

Experience in Developing Reference Applications with Qt/QML

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Abstract

There are many ways to get required information for people nowadays. One of the most popular among them is using different mobile applications. In this paper we describe our experience in developing reference applications using Qt/QML. Mobile reference applications have its certain advantages such as opportunity to provide the user with required information at any time, storing all the information in mobile device, so it is possible to use its content despite the lack of Internet connection on the device, etc. This paper contains description of designed pattern of developing reference applications. Then we consider the application of this pattern in implementation of three mobile reference applications. However each application has its own special features which are also described in the paper.

Index Terms: Reference Application, Qt, QML, Mushrooms, Origami Zoo, Kinoman.

I. INTRODUCTION

Nowadays there are many ways for people to get required information. If a person needs to learn or find something he/she can use a reference book, an information guide, etc. Also a person can search the information he/she needs in the Internet using a search engine or one of his/her favorite or well-known web-sites. However, there is one more way to solve this problem, which has become very popular these days, and this way is to use various mobile applications. Such approach to information receiving has certain advantages. The main of these advantages is that a person can get the information at any time he/she wants using a mobile phone or smartphone to do it. Also a person does not depend on his/her location while using mobile device.

The main component of mobile reference application is its content. Therefore the first step in development of such applications is to find an appropriate information resource to get required content. Reference resources in the Internet include electronic encyclopedias, reference books, dictionaries, etc. World Wide Web contains electronic versions of different authoritative printed publications and resources that exist only online.

From our point of view we can distinguish two types of reference resources in the Internet. The first type includes resources that do not need to be constantly updated. On the other hand, there are web-sites which we can use as reference resources that have to contain up-to-date information. Examples of such resources are various news feeds, databases of films, music albums, recipes, etc. These web-sites we assign to the second type. Each of two types of resources requires its own approach to developing reference application based on these web-sites.

Mobile reference applications have certain advantages in comparison with web-sites. First of all, these applications can aggregate information from several Internet resources, so the user doesn't need to collect relevant information by him/herself. Secondly, reference applications usually have convenient user interface to present the information and opportunities to search required information included in the application. Also all the information can be stored in the user's mobile device, so it is always available for him/her despite the lack of Internet connection.

This paper describes our experience in developing mobile reference applications. Recently we have developed three reference applications called "Mushrooms" [1], "Origami Zoo" [2] and "Kinoman" [3].

The rest of the paper is organized as follows: Section II contains detailed description of each reference application. In Section III we describe common structure of mobile reference applications and some features of all three developed applications. Section IV is dedicated to implementation details of each application. Section V concludes the paper.

II. REVIEW OF REFERENCE APPLICATIONS

Recently we have developed three mobile reference applications. Let's describe each of them briefly.

The first application is called "Mushrooms". It is an electronic encyclopedia, which contains descriptions of 345 species of mushrooms and can be used to find information about particular specie by its photo or name. After inspection of Nokia store we discovered that there are no such applications, so we decided to implement this idea. This application can be very useful for those people who are fond of picking mushrooms in the forest. You can identify a particular mushroom, which you have just found by its photo in the application, and then read all the information about it to be sure that you have identified it right. Information about all mushrooms is available for the user at any time because it is stored in his/her mobile device and the user does not need an Internet connection. That is really important, when you are in the forest.

The next reference application, we have developed, is called "Origami Zoo". Origami is a traditional Japanese art or technique of folding paper into a variety of decorative or representational forms, as of animals or flowers. In "Origami Zoo" the user can find the most popular animals which can be made using only one sheet of paper. Each figure comes with clearly illustrated steps and instructions. This reference application can be very useful for children and their parents. Origami is often used in teaching preschool children because it helps them to develop some important skills for their further education. There are several analogues of this application available in Nokia store, but "Origami Zoo" has more detailed instructions for all figures and more convenient user interface.

Watching movies and series is one of the most popular kinds of entertainment nowadays. It will be great if cinema lovers would be able to get access to information about any interesting film of series at any time. So we decided to develop one more reference application called "Kinoman". It is a mobile client for database of movies TMDB (The Movie Database) [4] and database of series MyShows.ru [5]. With this application the user can easily find information about any movie or series, which includes its description, rating, amount of seasons, release date, etc. Also using "Kinoman" the user can view release dates of new episodes for his/her favorite series.

There are no analogues of this application in Russian segment of Nokia store. Moreover, “Kinoman” combines databases of movies and series.

All the projects were initiated in 2012 at Petrozavodsk State University (PetrSU), FRUCT laboratory of wireless and mobile technologies [6]. These projects belong to the family of FRUCT research projects [7].

