Firepoint: Application for Identified Fires Notification

Inessa Sofronova, Artem Timonin, Artem Kalinin
Alexander Troshkov, Alexander Borodin, Kirill Kulakov
Petrozavodsk State University
Petrozavodsk, Russia
inessa3110@gmail.com
{timonin, kalinin, atroshko, aborod, kulakov}@cs.karelia.ru

Abstract

This paper describes the current state of Firepoint, an application that provides notifications of identified fires. The application is based on the Internet service FIRMS. Using the user location the application identifies nearest localities and fires and shows them on a map. The possibilities to mark user's fires and to call an emergency service are available. Also application contains tutorials about behavior in the forest. The application is implemented in Qt and Qt Quick. The project was initiated in October 2011 at Petrozavodsk State University.

Index Terms: Notification, Fire, Qt.

I. INTRODUCTION

The problem of fires is actual all over the world. Forest fires are on the list of global natural disasters, causing enormous damage to the environment every year. Often, during forest fires, people and animals die and huge areas of forests are destroyed [1].

Thus, the problem of timely warnings of forest fires as well as identifying fires in the early stages is actual. The widespread use of mobile phones with an access to the Internet allows us to provide users with information about the surrounding environment and provide feedback in the case of the fire site detection.

One of the problems of user interaction is the definition of a user's location. It's impossible to associate it with any street or house. Therefore, the use of geographical coordinates is required, which in turn is difficult to be transmitted by voice.

The Firepoint application provides the user with information about fire detection, obtained from the FIRMS service [2]. Nearby fires are displayed on the map. Also application has the possibility of connection with the emergency services for fire detection and fire warning.

The project was initiated in 2011 at Petrozavodsk State University (PetrSU), FRUCT laboratory of wireless and mobile technologies [4]. Firepoint belongs to the family of FRUCT research projects [5]. The project is co-funded by grant KA179 of Karelia ENPI programme, which is co-funded by the European Union, the Russian Federation and the Republic of Finland.

The rest of the paper has the following structure:
- section II describes Firepoint use case from the end-user point of view;
- section III presents the structure of application;
- section References contains links to useful online resources.

II. USE OF FIREPOINT

Let's consider a typical scenario when a user goes into the woods. This scenario focuses on user, who doesn't provide new information to the community.

Before going into the forest, this user is generally interested in the state of the places where he's going to (weather, availability, fires, etc.). Thus, user appeals to the available online sources to obtain information at home where a pretty good Internet connection is available.

Then the user goes into the forest and corrects his campaign using maps. We can assume that during the campaign the user has no possibility to access the Internet or has a low bandwidth connection because of complex terrain and long distance from mobile cells.

Thus, the scenario consists of two following steps:
- ✦ user downloads maps and actual environment to mobile phone before the campaign;
- ✦ application shows a map area with the nearest environment while driving.

The next scenario is aimed to the users who are interested in the preservation of forests from fires (forest rangers, hunters, mushroom pickers). The first task is to teach others how to behave in a forest. One of the best ways is to use video films or other visual methods of teaching.

Another problem is the notification of the protection service about identified fire. In this case, a user discoveres uncharted site of fire and informs about its location. In the absence of traditional positioning schemes, such as, street or the floor, you want to send the geographical coordinates of the fire. It can be done using geopositioning system like GPS or GLONASS. Systems work even in the absence of cellular signal.

Thus, in a case of fire, application displays geographical coordinates of your location and provides functionality of an emergency call, which user can make after entering the coverage area.

III. ARCHITECTURE

Firepoint uses FIRMS service to obtain information about fires. The service is based on satellite monitoring of fires and subsequent MODIS data processing [3]. Information about fire detection is updated every day, which allows to obtain relevant data. Service provides the data in XML format.

Each found point of source is marked as a separate fire. Because of large amount of data (FIRMS provides information on fires all over the world) it requires the prior clustering, ie combining the nearest points in a one big group.

High-level architecture of Firepoint application is presented in Fig.1. Main module starts application and initiates communications between other modules. User interface shows nearest fires and forestry corresponds user position as a layers in Map pattern.

Also User interface contains settings form, comics and interface for emergency calls. Fire module obtains data from FIRMS service, clustering and produce "fire layer", corresponding to the user position. Positioning module detects user position through GPS system or Yandex.Locator system [7] if Internet connection is available.

