

PROPOSED PROFILE TRANSLATION IN CONTEXT AWARE PROACTIVE SYSTEM

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Abstract

The advancement of mobile devices and Internet has given us great platform for our day to day tasks. Various Activities like ticket booking; shopping, paying bills have been done on the fly. The Smartphone adds portability for these jobs. To manage these jobs user must provide his credentials/profile to service provider. So user's profile resides in control of multiple service providers. Due to this, duplication of data occurs which leads to data inconsistency. Further, the profile includes the long listing of user's credentials to be filled by logging into different websites. To reduce such efforts, this paper proposes the Context Aware Proactive System to automatically generate user's profile according to the situations. In this proposed system, the profile remains in user's domain. So, with this we presented Context Aware Proactive System Architecture which reduces user efforts and adds flexibility for handling the credentials.

Keywords: context, context awareness, proactive, profile translation.

1. Introduction

Ever since the internet has come into evolution, it has made user's life very comfortable and convenient to do the work from his desk. Traditionally internet uses client-server model. Client requests for some pages and server responds to client or client may give his information to server if required. This is a reactive model. To give more ease at the client end we can use proactivity concept. Proactive service can be defined as giving response without explicit request. In proactive systems, user is provided with different suggestions according to the different situations. To apply proactivity we should store user's information, situation or some rules (context) and to enhance proactivity, concept of context awareness is applied.

Nowadays every service is being computerized and made available to users online. Many users are using these online services through their desktops or through the Smartphones. Due to the emerging of centralized markets, we have seen an explosion in the number of applications for Smartphone. So here, concept of context aware proactive system is applied on android Smartphones. In this paper, we discuss the properties which are required for designing framework for Context Aware Proactive System running on Android platform.

2. Motivation

In current scenario, profile of user is stored at service providers. As one user uses various kinds of services, his profile is stored at different places. Each service provider uses their own personalization architecture. The credentials in user's profile keep on changing frequently as time, place, and interest areas of user changes. So, user needs to remember all different credentials that he has submitted at different places. User must update his information with all the service providers he is interacting with. This is a tedious task. In this way storage of profile database at service providers raises the issues concerning privacy and consistency of the information. This can be made easy if the profile is under user's control [1].

Context awareness is a potential technology for mobile devices as it can facilitate the device use in demanding situation by dynamically adapting the device behavior. Hence storing the profile at user domain and providing it to the service provider can be made convenient using context aware proactivity.

3. Related work

Schilit and Theimer introduced the term 'context aware' first time. Context-aware computing was discussed by them in 1994 to be "software that adapts according to its location of use, the collection of nearby people and objects, as well as changes to those objects over time." This definition is more specific claimed by Dey. Dey defines more general definition of context as "Context is any information that can be used to characterize the situation of an entity [2]." An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves. In other words, any piece of information that the system has is a part of the system's context. The aspects of context include, but are not

limited to, location, identity, activity, time. He defines context aware system as “system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user’s task [2].” Now many context aware systems are developed. Everyone uses different approach to make system context aware.

One such type of approach is intelligent system architecture for dealing with context-aware application services in pervasive computing environment [3]. In [4], the author proposed architecture and the Hydrogen Context-Framework which was extensible to consider all kinds of context information and comprises a layered architecture. Moving towards the context awareness on mobile / portable devices, the authors in [5] have presented a server-based middleware CASS (Context-awareness sub-structure) that supports context-aware applications on hand-held and other small computers describing how mobile applications can benefit from the ability to use high level context data. Context aware system has also shown its enhancement through android. The concept of *ContextDroid* which is an Expression-Based Context Framework for Android is explained in [6]. In [7] the terminal is enhanced by providing it with content information which is retrieved, ranked and formatted for specific user. Author proposed the Architecture for Contextaware Proactive Recommender System in [8]. This recommender system provides recommendations proactively by using multi-agent technology. More specific solution of context aware proactive application on mobile can be PEMA [9]. The architecture with multiple agents for tourist guide application is referred in [10] which apply proactivity to the mobile.

A lot of work has been done on Context Aware Proactive System. With this, we analyzed the previous work and according to our prospective we have taken out the common parameters for evaluation. The evaluation Table 1.1 below shows state of art. So, we have tried to include all the parameters in the proposed architecture.