III. STRUCTURE OF REFERENCE APPLICATIONS

During developing mobile reference applications we designed a pattern for implementation of such applications. Its structure is shown in Fig. 1.

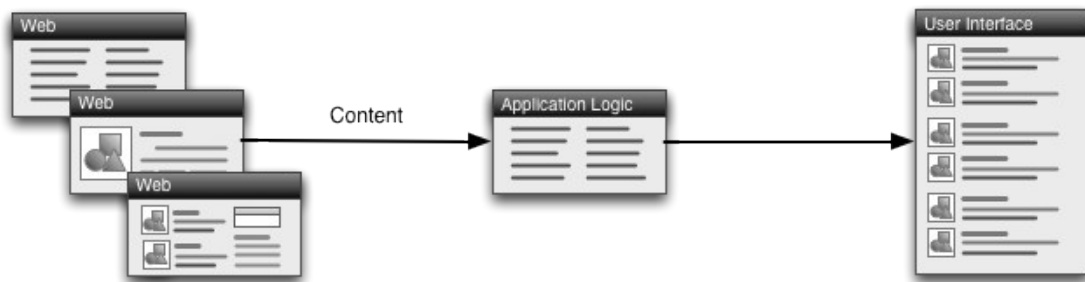


Fig. 1. Common structure of reference applications

The first stage of developing reference application includes searching of online resources with required information. The main problem of this stage is to find open resources that allow using their content without limitations. There are several ways to process the information received from chosen resources. One of them is to convert the information into XML format. The main advantage of this way is an opportunity to store all the data locally in user’s mobile device. Therefore the user does not need an Internet connection and required information is available for him/her at any time. However this approach is inapplicable in the cases when the information has to be updated constantly (news feeds, databases with movies, music, etc.). In these situations the most appropriate way is to receive required information using service’s API. But we have to mention that not every web-site with reference information provides API.

On the next stage of developing structured data have to be loaded into a data model regardless of the selected format. Finally, on the last stage the information is presented to the user by means of view.

Using this pattern you can develop a variety of reference applications. Applications “Mushrooms” and “Origami Zoo” are implemented with XML format. “Kinoman” application is based on interaction with web-sites via its API.

It is also important to consider main features of the application which is developed. “Mushrooms” application needs to provide the user with opportunity to perform a quick search of assumed specie of mushrooms. To achieve this goal we divided all the species into three base categories. When the user chooses one of them he/she can see previews of all mushrooms that belong to chosen category. After choosing a particular mushroom the user can see the page with detailed description of the mushroom and its picture. We also plan to add an opportunity to search mushrooms by their individual features (cap, stem, etc.).

“Origami Zoo” application’s main goal is to provide the user with visual presentation of all the steps of making a figure. Information about each step and its visual equivalent is stored in XML format.

“Kinoman” application gives an opportunity of quick search of various movies and series. Also it shows lists of the most popular among them. Information about movies and series has to be up-to-date, so the application is based on interaction with reference resources via their API.

IV. IMPLEMENTATION DETAILS

Designed pattern of developing mobile reference applications can be easily implemented using Qt Quick/JavaScript [8].

First of all we need to process data from web-service or XML file. If we interact with web-service via its API, we have to parse the response that we get from the service. Usually response is in JSON or XML format. In the case of “Kinoman” application, TMDB and MyShows.ru use JSON. We use *JavaScript XMLHttpRequest API* for sending requests and built-in *QML JSON parser* for parsing the responses. You can see a code fragment from “Kinoman” application, which demonstrates process of getting list of top-rated films from TMDB and filling *QML ListModel*, below:

```
// create an instance of JS XMLHttpRequest
var xhr = new XMLHttpRequest();

// handle response
xhr.onreadystatechange = function() {
    if (xhr.readyState == XMLHttpRequest.DONE) {
        var response = JSON.parse(xhr.responseText);
        var films = response.results

        // fill QML ListModel
        for (var i = 0; i < films.length; i++) {
            filmsModel.append({
                film_id: films[i].id,
                title: films[i].title,
                ...
            });
        }
    }
}

// create and send request for getting top-rated
// films from TMDB
xhr.open("GET", "http://api.themoviedb.org/3/movie/top-rated?
api_key=XXX");
xhr.setRequestHeader("Accept", 'application/json');
xhr.send();
```

In the case when reference application is based on storing data in XML format, we simply use *QML XMMLListModel*. Both cases are shown in Fig. 2.

After filling models with data we use QML *ListView* or *GridView* elements for presenting data to the user (see Fig. 3). We choose *GridView* with image deate for list of

mushrooms in “Mushrooms” application because it allows the user to find particular mushroom by visual key quickly.

