A Study on the Context-Aware Reasoning Filtering Mechanism in USN

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Abstract— **Context-awareness system can provide an optimized services to users. Analyzing physical and complex circumstance elements which give direct or indirect influence to users can tell what users want. However, there are various situation informations around users and it requires high level technology to extract the service what users really want among those informations. The circumstance of the user can be changed from moment to moment, even the service what users want also can be changed in every minutes. Recently the researches to provide the service which a user demands has been progressed actively. Web based filtering method which reaches commercialization is a one of good examples. This method extracts necessary data according to users' demands from the documents on the Web or multimedia informations. However, there is a limit to use it to provide Context-awareness service because it extracts static data, not dynamic data. There is also other researches with a rule based filtering method in progress to filter situation information but this method doesn't have mechanism for dynamic data as well.**

We would like to solve these problems by providing a dynamic situation information filtering mechanism applying an weighted value about each property of objects and also applying Web based dynamic categories in this paper when unnecessary data should be filtered.

Index Terms*— *Context awareness, Filtering, Reasoning

I. INTRODUCTION

NOWADAYS, many people of using web-service want to connect web-systems whenever, wherever they want to use web-service with new web-enabled mobile devices such as Smartphone, laptop-computers, and mobile phones. Despite these developments of many kinds of web-enable-devices, they still have some problems. For example, they are reduced display and memory capacities for a portability and they have limited bandwidth and battery life[1].

Moreover, context of people who are using these devices is changing all the times such as: there physical location, a kind of device, and they can use many complexly device also then collaborative processes occur among there devices sometimes.

Context-awareness system has to understand user's context to provide service or information what they want. It is an example to use the user's context-information for context-awareness. And it shows a necessary of context-awareness as a mandatory element of ubiquitous computing.

Recently, we can hear this word "Ubiquitous computing" often. It is based on context-awareness about user, and all devices and things connected with network interact each other to serve invisible computing resources to the user[2].

Ubiquitous computing should support appropriate services to users who need service information right on the time when users request service or information to Context-awareness system by using situation information occurred in every minutes when a user uses the system.

II. RELATED WORKS

2.1 Web-based text filtering

Information is often represented in text form and classified into multiple categories. In the information space spanned by the categories, upon receiving a document, automatic text filtering and text classification are essential. One of the popular ways to achieve the task is to delegate a classifier to each category. The classifier is associated with a threshold, and upon receiving a document, it may autonomously make a yes-no decision for the corresponding category. A document is "accepted" by the classifier if its degree of acceptance (DOA) with respect to the category is higher than or equal to the corresponding threshold; otherwise it is "rejected" [3].

But unfortunately, since no classifier may be perfectly tuned, estimation of DOA values does not always be proper[4].

Rey-Long Liu proposed DP4FC(Dynamic profiling for Filtering Classification) for exactly classifier more than before and it got a successful decreasing of misclassification problem[3]. Figure 1 illustrates the introduction of DP4FC to a classifier.

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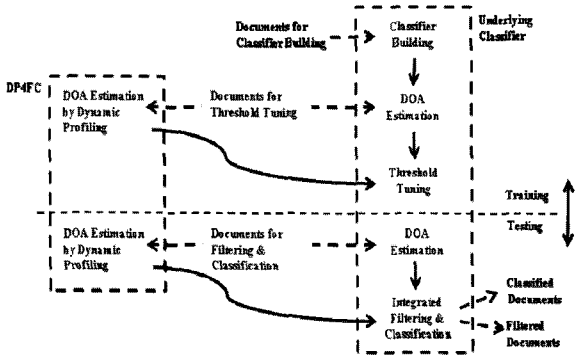

Fig. 1. Associating various classifiers with DP4FC.

However despite these efforts, web-based text filtering can not adapt to context-information filtering. Because user's context is changing all the time and it has limited represent in text about all of context-information.

