

CONTEXT- AWARE SERVICE BASED WEB SERVICE

DISCOVERY PERSONALISATION IN MOBILE

ENVIRONMENT

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ABSTRACT

The most expedient and prevalent devices in today's world are mobile devices. The web services approach is proficient enough to work with the assorted nature of the mobile environment. However, the diversity in the mobile devices challenges the development of the web services which work on these environments. Existing discovery approaches lack adequate techniques that can incorporate the user preferences and context while finding services that satisfy the user's objective. Subsequently, relevant services might not perform as expected due to device constraints and might result in poor user experience unable to accommodate user preferences. Personalisation of service discovery based on the user context information would help resolve this problem and ensure higher customer satisfaction which is very crucial in today's competitive world. In this paper, we have proposed a Context Aware service based web service discovery for personalization in mobile environments which influences the use of context information and user preferences for the personalization of mobile web service discovery and delivers a novel experience to the users.

Keywords: Mobile web services, Personalisation of service discovery, Web services, Web service discovery

I. INTRODUCTION

The widespread and exponential growth in the use of mobile devices has triggered the recognition for the necessity of many existing technologies to be integrated in mobile environments including the web services technology. The worldwide revenue for the mobile web services have generated nearly USD 1.2 trillion in 2010 and was expected to exceed USD 1.7 trillion by the end of 2015. In the beginning of 2013 the global mobile customer base has exceeded 6.5 billion subscribers, which epitomizes 87% of the world's current population, and 1.5 billion of subscribers are reported to have broadband subscriptions^[1]. These numbers are projected to rise in the upcoming years, especially with the emergent interest in broadband connectivity. These facts highlight the momentous market potential for the mobile services and their applications. The uprising broadband wireless access technologies along with the deployment of 4G networks promise to offer data services 3-4 times faster than the current speed, offering a variant user experience. Both the proliferation of mobile devices and advances in wireless technologies have led to the increase in interest regarding mobile services, widening the horizon for a great potential for a multitude of services and opportunities.

Web service discovery plays a key role in the automation of web services. The traditional discovery process using Universal Description and Integration (UDDI) which involves only keyword based matching is no longer sufficient in today's competitive and highly evolving world. The enormous increase in the number of web services and the introduction of various concept models such as Web Service Modelling Language (WSML), Web Service Description Language Semantics (WSDL-S), Web Ontology Language for Services (OWL-S), and Web Service Description Language (WSDL), further trigger the complexity of automation web service discovery.

Mobile services make service personalization possible, where services are selected that best fit the current situation according to the best interest of the user. This is possible due to the fact that mobile devices are associated with users who have personal preferences, beside the ability to access various contextual information.

The rest of the paper is organised as follows: Section II describes some of the existing techniques used for web service discovery in mobile environments. Section III explains the proposed system followed by the glimpse of the ranking algorithm used in section IV. Section V presents the expected results of the system. Finally, we conclude our paper in Section VI.

II. EXISTING METHODS:

The solutions to the PWS problem are varied. Some of the notable methods in existence can be explained in the below sub sections.

1. ProMWS strategy for mobile web service discovery:

Chii Chang et al.^[2] have proposed a Proactive mobile web service discovery (ProMWS) which uses context aware cache pre-fetching strategy. This technique involves the following three basic steps:

- Prediction of upcoming queries to be sent by a user based on their existing context information and transactional history.
- Neighboring peers coordinate to find the relevant service providers.
- Results are pre-fetched before the actual query is sent to the device's hosted mobile service.

The context aware prediction scheme ensures the success of the cache prefetching process. Weights are calculated and assigned to each query based on Bayes' theorem and context weight model. Though this scheme is efficient to reduce the retrieval time drastically, it does not consider the resource context information. This might affect the situation where a new peer is assisted by multiple existing peers.

2. XMPP based Service Directory:

This approach is proposed by Rohit Verma and Abhishek Srivastava^[3] in their paper "A Novel Web Service Directory Framework for Mobile Environments". They have projected a XMPP (eXtensible Messaging and Presence Protocol) based service directory for the service discovery in mobile devices. XMPP is a popular existing technique used for messaging applications for mobile devices. The idea behind this approach is to

manage a local service registry to facilitate a service directory as a contact list similar to a messaging application along with its availability status using XMPP. A service oriented architecture based on publish/subscribe system is used. This approach is useful for scenarios when there is only limited infrastructure available. However, this approach is limited to the refinement of service discovery based on the categories of the services alone.