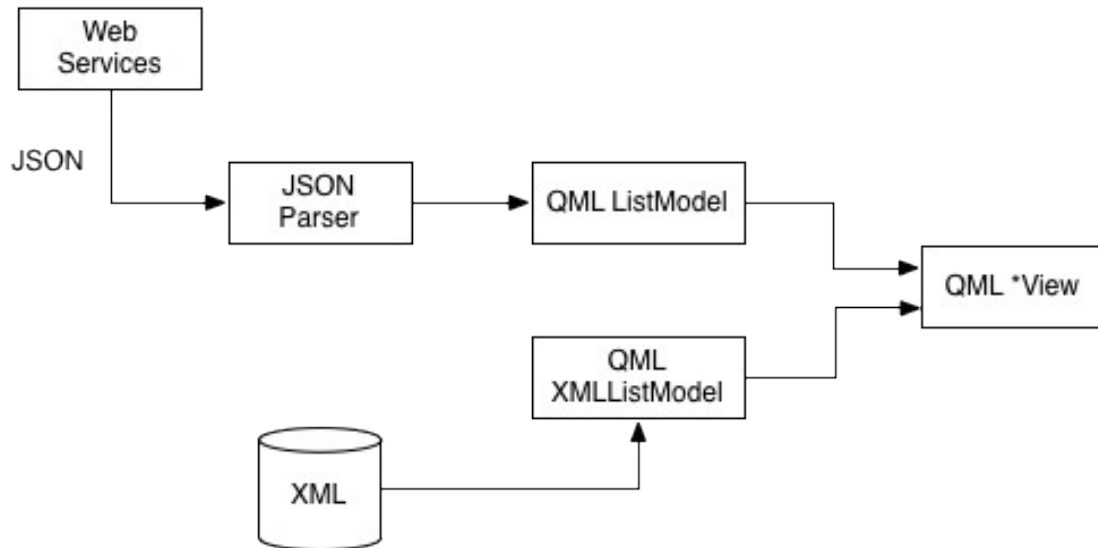


Fig. 2. Common schema of data presentation using QML data models

After clicking on one of the items on list pages the user can see the page with detailed information about chosen item (see Fig. 4).

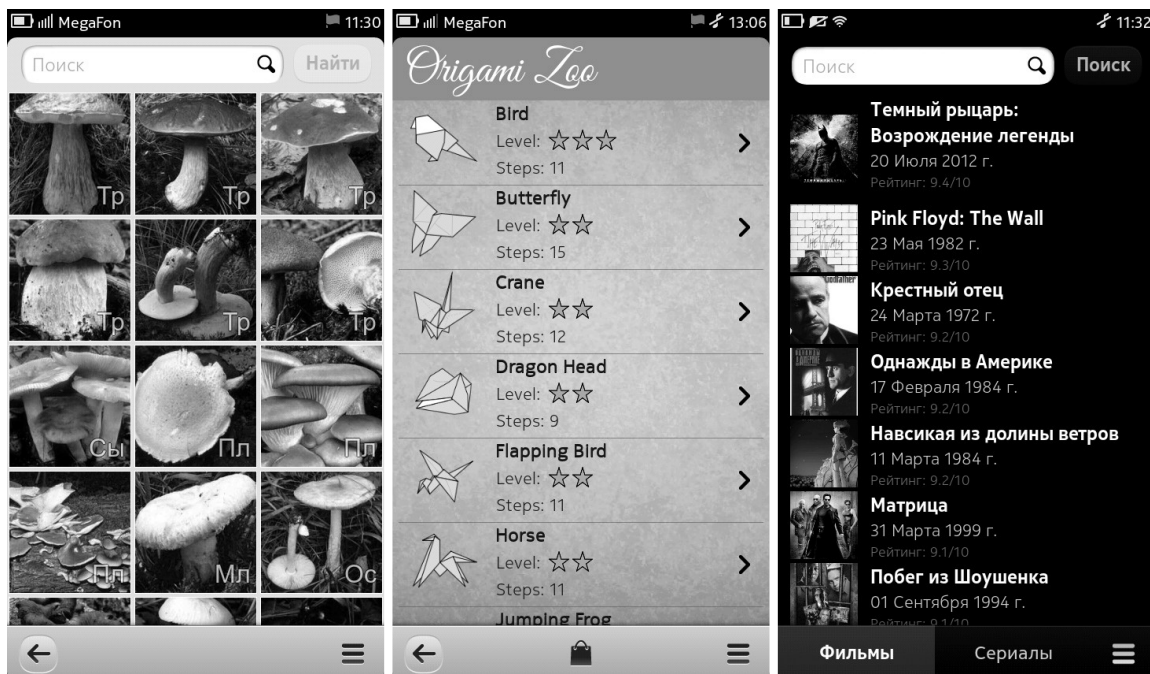


Fig. 3. List pages of “Mushrooms”, “Origami Zoo” and “Kinoman” applications

Therefore all reference applications described in the paper have similar structure based on QML models and views with small differences in user interface.