Table 1.1 Evaluation of Related work

Existing Solution	Context Quality	Portability	Extensibility	Data Personalization	Data Consistency
[4]	√	×	√	×	×
[8]	×	×	√	√	√
[6]	√	√	√	√	×
[9]	×	√	√	√	×
[10]	×	√	√	×	√
[5]	√	√	√	×	×
[3]	√	√	√	√	√
[7]	√	×	√	×	×

√: Corresponding parameter is present in that particular solution

×: Corresponding parameter is lagging in that solution

4. Proposed Profile Translation in Context Aware Proactive System

With the increasing use of web apps present in Smartphones it has become tedious job for the users to provide the detailed profile to service provider. In current scenario the user’s profile is maintained by service providers. When the particular website requires the information of user, whole profile is provided by the user. But this is actually not relevant because all the information is not needed. Accordingly, only the specified information of the usage should be provided. So here we propose a system which is android based and generates specific profile for specific website. As if the website relates to shopping, the profile would contain only the name, postal address and contact or online reservation will require name, age etc. So according to the requirements, different profiles of user are generated. These will be the abstract views of actual profile of user. And these abstract views are provided to the service provider.

Now to recognize what profile is needed by service provider we use the concept of context awareness. Context in our terms can be referred as all the web apps in a smartphone also all different kinds of websites that user visits through these Apps. Recognizing which website/webapp or which action of user needs generation of such profiles is referred as context awareness. Being context aware, the system recognizes need of an abstract views of profile which is provided proactively i.e. before user requests. When user tries to open an app which requires profile then this will be recognized and while that site loads, profile will be generated automatically. To generate these views proactively we should know the credentials needed for that website. Generating the profile according to the context determined is the foremost task of the application. The personalization of data is to be done at user side itself. The profile database is to be stored in the smartphone.

This is android based context aware proactive system which manages user's whole profile information and gives abstract view of profile according to the current context requirements [1]. As whole profile information is stored at one place consistency of information will be maintained. Profile of user will be in user's control and not of service provider. In this way it becomes convenient for user to update his profile. He can update his profile stored in the database and next time when he visits different websites, this updated information will be made available to that website proactively.

This paper includes:

- Emphasis on the fact that for ease of generating user profile it is necessary to design framework which includes storage of user credentials, accepting the queries, fetching the requisite data to application with its needs.
- The structural designs that will give the clear and distinct idea about how each layer is interrelated to each other and equally contribute to all.
- The necessary requirements for Context Framework in Smartphones.

4.1. Proposed Architecture

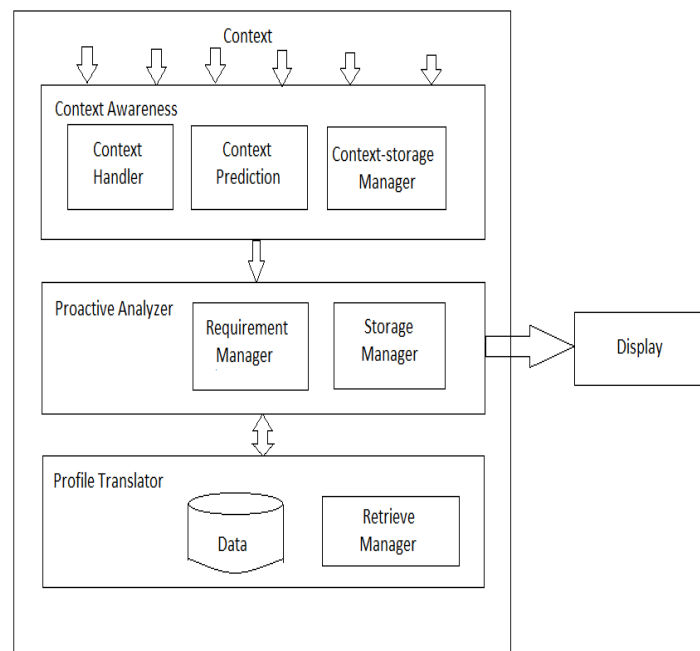


Fig.1.Proposed Architecture

The Fig.1.summarizes layered architecture for the proposed system which incorporates interrelated functionalities. The detailed description of each layer is as follows.