3. Peer to Peer Mobile web service discovery:

SatishNarayanaSrirama et al.^[4] propose an alternative way to the traditional centralized registries used for mobile web service discovery. They emphasized the use of peer to peer network for the publicizing and discovery of mobile web services. The mobile web services are published as JXTA module in P2P networks using a standard Module Class Advertisement (MCA). The WSDL descriptions of these services are integrated into the Module Specification Advertisements (MSA). A simple keyword based search grounded only on the name and description elements of the modules which are advertised in the mobile P2P network is provided by the JXTA API. The search parameters are however limited to the MSA details. Also, the resource restrictions of the smart phones limit the detailed search mechanism.

4. MobiEureka:

This technique has been proposed by E. Al-Masri and Q.H. Mahmoud^[5] which dynamically discovers the web services. This approach considers device constraints and capabilities as defined by the standardized device profiles. The discovery process is based the keyword search made by the user. The relevant web services are retrieved based on the ranks assigned as well as the degree of relevance and compatibility catering to the device capabilities and features. This technique is however limited to the context information with respect to device proficiencies alone.

III. PROPOSED SYSTEM:

The proposed approach is Context-Aware Service based discovery in mobile environments tries to improve upon the results returned to users by involving personalised parameters and provide higher user satisfaction to them. Context information as well service rankings are used to retrieve the relevant web services.

The context information and parameters used for the discovery process involves:

- a) User preferences – This information caters to the personal choices or preferences made by the user which is collected based on previous search history.
- b) Mobile Device profile – This includes all the information regarding the device features and constraints to ensure compatibility with the discovered services.
- c) Popularity context – involves the most popularly searched or accessed web services
- d) Service ratings given by the user.

Service ranking involves the following procedure:

The service ranking component contains a set of relevant Web services $WS = \{ws_1, ws_2, \dots, ws_l\}$ and ranks them based on the above four types of context information assuming that:

user preferences $UP = \{up_1, up_2, \dots, up_i\}$

device profile $DP = \{d_1, d_2, \dots, d_j\}$

popularity context $P = \{p_1, p_2, \dots, p_k\}$

user ratings R_{sl} , which represents the normalized average rating for a service sl .

Assume that the matchmaking recovers a set of relevant services S to a particular service request SR . During this request communication session, the discovery appliance collects the features of the customer's device $D_c = \{dc_1, dc_2, \dots, dc_j\}$ which correspond to the provider's recommended device profile D . The context manager on the mobile device gathers several ambient conditions to assess the environment of the user $P_c = \{pc_1, pc_2, \dots, pc_k\}$. For each service sl , there are features ups corresponding to user preferences UP as expressed by the matrix below. These features are extracted from the service description files.

$$SP = \begin{pmatrix} ups_{1,1} & ups_{1,2} & \dots & ups_{1,i} \\ ups_{2,1} & ups_{2,2} & \dots & ups_{2,i} \\ \vdots & \vdots & \ddots & \vdots \\ ups_{l,1} & ups_{l,2} & \dots & ups_{l,i} \end{pmatrix} \quad (1)$$

Where rows represent the set of service features for service sl that correspond to the user preferences and the columns correspond to a single feature for the entire set of relevant services.

The rank of each service $Rank_{sl}$ then is represented by the following formula in Eq. given below

$$Rank_{sl} = \sum w_i \times f(up_i, ups_i) + \sum w_j \times f(d_j, dc_j) + \sum w_k \times f(en_k, ec_k) + R_{sl} \quad (2)$$

Where, w represents the weight of each corresponding feature.

The function f computes the relation between two objects as shown in Eq.

$$f(a,b) = \begin{cases} b/(a+b) & \text{if } a, b \text{ are numbers} \\ \text{sim}(a,b) & \text{if } a, b \text{ are strings} \end{cases} \quad (3)$$

where, $\text{sim}(a,b)$ is a featureless similarity factor computed between objects a and b using Normalized Google Distance (NGD).

$$\text{sim}(a,b) = 1 - \text{NGD}(a,b)$$

The function $f(a,b)$ yields the values $\in [0...1]$. If a and b are numbers, then values greater than or equal 0.5 means that b satisfies a . The closer the value to 1, the higher is the satisfaction that condition b achieves to the condition a . While if a and b are text corresponding to keywords, the function value close to 1 shows that a and b are semantically related, where values close to 0 indicate that they are not related.

