can provide a suitable cadre for learning through interactive tasks. For example, Johnson and Wu [2] presented the training system Tactical Language and Culture Training System that helps people to acquire quickly functional skills in foreign languages and cultures. The system includes interactive lessons that focus on the specific skills of communication and interactive games for players to apply their skills.

Richard Sandford and Ben Williamson [3] studied the serious game Civilization III which is a historical game where the player must ensure the supremacy of its civilization by building a powerful empire, while other empires controlled either by the computer or by d other players are also being created and compete for world domination. These researchers showed that learners have developed more complex than a simple perception of causal reasoning strategies. In this serious game, learners become able to identify problems, make causal interpretations and implement solutions to critical situations.

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Other work has studied not only the assessment of learning and monitoring of learner that serious games offer, but also the question of the design of such games. For example, Bertrand Marne and their colleagues [4] suggest six facets of education that must be concerned in the design of a serious game: educational objectives, simulation domain (disciplinary knowledge or skills that wants to present to students through this game), interactions with the simulation , progression and problems (what problems need to be solved to advance in the game?), immersion (what media and screenwriting elements favor the immersion of the student and make the game pleasant?) and conditions of use (do we The access to the game will be from distance or in the classroom?).

Finally, efforts of classifications of serious games have been made. For example, Michael Zyda [5] identified seven classes of serious games based on application areas: training and simulation, education, health, defense, civil security, communication, evaluation by the game.

David Michael and Sande Chen [6] identified five other application areas: politics, industry, government, religion and art. Julian Alvarez and Laurent Michaud [7] highlighted seven major markets for serious games: defense, education and training, advertising, information and communication, culture and activism.

3 DESIGN OF A LUDIC PEDAGOGICAL SCENARIO

The concept of "scenario" is relatively recent and comes from the audiovisual field (theater, cinema, literature). Several authors have defined the term "pedagogical scenario" such as Henri and al. [8] who defines it as the result of a process of learning activity that involves planning of objectives.

When Quintin and al. [9], they consider the pedagogical scenario as a "structured and coherent set of two parts" that includes the learning scenario and the coaching scenario.

As for the ludic component, it seems necessary firstly define the word "ludic."

According to Genvo [10] the ludic dimension refers to game and "the result of a joint development between the game structure and its context."

Faced with these definitions, we propose a draft definition of the concept of the "pedagogical scenario" as a digital environment consisting of a fun activity for teaching and learning."

To design a pedagogical scenario, several models exist including the model of Paquette [11], which contains four steps in the construction process. Another model was defined by Brassard & Daele [12] it is based on the model of Reeves [13] and takes into account 17 dimensions. Compared to these two examples of design models, it is possible that the model of Brassard [12] is more comprehensive and helps us to design a pedagogical scenario as it takes into account more aspects of learning.

4 UML CLASS DIAGRAM

A UML class diagram is a type of static structure diagram that describes the structure of software in the form of objects (classes), attributes and operations (methods) and the relationships between these objects.

The classes we used in our application are:

- jeu: is the class that contains the questions and answers and displays the questions and select answers (getReponse).
- Histoire: is the class that contains all the stories and displays them.
- Résultat :is the class that displays the result after each part of the game.
- Meilleur score: is the class where we store all high scores, it displays (GetHighScore) by order and on the type of game and modifies (SetHighScore).
- Aide: is the class that contains an indication of the application.

The relations between the classes:

- A game can have three types namely: “Jeu de calcul” (calculation Game), “Jeu de letters” (Letters game) and “Jeu de mots” (Words Game).
- A game can have several outcomes, and a result is for a single game
- A game can have at most a high score and a high score necessarily belong to a single game.