Application uses Google maps to show the map. Main forms are shown in Fig.2. User can navigate and scale the map. The information about fires is scaled respectively. For example, when large area is selected (first screen shot), fires are shown in large groups. When user increases the scale, application shows more detailed information about fires

(second screen shot). When user finds a new fire, which isn't shown on a map, he/she can report about it (third screen shot).
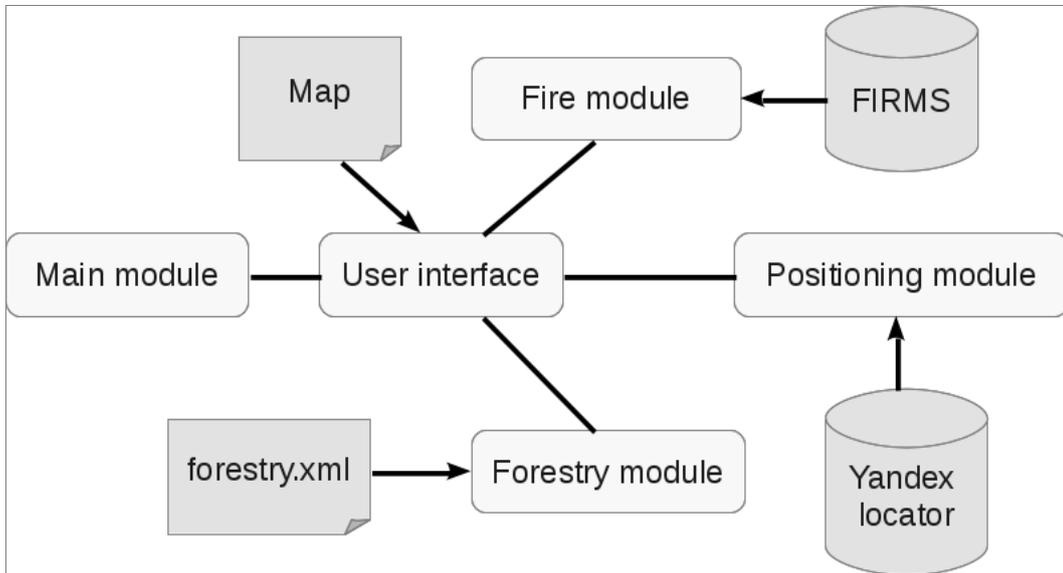
Fig. 1. Firepoint architecture
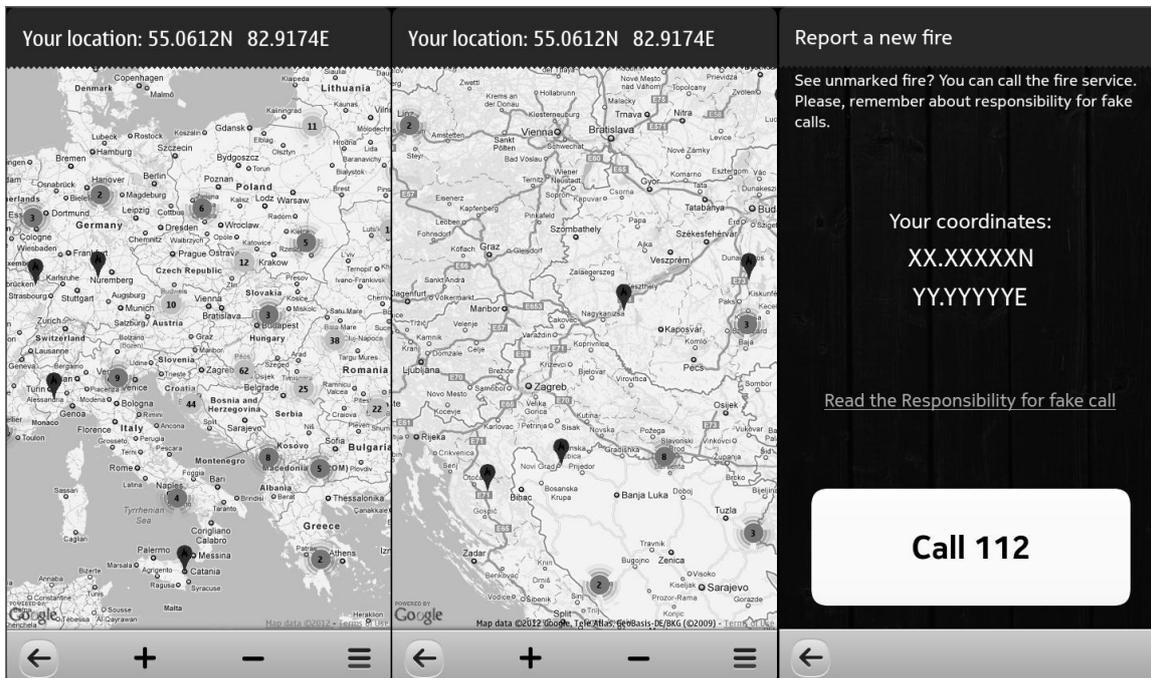
Fig. 2. Application forms

Firepoint is implemented in Qt/QtQuick platform using QtMobility for positioning and showing maps. Details of Firepoint code are given in Table I. Application contains two comic strips which describe, how to behave in a forest: "What to do in case of fire" and "How not to cause a fire", which are presented in Fig.3.