- **Context Awareness Layer**

Context is taken as main input to the system. The basic task of context handler is to recognize the current context in which user is operating. Recognition of context can be done by checking stored context. Sometimes it may happen that the user is using that app first time or navigating the new web site. Now, if user is in new context then the whole data is passed to Context Predictor. Context Predictor checks if this current context needs the profile to be generated. If require then this context is passed to Context Storage Manager. Context Storage Manager stores new context or updates previous data according to the situation. This way, first layer recognizes the context that is nothing but the situation awareness and suggests if current context is appropriate for profile translation. And finally forwards this contextual information to the next layer.

- **Proactive Analyzer Layer**

It takes the contextual information which is provided by upper layer. The Requirement Manager in this layer will gather all the required information of the profile. This is done without user's request which is nothing but extracting the requirements from the context proactively. Here, best results can be achieved by properly examining the current context and gathering results accordingly. After this accumulation, the data is pushed to the next layer.

- **Profile Translation**

The layer takes the requirements from second layer via Retrieve Manager. It will check if those user requirements are fulfilled by the database. If the user requirements are satisfied then it creates the abstract view of profile. The layer will pass this abstract view to the Display Manager from Proactive Analyzer Layer. It will display the view proactively.

4.2. Proposed Algorithm

Let, **C** ← **context**
 A ← **User's Action**

Sense function will sense user's action and will return current context. This context is passed to the ContextHandler. **ContextHandler** will handle this context. Handling of context is done by using stored context information. Here, **NewContext** function takes context as input, compares it with stored context and returns true (Boolean value) if the context is new i.e. not available in stored context. If so, then **Predict** function is called in **ContextPredictor**. **Predict** function checks if current context requires profile to be generated. If yes, the **ContextStorageManager** will store the new context. If profile generation is not required then reject current context and goto step 1 to repeat i.e. again sense user's action. Now if current context is not new context i.e. old or stored context then directly goto step A.2. At the end the context that needs profile to be generated will be passed to the **ProactiveAnalyzer**.

```

1] C ← Sense (A)
A] ContextHandler(C)
    A.1 if (NewContext(C))
        ContextPredictor(C)
        a] if (Predict(C))
          ContextStorageManager(C)
          Goto step A.2
        Else
          Reject context;
          Goto step 1
    Else
        Goto step A.2
    A.2
        ProactiveAnalyzer(C)
  
```

Let Profile type can store whole profile of user which contains attributes and specific values of these attributes i.e. attribute – value pairs.

So Profile $P = \{ T_1, T_2, \dots, T_n \}$

Where $T_i = R_i V_i$

$R_i = i$ th attribute

$V_i =$ value of R_i attribute

Profile $P [1..n][1..n]$ ← set of attribute-value pairs in user's profile

Credential $[c1..cm]$ ← set of attributes

AbstractView $[a1..am]$ ← set of values

In this algorithm **FindAttribute** function will scan the context and will check if any attribute to be retrieved is present in the context. If present, the function returns true or false otherwise. Using **GetAttribute** function one attribute from the context is saved into credential array and is marked as taken. Now at the end of while loop we get all attributes that should be retrieved in credential array. Now compare each attribute in credential array with each profile entry to retrieve values. If match is found then retrieve value in **AbstractView**. And if no match is found in whole profile then make new attribute entry in profile. After all comparisons we get abstract view of values in profile. Pass it to **ContextStorageManager** which will store and display it to user.

ProactiveAnalyzer (context C)

A] While (*FindAttribute(C)*)

 A.1] *credential []* ← *GetAttribute(C)*

B] While all attributes in *credential []* are not checked

 B.1] for each attribute in **Profile P**

a] Compare **current credential** with attribute in **P**. If matched

AbstractView [] = value in P

Break for loop

B.2] If **current credential** Not matched with any attribute

Make new attribute entry in profile **P**

B.3] increment **current** credential index

C] ContextStorageManager (**AbstractView**)

C.1] store and display AbstractView to user

5. Conclusions and Future Work

In this paper, we have proposed the architecture for providing proactivity in Smartphones, using profile translation architecture. While accessing website usually user has to provide some credentials which is under service provider's control. But keeping some constraints like consistency of data and privacy in mind, user controlled profile is put into the implementation of the proactivity model for android smartphone. The android based context aware proactivity framework is a step towards user control vision in Android Smartphone system.

Current and future work includes the implementation of the complete system, and a field study to evaluate it with users really interacting with a mobile device in a realistic scenario in order to have a better feedback related to use this kind of proactive systems in daily life.

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