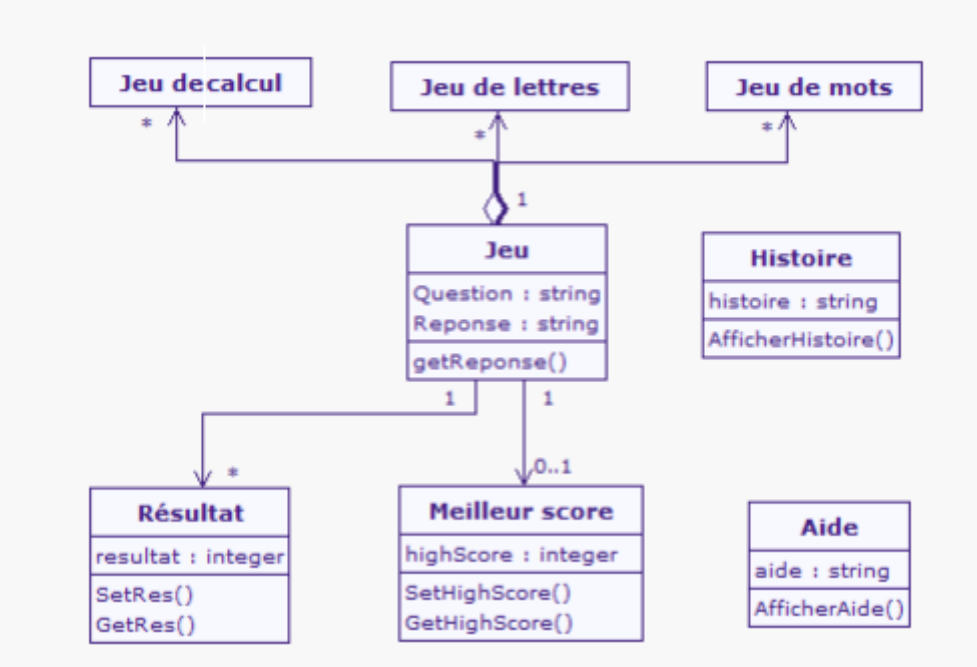

Figure 1: Class diagram of edugame

5 ANDROID AND ITS ARCHITECTURE

Android is an open-source operating system for smartphones, PDAs and other mobile devices. It is easy to develop and flexible as it is extremely portable, it adapts to different structures.

The following diagram shows the major components of the Android operating system:

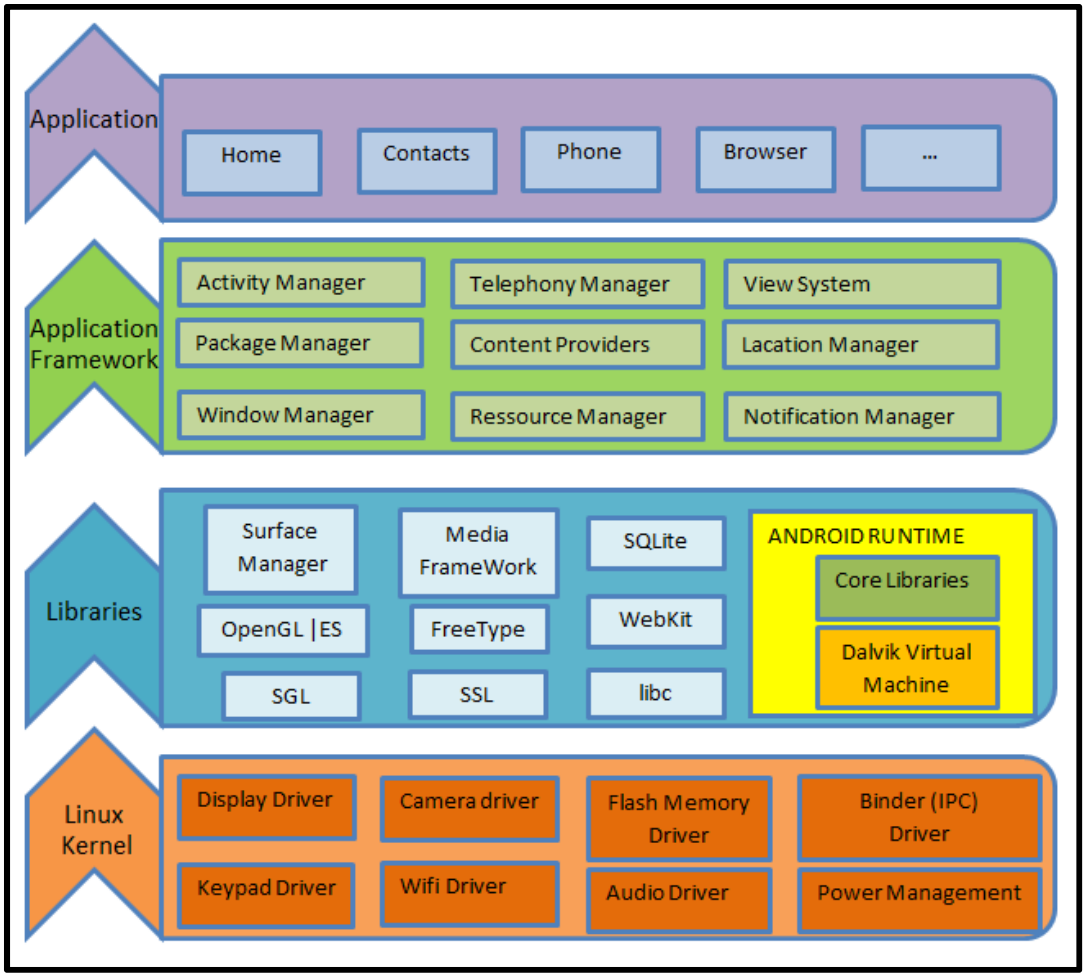

Figure 2. The Android architecture

We can observe a stack of components which constitute the operating system. The reading direction is from the bottom upwards, since the lower level component (farthest user) is the Linux kernel and the higher level (closer to the user) formed by the applications.

Android is based on Linux kernel 2.6.xx. Above this layer, there are the libraries of C / C ++ used by a number of components of the Android system. Above the libraries, there is the Android runtime. This layer contains the core libraries of the Framework and the virtual machine running the application. Above the layer "Android Runtime" and cores libraries, we find the Framework allowing the developer to create applications. Finally above of Framework, there are Applications.

6 IMPLEMENTATION OF THE APPLICATION WITH ANDROID

6.1 STRUCTURE OF THE ANDROID PROJECT

After creating the project we obtain a tree architecture (Figure 3), which allows us to exploit the different components of the application: the Java files, XML files and other resources.

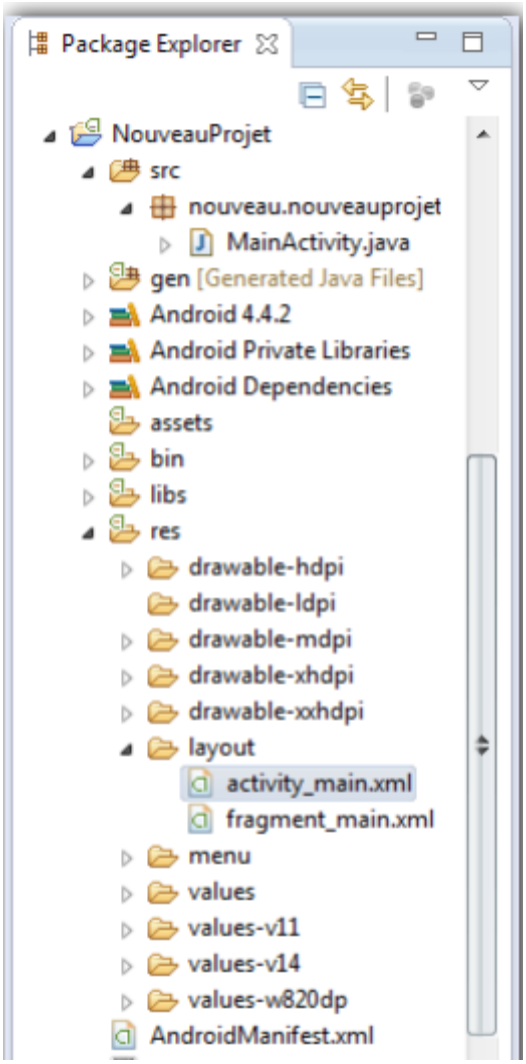

Figure 3: The Package Explorer

The Package Explorer lets to navigate through all directories of projects.

