

transformations, in particular, to construct prenex normal forms. All such transformations rules are not valid if a logic does not have unessential variables.

4. *Sensitivity to unassigned variables.* Variable interpretations in classical predicate logic are assumed to be total. It means that every variable has a value in an interpretation. In this case Henkin axiom of the form *for all x P → P* is valid, but if we have interpretations with unassigned variables and predicates can detect such variables, then Henkin axiom fails.

5. In case of *non-determinism*, classical consequence relation collapses and we should use a special truth-false consequence relations [2, 3]. For these consequence relations many classical reasoning rules fail.

Summing up, we can say that many program features change classical rules for reasoning about programs, and thus, a special attention should be paid to identification of such situations and choice of special logics which will be valid in such cases.

References

1. M. Nikitchenko, S. Shkilniak. *Mathematical logic and theory of algorithms*. Publishing house of Taras Shevchenko National University of Kyiv, Kyiv, 2008 (in Ukrainian), 528 p.
2. M. Nikitchenko, S. Shkilnyak. *Applied Logic*, Publishing house of Taras Shevchenko National University of Kyiv, Kyiv, 2013 (in Ukrainian), 278 p.
3. A. Kryvolap, M. Nikitchenko, W. Schreiner, *Extending Floyd-Hoare logic for partial pre- and postconditions*, CCIS, vol. 412, Springer, Heidelberg, 2013, pp. 355-378.

UDC 005.8+331.45

STRUCTURE OF CONTEXT - SENSITIVE SOFTWARE SERVICE FOR NOTIFICATION ABOUT HUMAN SAFETY THREATS

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Introduction

It is known that human security depends on the surrounded objects and processes [1]. 60-80% of accidents are the results of the inability to predict, to identify hidden danger, to assess risk and align it with its capabilities, which are determined psycho-physiological properties of the body and state of the equipment [1]. Warning of threats related to the safety of human life is the urgent task. Developing of the context-dependent software services for personal mobile devices (PMD) is one way of solving this problem, which is a real-time report on possible threats or emergencies.

II. Formulation of the problem

Nowadays, there are a number of mobile applications developed for alerting and responding to threats to the security of human life: FamilyLocator [2] bSafe [3], SOS + [4] Shake2Safety [5] SaveMePro [6] "Cknopcka zizni" [7] "Mobilnyi spasatel "[8]. The principle of these applications is almost identical: they constantly monitor the whereabouts of the person and in case of threat (after pressing the panic button) it reports the persons coordinates by SMS or e-mail to the appropriate service or family. Some of these tools include first aid instruction in emergency situations and first aid facility guides [7,8].

The disadvantages of all analyzed services are static presentation of data and lack of information about the causes of threats. Accordingly, users who have received the alerts about the threat have no opportunities to adequately respond to alerts.

A number of analyzed applications are characterized by too congested interface in which the user in a state of shock, pain, confusion is not always able to select the required function [2,5,8].

The approach of the authors is to develop context-sensitive software service for permanent residence, which, in addition to the traditional functionality will be implemented with PMD user notification about potentially dangerous places to which the person is coming. Transferring the audio and video / photo from PMD sensor to data storage in the cloud in real time by pressing the panic button will be the unique service feature. In addition, the PMD's location and rout path will be displayed on a digital map.

III. The purpose of the work

The purpose of the work is to develop the structure of context-dependent software service for alerting people about human life security threats.

IV. Analysis of the requirements for context-dependent software services

The requirements for any software service are divided into functional (requirements to service behavior) and nonfunctional (requirements that specify how the system should work). The main functional requirements to software services are:

1. Adding and removing threatening to human safety locations on digital maps.
2. Status identification of a potentially dangerous place.
3. Sending the audio or video / photo of the marked on map place to the server.
4. Alerting user about approaching to the potentially dangerous place.
5. Alerting user's relatives and relevant services about emergency.
6. Laying the route to the place of the emergency.

Mandatory non-functional requirements for software services are:

1. The client side must work on the operating system Android 4.0 or higher.
2. Comfortable graphical interface of basic activities.
3. Software reliability – the service must be resistant to various user actions.
4. Speed response for instant notification about the threat of user safety - 0.5 seconds. Service must instantly respond to user actions.

V. Structure of context dependent software services

After the analyzation of subject area and requirements, the structure of context-dependent software services based on client-server model of interaction was developed, in which the client component is a mobile application for the Android operating system (figure1).