2.2 Context-Awareness

The mean of the nature of context can be "Defined information by characterize the state of the fact exist in the real world" and the state of the fact means interacting objects between the human and service[5]. In addition, Shilits shared context-information to 3 categories. 3 categories are as follows;

- Computing context: Information of around computing resource
- User context: User's personal information
- Physical context: Data of around user

The information of interacting objects between the human and services can reinteract with themselves and they can make characteristic context of the human and the information of defined character can be the others context information.

Context-awareness research is started to develop applications for service user who want to receive customized service. However, that has a problem that developed applications using the each context-information are difficult to correct definition for interacting objects. In the present time, many peoples are research about the specific definition of context, neural theory, data mining technique, and etc. to solve these problems.

2.3 Context-Awareness

Context-information is collected by various devices, sensors, and among its information of context-awareness system. In the present, many research institutions and laboratories study on context-modeling.

Methods of context-modeling can classify as follow these; key-value model, mark-up scheme model, graphic model, object-oriented model, logic based model, and ontology based model.

Manuele Kirsch-Pinheiro use UML scheme model which is object-oriented model for context modeling[6]. It is implemented the context model using the java API of AROM system. AROM is an object-based knowledge representation system, which adopts classes/objects and associations/tuples as main representation entities[7]. The Figure 2 shows how the concept of context he uses is represented by a class context description which is a composition of both physical and organizational concepts.

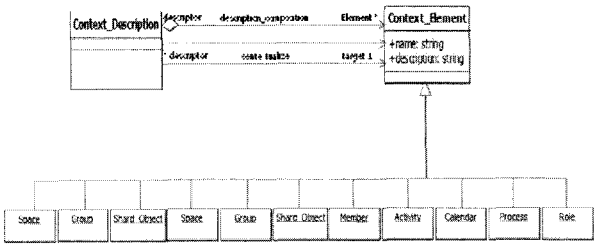

Fig. 2. The composition of the context description of Manuele Kirsch-Pinheiro.

His proposal gets over limited context representation of text and it represent various relations among context-information using the AROM system. The modeled contexts in this way are filtered through pattern matching algorism. This algorism is based on the operations equals and contains.

However this pattern matching algorithm has a problem which can't understand user's context exactly because it has not a clearly standard and if context-information is growing continually then system is going to receive overload.

In this paper, we propose dynamic context filtering method to resolve addressed problems above by adopting weight, setting threshold, and DOA estimation.

III. CONTEXT-AWAR REASONING FILTERING MECHANISM

3.1 Weight Method

Context is classifying two attributes such as mandatory attribute and the others attribute when adding weight to filtering system. The mandatory attribute is considered whenever our filtering system worked on. The system filter mandatory attributes of context at the first. If the filtering system gets enough information then it operates association among the others attributes of low level that concerned with mandatory attributes directly and results are given priority by according association grade. However, if results are not enough then the filtering system is retrying to filter all attributes. And results are given to user by higher priority. Then we predefine mandatory attribute that was decided by an expert of each field because to improve weight method performance, we

have to know professional knowledge each field to understand importance of context. Therefore, the mandatory attribute is changed by expert.

The others attributes are all attributes of all classes except mandatory attributes and they are in use as a support to decide priority or not enough result of the mandatory attribute filtering. In this way, the context-awareness filtering system can treat various and changeable context because the mandatory attribute can be changed by expert. The Figure 3 shows example of context-awareness system using weight method for context filtering and the weight element is a location.

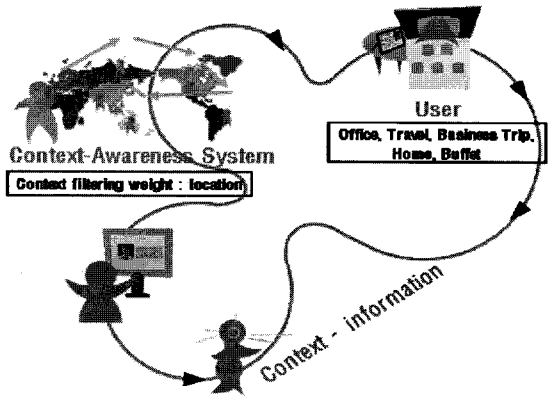

Fig. 3. Context-awareness system using weight method.