TABLE I
REFERENCE APPLICATIONS CODE METRICS

Application	QML files (LOC)	JavaScript files (LOC)	XML (LOC)
Mushrooms	15 (1111)	4 (266)	3 (4962)
Origami Zoo	13 (679)	2 (104)	17 (1420)
Kinoman	15 (1187)	7 (667)	-

Implementation metrics of all reference applications are shown in Table I. There is a big difference in amount of lines of source code in QML files because pages with detailed description in “Mushrooms” and “Kinoman” applications contain much more information in comparison with “Origami Zoo”.

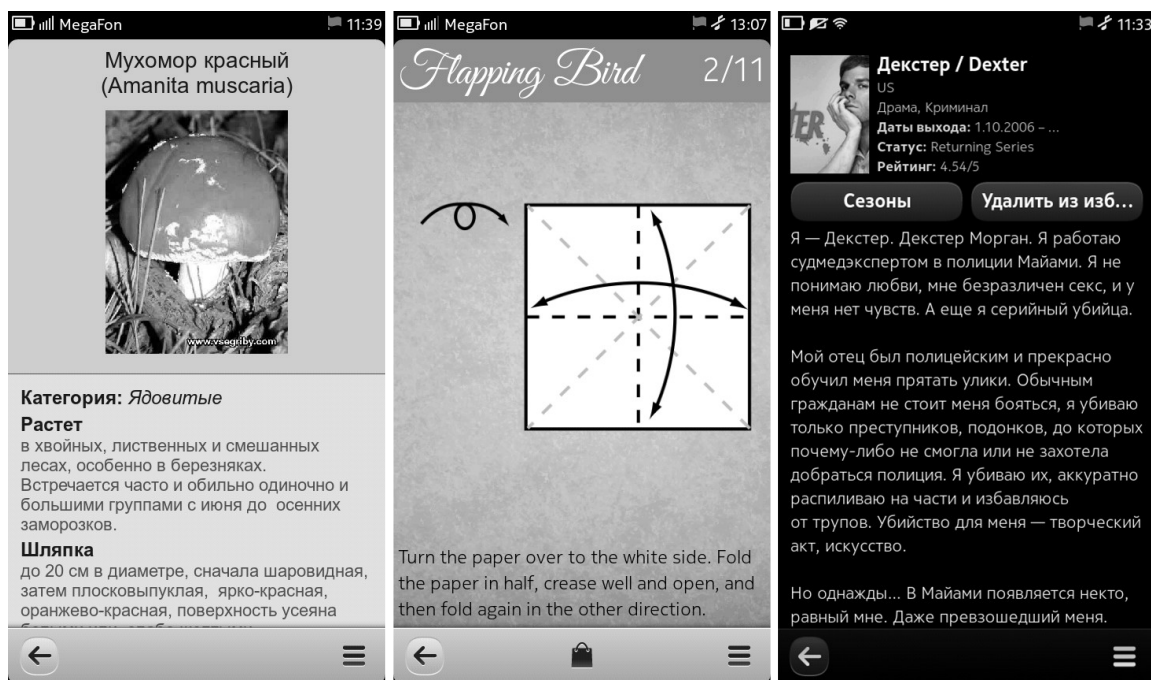


Fig. 4. Pages with detailed information of “Mushrooms”, “Origami Zoo” and “Kinoman” applications

V. CONCLUSION

In this paper we described our experience in developing reference applications with Qt/QML. A variety of reference applications can be implemented using suggested pattern. The main stages of such developing are choosing an appropriate online resource for the application, converting its content into required format, loading structured data into a data model and presenting this information to the user.

“Mushrooms”, “Origami Zoo” and “Kinoman” applications are available in Nokia Store [9, 10, 11]. There are many ways to improve these applications. For example, we plan to add an opportunity to search mushrooms not only by its name or picture but also by its other individual features (stem, cap, etc.).

ACKNOWLEDGMENT

These projects are a part of grant KA179 “Complex development of regional cooperation in the field of open ICT innovations” of Karelia EMPI programme, which is

co-funded by the European Union, the Russian Federation and the Republic of Finland. The article is prepared with financial support from the Strategic Development Program of Petrozavodsk State University. We would like to thank Iurii A. Bogoiavlenskii for his feedback and expertise.

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