Each project contains:

- Directory src /: contains all source files .java
- Directory res /: contains all the resources within the project as:
- drawable: contains the images according to their sizes.
- Layout: Contains .XML files.
- Values: contains dimensions, strings and style.
- AndroidManifest: it is an XML file where you have to declare all activities of the application (.java inherits android.app.Activity).

Then to organize the graphical interfaces of the application is very useful to use XML files that have the following form:

```xml
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    tools:context="nouveau.nouveauprojet.MainActivity$PlaceholderFragment" >

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/hello_world" />

</RelativeLayout>
```

Figure 4: XML file of the layout MainActivity

In addition we must associate graphical interfaces to Java files that inherit from : android.app.Activity

```java
package nouveau.nouveauprojet;

import android.os.Bundle;
import android.support.v7.app.ActionBarActivity;
import android.view.Menu;

public class MainActivity extends ActionBarActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);


    }
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {

        // Inflate the menu; this adds items to the action bar if it is present.
        getMenuInflater().inflate(R.menu.main, menu);
        return true;
    }


}
```

Figure 5: Example of a Java file

Finally we end with the declaration of all activities in the AndroidManifest.xml file.

```xml
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="nouveau.nouveauprojet"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk
        android:minSdkVersion="8"
        android:targetSdkVersion="19" />

    <application
        android:allowBackup="true"
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name"
        android:theme="@style/AppTheme" >
        <activity
            android:name="nouveau.nouveauprojet.MainActivity"
            android:label="@string/app_name" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

Figure 6: Example of the AndroidManifest.xml file

Each time we add an activity, it must be declared in the previous file between the tags: <application> <activity> </ activity> </ application>.

6.2 DETAILED FUNCTIONING OF THE APPLICATION

6.2.1 THE MAIN INTERFACE

Figure 7: The main interface Edugame

6.2.2 THE OTHERS INTERFACES:

✓ **Read a story:**

Once you click on the button: Reading a story (lecture d'une histoire), the following interface is launched:

The child will begin to read the story with or without music. it may also listen and read the story together.

He clicks the button  to read the rest of the story.

Figure 8: the interface read a story

✓ **Calculation Game**

Once the child clicks this button, questions are raised to him about numbers and arithmetic.

Among these questions we found those in the following interfaces:

Figure 9: Example of the questions of Calculation Game

Interfaces of "game of calculation" allow children to compare numbers, counting, summing, multiplication...

✓ **Letters game**

Once the child clicks this button, questions are raised to him about the letters of the alphabet.

Among these questions we found those in the following interfaces:

Figure 10: Example of the questions of Calculation Game

These questions allow the child to test their knowledge of alphabetical order, uppercase and lowercase...

✓ **Words Game**

Once the child clicks this button, questions are raised to him about words.

Among these questions we found those in the following interfaces:

Figure 11: Example of the questions of words game

These types of questions help the child to learn the names of animals, fruits and vegetables and to build words from letters.

7 CONCLUSION

The main reason for this work is the motivation and encouragement of children to improve their knowledge. To achieve this goal we thought of designing and developing an Android game in order to provide independent learning.

The game can easily be used in education in order to get children to acquire knowledge and skills. Nothing prevents you from to use at school, on the contrary, each teacher is free to use in their lessons.

Indeed, the application that we developed could be enhanced by other advanced features such as the integration of different levels of difficulty, game ratings by age. We can also make it more fun for the child by adding other types of games like puzzle, coloring and drawing.

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