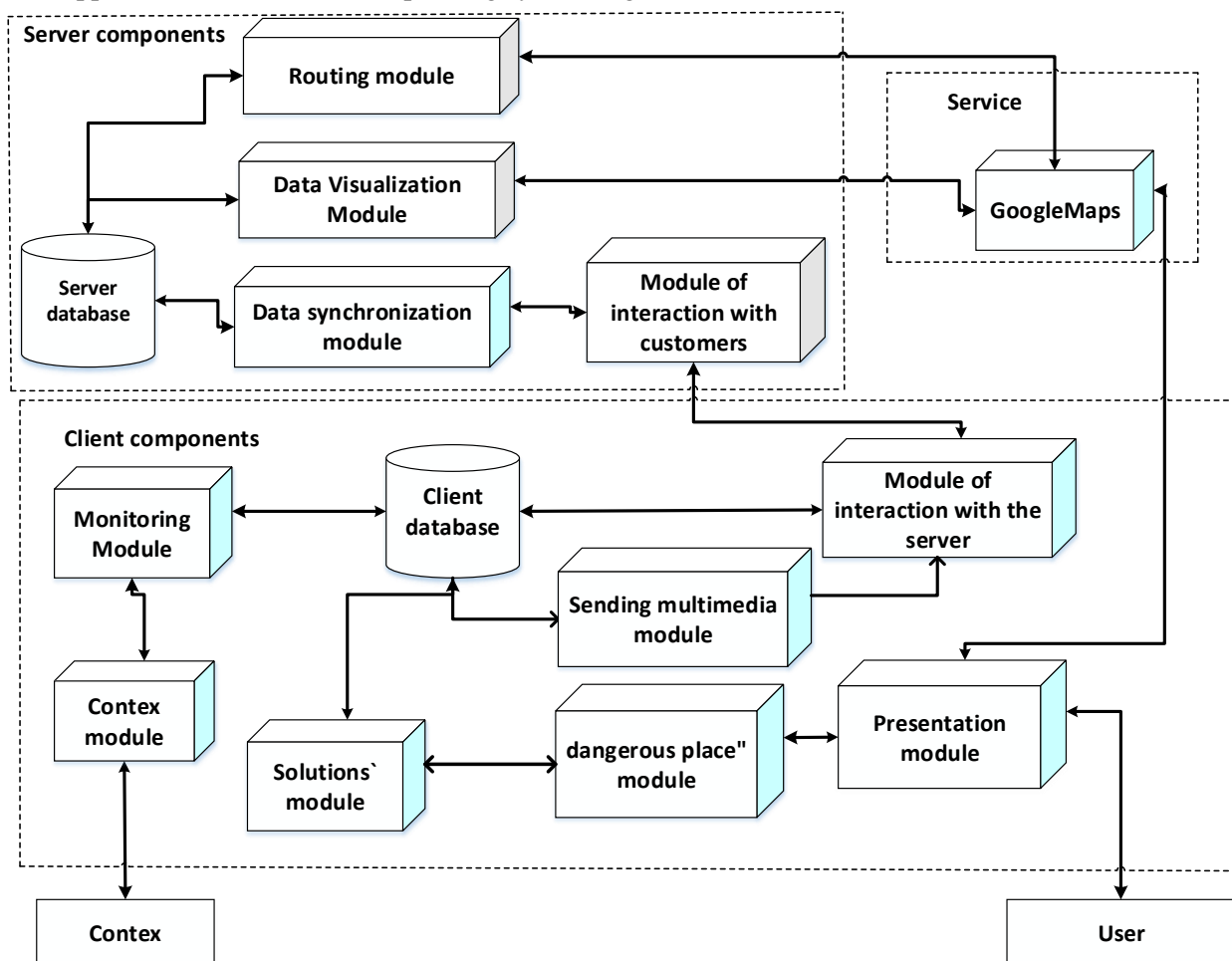


Figure 1 - The structure of context-dependent software services

The client side consists of the database, which stores data about users and dangerous places on a digital map and a number of modules:

- Server interaction module - designed to sync with the server.
- Context module - used to determine the current state in which the user is (time of day, weather, distance to the nearest threat).
- Solutions module – designed for determining the threat to the human life and allows to inform the user about the potential threat in real time.
- Presentation module - implements the functions of changing the data view appearance to the user. The module communicates with GoogleMaps service to display the points on a digital map of the area.
- Monitoring Module - allows to track and store data about the users movement.
- "Dangerous place" module - designed to create, delete, and edit dangerous points on the map.
- Sending multimedia module – is designed to transfer media files about dangerous points on the map to the server.

The server component consists of the following modules:

- Routing module - designed to build the best route to a dangerous place.
- Data Visualization Module – designed to visualize data obtained from GoogleMaps and client.
- Data synchronization module – designed to synchronize data between the client and server side.
- Customer Interaction module – validates the data obtained from the user and performs its conversion on the business logic level.

One thing that should be noted is that the part of the system is GoogleMaps service, which provides map data required for a software system.

Conclusion

In this work, the principles of software applications used for notification about human life threats have been analyzed. It is shown that the main drawbacks of all known services are a static presentation of data and lack of information about the causes of threats that significantly affects the possibility of an adequate response to the alarm.

The context-sensitive software service for permanent residence was developed for solving these deficiencies problems, which will be additionally implemented with PMD user notification about potentially dangerous places that are nearby. A unique service feature will be transferring the audio and video / photo data from PMD sensors to the cloud data storage in real time by pressing the panic button. In addition, the application will display PMD's user location and route path on a digital map on the server side of the application.

The functional and nonfunctional requirements for context-dependent software services have been analyzed. System structure has been designed based on client-server model of interaction in which the client component is a mobile application for the Android operating system.

References

1. Мягченко О.П. Безпека життєдіяльності людини та суспільства. Навч. пос. – К.: Центр учбової літератури, 2010. – 384 с. (in Ukraine)
2. Family Locator [Electronic resource] - Access to resources: <http://www.sygi.com/family-locator>.
3. BSafe [Electronic resource] - Access to resources: <http://www.getbsafe.com>.
4. SOS – Stay Safe [Electronic resource] - Access to resources: <https://play.google.com/store/apps/details?id=com.extentia.sos>.
5. Shake Safety – Personal Safety [Electronic resource] - Access to resources: <https://play.google.com/store/apps/details?id=com.photon.shake2safety>.
6. Save Me Pro [Electronic resource] - Access to resources: <https://play.google.com/store/apps/details?id=com.yoapp.savemepro>.
7. Кнопка Жизни [Електронний ресурс] – Режим доступа к ресурсу: <https://кнопка24.ru/6.https://play.google.com/store/apps/details?id=com.yoapp.savemepro>. (in Russian)
8. Мобильный спасатель [Електронний ресурс] – Режим доступа к ресурсу: <http://spasatel.mchs.ru>. (in Russian)