3.2 Design of Context Table

In order to implement the proposed method first constructs a table of the database should be the default. Our purpose in order to achieve Predicate the same context as the type of to classify anything, but I think the relationship from the database, the Bayesian network to construct the Subject of the types classified this Class unit that handles the necessary is In other words, through our scenario of each Subject Room, Window, OutDoorPlace, Person is defined as a separate class consists of a table in a database, the following are Class-Property that is the form of a table.

TABLE I
CLASS-PROPERTY TABLE

Room Class

Subject	**hasLight**	**hasTemperature**	**hasSound**
RoomNo1	Bright	Warm	Silence

Window Class

Subject	**WindowStatus**	**BlindStatus**
WindowNo1	Close	Open

OutDoorPlace Class

Subject	**hasLight**	**hasTemperature**	**hasSound**
OutDoorPlaceNo1	Dim	Warm	Silence

Person Class

Subject	**Name**	**Activity**
PersonNo1	John	Sleeping

These Class-Property table event occurs when the context is activated in the context of each of its Class Subject, depending on the type of context, the table is stored in tables that make up the Class table, and has been adopted through the appropriate domain knowledge of the Class and Property serves as a data.

Each Class of the actual data, the instance of the Subject in this table by type and which accumulates through the various tables will be available as a conversion.

RDF(Resource Description Framework) in a relational database context is switched to three columns to the Statement Table is built with a base table to this table as a low-level sensor (low-level) that represents the context is the context table is the most basic table.

For example, "light, bright room," as a means to represent the context of

In other words, hasLight (RoomNo1, Bright) constitute the context of a single context in the table represents one instance.

TABLE II
CONTEXT TABLE

Subject	**Predicate**	**Value**
RoomNo1	hasLight	Bright
RoomNo1	hasTemperature	Warm
RoomNo1	hasSound	Silence
WindowNo1	WindowStatus	Open
WindowNo1	BlindStatus	Close
OutDoorPlaceNo1	hasLight	Dim
OutDoorPlaceNo1	hasTemperature	Cool
OutDoorPlaceNo1	hasSound	Noisy
PersonNo1	Name	John
PersonNo1	Activity	Sleeping

3.3 Design of Method

Object-oriented technology is highly useful to express various situations. The situation which an object belongs to can be divided into two groups; property of the object and behavior of the object. To explain this as an object-oriented technology class, the first one can be property which the object has in its domain like the category of the object and the second one can be the behavior which the object can work.

UML provides the method to express the objects with the class diagram, to systematize, and to extend it. For example, let's suppose an user wants to use an washing machine. The washing machine has the property of model number, operation status, capacity, brand name as its class category. It also has the behavior like "adding the wash", "adding soap and water", "washing", "removing the wash".

Figure 4 shows the property of washing machine and its behavior with UML Class Diagram.

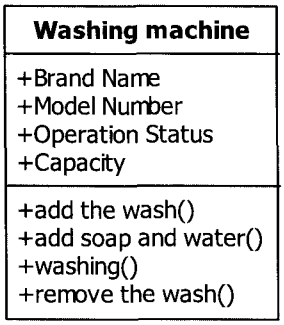

Fig. 4. Class Diagram of UML.

The correlation among objects should be expressed when the object is expressed as the class diagram and abstracted as the upper class. Various and numerous situation informations can be occurred frequently and occurred situation information can have correlation one another and it can be a new circumstance information. Also the correlation of various situations should be figured out to understand users' situations exactly. Figure 5 depicts the correlation between a player and his/her team using UML.

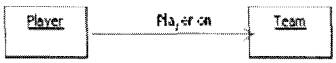

Fig. 5. Relationship between player and team.