TABLE I
FIREPOINT CODE

Module name	Language	LOC
Map	QML/HTML/JS	965
Positioning	Qt	253
Fire	Qt	444
Main module	Qt	39
User Interface	QML/JS	1536
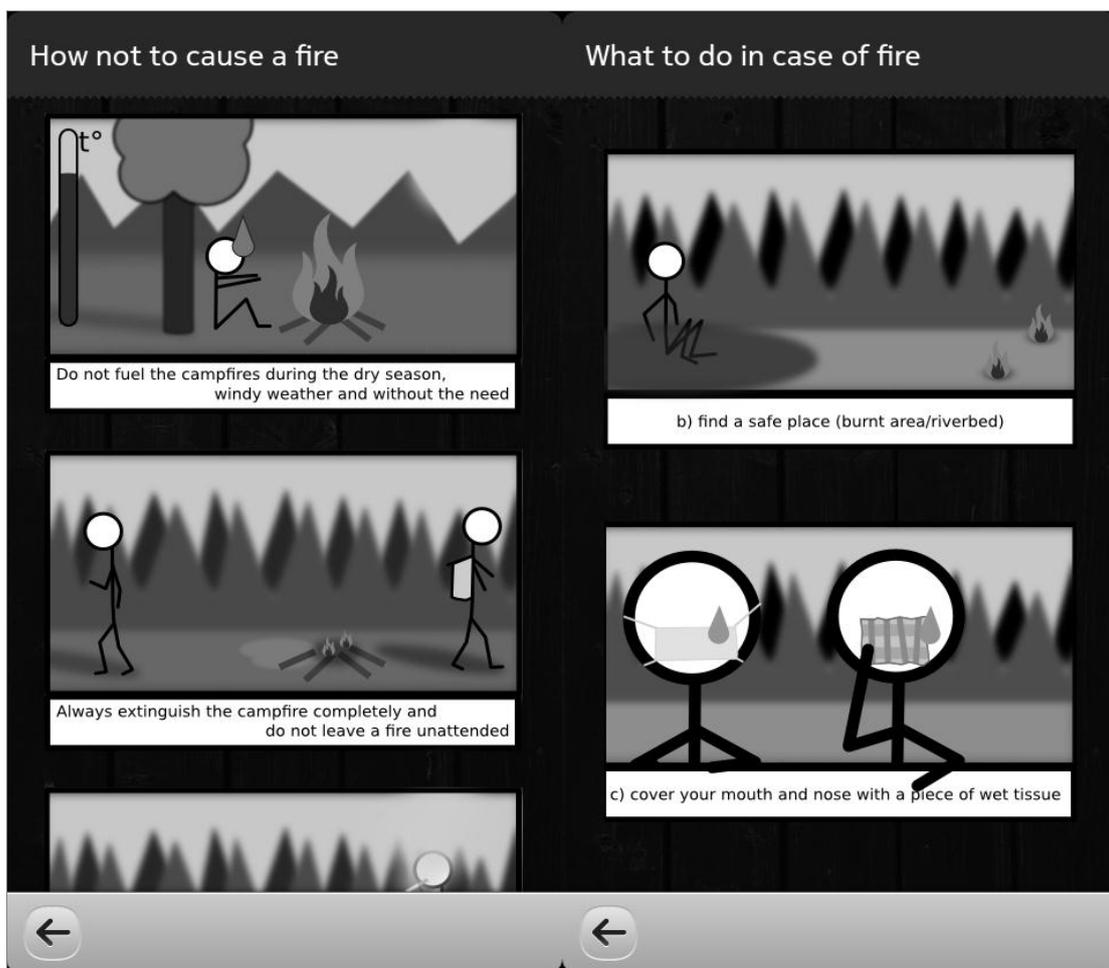
Fig. 3. Application comics

III. CONCLUSION

We described the current state of Firepoint project. The application is oriented to be used on mobile devices. The full code is available from Launchpad [5]. We are planning to publish this project in Nokia Store [8].

There are many ways to develop project in future. Application could show warnings about the weather. Comics could be expanded by adding cartoons for other scenarios.

REFERENCES

[1] "World Wildlife Fund (WWF): Forest Program", Feb. 2012. [Online]. Available: http://wwf.ru/about/what_we_do/forests/eng/.
[2] "Fire Information for Resource Management System", Feb. 2012. [Online]. Available: http://firefly.geog.umd.edu/firms/.

[3] "MODIS Global Fire Image Subsets", Feb. 2012. [Online]. Availble: http://firefly.geog.umd.edu/firms/subsets.htm.

[4] "Open platforms for mobile devices," Petrozavodsk State University, Department of Computer Science, Feb. 2012. [Online]. Available: https://oss.fruct.org/.

[5] "Firepoint in Launchpad", Feb. 2012. [Online]. Available: https://launchpad.net/firepoint.

[6] "Open innovations framework program fruct," Feb. 2012. [Online]. Available: http://fruct.org/.

[7] "Yandex.Locator", Feb. 2012. [Online]. Available: http://api.yandex.ru/locator/.

[8] "Nokia Store", Feb. 2012. [Online]. Available: http://store.ovi.com/.