The current personalisation techniques do not include user authentication. This may question about the user privacy and data security issues due to the wide range of personal information collected. Hence we improve the system by providing user authentication modules to ensure security and privacy.

IV. RANKING ALGORITHM:

The ranking algorithm used is as follows ^[6].

Inputs given: set of relevant services S , various context P, D, E , and R , and corresponding weights W

Outputs: ranked list of services Rank_Ser

Step 1 Function Rank(S, P, D, E, R)

Step 2 Initialize Rank_Ser to zero

Step 3 calculate the rank of each $s \in S$ based on all context domains, i.e. P, D, E, R , Eq. (2)

Step 4 for each s in S do

Step 5 Rank S = Calculate

Step 6 Rank S = Rank S + Rank_ser

Step 7 end

Step 8 //sort the results

Step 9 Sort(Rank S)

Step 10 return Rank S

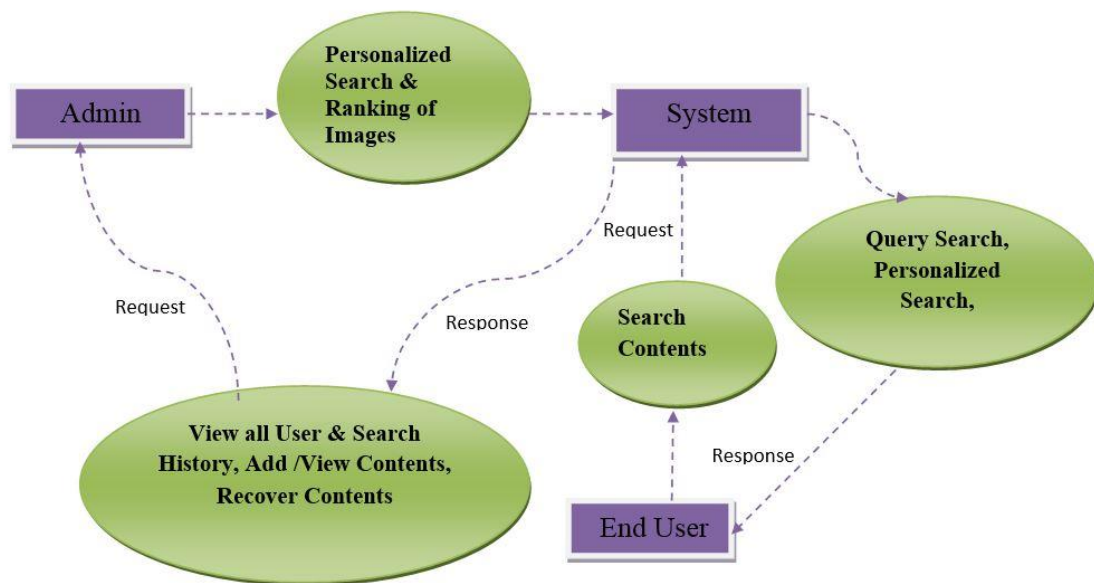


Fig 1. Architecture of personalised web service discovery system

V.EXPECTED EXPERIMENTAL RESULTS

The prototype will have two parts, a user interface to submit service requests and a keyword-based service matching algorithm. Trials will be conducted with a few WSDL documents of valid online Web services that serve several domains. These service description files will be collected from some real world Web service providers and online service directories, such as WebserviceList, WebserviceX.net, Service-repository.com and xMethods. The focus is to evaluate the context aware filtering and ranking technique, not to evaluate the precision and recall of the information retrieval technique. The user interface will be deployed on a smartphone running Android platform.

VI. CONCLUSION

In this paper we proposed a method which improves upon the traditional web service discovery methods which do not focus on the personalisation and/or the mobile environments as well as the current personalisation techniques which do not involve sufficient privacy preserving methods. The advantage of this method is that it provides a novel experience to the users assuring their privacy resulting in extreme user satisfaction. We further intend to expand the categories of context information as well refine the algorithm used.

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