The correlation about the objects to express situation informations can be complex more than one class is connected to another class. Various classes can be connected to the only one class. The correlation also can has the same property with the class and the operation. This is called the connected operation. Figure 6 shows the contract correlation class about Player on correlation between a player and his/her team. It also shows the contract class is connected to the class of General Manager.

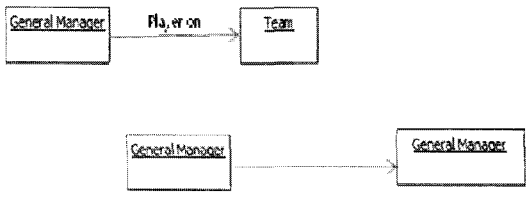

Fig. 6. The express of the correlation class.

The figure 7 represents classes of user's context for weight method, setting threshold, and DOA estimation. We consider location and device information as a mandatory attribute because many previous studies addressed location and device as context-information.

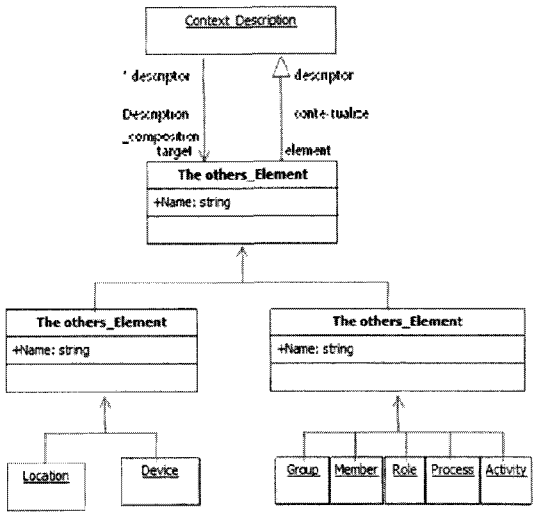

Fig. 7. Classes of user's context.

Context-based filtering mechanism, an example of the process, the algorithm is as follows:

```
Context_Description C ← CONTEXT (user)
SET Profiles ← PROFILES (user)
.....

Selected ← { }
FOR EACH Pri IN Profiles
Context_Description C' ← CONTEXT (Pri)
IF CONTAINS (C, C')
THEN
Selected ← selected ∪ { Pri }
END
.....
selectedEvents ← { }
FOR EACH Pri IN selectedProfiles
.....
SET type ← EVENT_TYPES (Pri)
SET preSelected ← { }
FOR EACH EV IN types
.....
SET preSelected ← preSelected ∪ FIND_EVENTS (EV)
FOR EACH evt IN preSelected
.....
IF NOT MATCH_INTERVAL (Pri, evt)
THEN
preSelected ← preSelected - { evt }
.....
IF NOT MATCH_CONTEXT(Pri, evt)
THEN
preSelected ← preSelected - { evt }
selectedEvents ← selectedEvents ∪ preSelected
.....
```

IV. CONCLUSIONS

In this paper, we have presented a context-based filtering process which proposes to adapt the information delivered to mobile user by filtering it according to the current user's context.

This method can reduce unnecessary operation from comparing all value of classes based on object, and treat various changing of context activity.

The contexts of an uncertain future to represent the existing ontology-based model for dealing with uncertainty in the stochastic part of the expanded model suggests the context of these extended RDF as a transition the relations of the database table how to build, and saved from a database table uncertainty about the context only the information by extracting them, the context of a causal relationship based on the reasoning for the Bayesian network by establishing the uncertainty reasoning about the probability to isolate the lead.

After this, if professional knowledge about each environment is adding to our method then it can be useful system according the environment that using context-awareness system.

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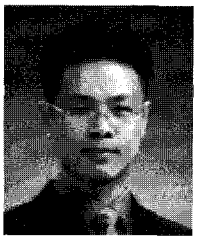

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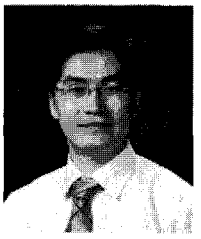

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