Using Information and Communication Technology to Improve Citizen Access to e-Government Services

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Abstract: The paper present an approach, that consists on: (1) to organize geographically, autonomous and heterogeneous e-Government services for citizens, provided by many agencies, in a network of communities based on taxonomies of terms; (2) to use a single entry point implemented by a compressive middleware to manage the network of communities, to register e-Government services with the communities; (3) to provide support for navigating on the taxonomies of terms in order to select generic operations from communities, to invoke selected operation to execute e-Government services unregistered with the networks of communities. Expected outputs and results refer to: taxonomies of terms to cluster e-Government services; communities of generic operations for main domains from e-Government; network of communities and e-Government services; navigation and querying the network of communities to select generic operations in order to be executed; execution of generic operations by directing them to e-Government services registered with the network communities. Based on this approach, this paper presents an experimental system, designed and developed through the Romanian Research National Program, in order to provide easy and personalized access to online services for elderly persons.

Key words: E-Government services, Semantic Technology, Domains Taxonomy, Community Ontology.

1. INTRODUCTION

Accessing public services from several domains including social programs, healthcare, tax filing etc. posses bureaucratic challenges for all citizens. To capitalize on this trend, many agencies now offer online forms to access e-government services dedicated to citizens' needs. Unfortunately, such efforts had a little effect in the lives of citizens in terms of their receiving better care and services.

The WebAgeing experimental system was developed through a research project, financed by a Romanian National Program. This system takes in consideration the European approach regarding service accessibility and initiatives concerning semantic Web Services. Regarding services' accessibility, WebAgeing system is based on 'Web Accessibility Initiative' (WAI) created by W3C group, that offers a guide concerning the projection and structure of Web services. Regarding the semantic initiatives for the modelling of Semantic Web Services (SWS) there are two types:

- initiatives that require anthologies' defining for the representation of any aspect of SWS (for example OWL-S, WSMO);
- initiatives that encourage the extent of the actual SWS, with open possibilities to reason over SWS definitions, in the purpose of extracting service capabilities, in order to match these capabilities with the ones demanded by the clients (for example METEOR-S, WebDG, WSMX).

WebAgeing approach, being part of the second type of initiative, takes in consideration the following technologies and standards: WSDL, WSDL-S, UDDI, RDF-S, OWL, OWL-S, SOAP, HTTP, RMI. The following European projects address certain aspects relevant to WebAgeing approach:

- SENIORWATH addresses the need for a better understanding and monitoring of web services for the ageing population;
- HealthService24 is a eTEN project, that validates a new platform for the continuous elderly monitoring. Thus, the senior citizens are equipped with sensors, driven by a mobile phone. The measurements are sent wireless to a medical centre where the data is analyzed immediately and the personalized feedback is sent to the patient in real time;
- SENIORITY, a eTEN project, that uses ICT to furnish quality models for the European sector for care for the elderly.

1 http://www.w3.org/
WebAgeing approach exploits the results obtained from projects mentioned above and adds to there results, mechanisms for:

- Organizing services destined for the elderly in communities based on semantic domains, communities that are defined by a set of semantic attributes, that identify the community (community category, community synonyms and community specializations). A collection of generic operations is identified through semantic attributes (operation category, purpose of the operation, operation synonyms, and operation specializations) include in-out parameters, rules of the operation eligibility etc. For the loading of semantic attributes values different standards are used, like: NAICS (North American Industry Classification System), UNSPPSC (Universal Standard Products and Services Classification), Rossetta Net, cXML, EDI etc.
- Service registering with semantic communities, using matching algorithms between generic operations of the communities and concrete operations of Web services.
- Personalized composition of services, based on rules and regulations from the domain of accessing services and on user profile. The rules and regulations for accessing services by the ageing population are implemented using relationships between generic operations (pre-operations, post-operation) and eligibility rules attached to generic operations.
- The interrogation of communities’ collection as a data base. The user has the possibility of consulting the communities in the purpose of selecting generic operations to be included in the users’ demands.
- Ensuring information security and confidentiality for Web services, using credentials and data filters. The security and confidentiality policies can be found and recorded with the user profiles.

The innovative character of the approach used in experimental system consists on: domains taxonomy including interest domains (synonyms) for citizens; functions taxonomies including interest operations (synonyms) for citizens; organizing Web services to be easily discovered at run time (communities based on term taxonomies, each community having a single domain of interest, selected from domains taxonomy, and a collection of generic operations selected from functions taxonomy); agile integration of Web service, matching of service capabilities with community capabilities using service ontology and community ontology.

2. WEBAGEING SYSTEM DESCRIPTION

The main objective of the WebAging system is to provide easy and personalized access to online services (services provided by government agencies, non-governmental agencies, foundations, institutions, trade organizations etc) for elderly persons. In this context, WebAging system organizes Web services in communities, each community corresponding to a domain of interest for elderly people. Communities in their turn are organized in a hierarchical structure using domains taxonomy. This organization provides elderly people with an easy access to Web services designed for them. Elderly people will browse among the nodes of Domains taxonomy and will select generic operations in order to invoke them, without the need to know details about Web services that will be executed as a result of invoking generic operations. Mapping generic operations over the concrete methods of Web services that implement these generic operations is provided by the system. Semantic structure of domains (synonyms, etc) as well as the semantic structure of generic operations (function, synonyms of function, the role of Input/ Output parameters), enable elderly persons to easily make a selection of interest areas and then the generic operations to be invoked.

The WebAgeing architecture (fig.1) is „open middleware”, and it is based on semantic technology able to provide personalized composite services to ageing persons according with their profiles.

Based on this architecture Web Ageing system provides the following functions:
- definition and management of domains taxonomy, including interest areas for services designed for elderly people (social, health, etc.);
- definition and management of Web services descriptions;
- services registration in WebAging;
- user profiles management and customizing services access;
- Web Services execution.

In order to perform these functions WebAgeing contains the tools for request management and use profiles addressed to the WebAgeing system, such as:

- instruments for the management of requests addressed to the WebAgeing system by the community providers;
- instruments for the management of requests addressed to the WebAgeing system by the web service providers;
- the management of requests addressed to the WebAgeing system by the elderly.

2.1. The management of requests addressed to the WebAgeing by the community providers

In order to create the experimental system, during the project stage, there have been identified communities that belong to different fields. For example, for the social field there have been identified 14 communities as follows: institutionalization prevention (home care), elderly assistance, elderly home, retirement legislation, elderly people banking services, document issuing by the public institutions, taxes, legal counseling for elderly persons, bill payment, housekeeping services, home sanitation, online shopping. Each community supplies specific information through the operations defined for them. For example, The Elderly Club Community offers information regarding elderly clubs in different towns through operations such as: registering the list of towns where there are elderly clubs registered with the community, registering the club list in the selected town, information regarding location and timetable, information regarding types of activities in the respective club, information regarding access conditions for the elderly. The community providers interact with the WebAgeing system, by using orders such as: Navigation on community taxonomy (fig.2), New community set up, deletion of existing communities.

Community providers navigate on the community taxonomy with the aim of visualizing the existing communities in the WebAgeing system, such as the visualization of communities (digestive diseases, endocrinology, heart diseases, bone diseases, lung diseases, etc.) of the “Frequent_Disease_Information” class. The visualization process can also be expanded. For example, for the digestive disease community, the generic operations which can be visualized are as follows: liver-cyrosis, biliary_cyrosis, gastritis, liver insufficiency etc. The expansion process can continue with syntactic and semantic attributes of the generic operations.
2.2 Management of requests addressed to the WebAgeing system by the Web service providers

This function of the WebAgeing system allows:

- **The visualisation of the Web service description**
  After log in, the Web service providers can visualise the description of the above-mentioned services stored in the system. By selecting the Attribute button, the system will list the attributes of a service description, such as: bindings, methods, types of data, methods’ data inputs and methods’ data outputs.

- **Creation of new descriptions for Web services**
  The providers of Web services are able to create folders containing the description of Web services developed by them and upload such descriptions in the WebAgeing system, by using the system’s interface if such description complies with the extended WSDL format.

- **Deletion of Web services’ descriptions from the system**
  A provider of Web services is allowed to delete the description of a Web service from the system if the user deleting the description is its actual owner. Otherwise, the respective description will not be deleted.

- **Registration of services in communities contained in the taxonomy of communities**
  In order to map generic operations with the methods used by the Web services, the system checks, with the help of the matching algorithm, if such mapping is possible, as follows:
  - the generic operation and method have the same domain or similar domains;
  - the generic operation has a number of input arguments equal or higher than the method’s number of input arguments;
  - there can be established a correspondence between the types of data of the input arguments from the generic operation and method.

- **Management of mapping registry: viewing the mapping registry; deleting records from the mapping registry**
  The service providers are able to see the contents of the mapping registry or delete the registry’s records.

2.3. Management of demands addressed to the WebAgeing system by elder persons

The elderly and public servants may access the WebAgeing system using Login, which encloses the following buttons: Community Management, Service Management, Service Access, Administration. Such buttons are activated/deactivated depending on the role of the user filling in the Users and Password fields and selecting the Login button. For instance, if the user is a service provider, the Service Management button will be activated and if the user is a community provider, then the Community Management button will be activated.

The requests addressed to the system by the elderly refer to:
- The selection of a generic operation for the purpose of generating the precedence tree – the system allows the user to select a generic operation for the purpose of generating its precedence tree.
- Generating the pre-operation tree attached to the selected operation.

The pre-operation tree is defined by: the tree root is the selected generic operation, level 1 of the tree contains the generic operations to be invoked prior to the root operation, Level 2 of the tree includes the generic operations to be invoked prior to each operation on level 1, ........ level n of the tree includes all the generic operations to be executed prior to the operations on level n-1.

The generated tree depends on the values of the attributed stored in the profile of the user who selected the generic operation.

- Execution of the pre-operation tree
  The execution of the pre-operation tree involves invoking of each generic operation in the tree, starting with the terminal nodes. Invoking a generic operation involves:
  - Screen display of the control attached to the invoked operation.
  - The system selection of a concrete method which implements the invoked generic operation.

3. CONCLUSIONS

WebAgeing system was developed in order to increase in the access of the elderly persons to their services. This system provide to the elderly persons the facilities to select the communities and generic operations (targets), the performing of the operations, the visualization of the results following the performing of the generic operations. The precedence relations between generic operations allows to access the services for elderly persons according to the legislation and regulations in force.

4. REFERENCES


***PNCDI II - Sistem flexibil pentru accesarea personalizată a serviciilor destinate persoanelor vârstnice (http://193.230.3.97/webagin/).


***http://www.webserviceshelp.org/wsh/Practices/Interoperability/Designing+the+WSDL.htm