Computer Industry Laboratory

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Computer Industry Laboratory

Research by faculties and students in the Computer Industry Laboratory has been carried out in the fields of both basic computer science and industrial applications, such as Semantic Web Services, Web Data Mining and Security, Semantic e-Business, Situation Awareness, Signal processing, Simulation engineering, and Functional Safety, and environmental impact analysis of energy industry. Several articles were published as book chapters, journal-contributions, proceedings-contributions in conferences, and technical reports.

The research activities of the Computer Industry Laboratory include the following topics:

[Shigeru KANEMOTO] - Signal processing for plant monitoring and control - Dynamical system identification and analysis - Image processing and 3D shape reconstruction - Human-Computer hybrid simulation - Functional safety of embedded system [Incheon PAIK] - Semantic Web Service - Web Data Mining and Security - Semantic e-Business Application and Workflow - Situation Awareness - Software Engineering on Smart Moible Device [Kenta OFUJI] - Environmental impact of energy industry - Environmental economics and computer simulation - Assessment of new technologies in electric power generation and consumption

Refereed Journal Papers

[kanemoto-01:2012] T.TAKAGI S.KANEMOTO R.URAYAMA, T.UCHIMOTO. Online monitoring of Pipe Wall Thinning with Electromagnetic Acoustic Resonance. *Mentenology*, 11(4):83–89, 2012.

Recently, to ensure the safety and reliability of the nuclear and thermal plant's maintenance actions, in addition to shutdown inspections, condition-based maintenance using online monitoring is required, which can identify operational trends in pipe wall thinning. In this study, the electromagnetic acoustic resonance (EMAR) method and the superposition of the nth compression (SNC) for data processing are applied to online monitoring of pipe wall thinning. Furthermore, the accuracy and stability of the measurements are evaluated through field tests using a large-scale corrosion test loop at high temperature. To measure the thickness of pipes with complicated wall thinning, the SNC extracts thickness information from the spectral responses of the EMAR. Results from monitoring test show that EMAR with SNC can evaluate pipe wall thinning with an accuracy of a few ?m at 165 ° C.

[o-fu-01:2012] Kenta Ofuji and Naoki Tatsumi. Determinants and their Impact on the Profitability and Credit Issuance Rates of CDM Projects. *Journal of Japan Society of Energy and Resources*, 33(5):1–13, 2012.

This article empirically studies the determinants of (a) ex-ante credit-related profitability, and (b) ex-post credit issuance rates, of CDM (Clean Development Mechanism) projects. In particular, attention was paid to which project type, investing country, and host country is more likely to yield higher (or lower) profit and the issuance rate. It was estimated that, for the ex-ante credit-related profitability, the project type, particularly methane recovery and utilization (MRU) and biogas projects, tend to yield relatively higher profit by about 10examined, MRU projects tend to fall behind other project types by as much as about -45as empty fruit bunch biomass that occasionally concentrate in limited countries, are found to have relatively lower issuance rates.

[o-fu-02:2012] Kenta Ofuji and Ken ichiro Nishio. Analysis of residential water heater choice using multinomial logit models. *Journal of Environmental Engineering, Architects Institute of Japan*, 78(689):89–95, 2012.

Choice of water heaters in the housings built in 2010 across Japan is analyzed using multinomial choice models, with a focus on custom-made single-family

housings. It was found that the most influential parameter is the resident's perceived importance towards water heaters, generating higher preference to energy-efficient, and in particular electric, water heaters. As such, the perceived importance greatly influences the macroscopic substitution within the water heater market, in particular that of the energy-efficient electric water heaters.

[o-fu-03:2012] Ken ichiro Nishio and Kenta Ofuji. Differences in electricity conservation rates by households and effects of conservation measures, Journal of Environmental Engineering. *Journal of Environmental Engineering, Architects Institute of Japan*, 77(679):753–759, 2012.

Japan experienced an electricity crisis in the summer of 2011 because of the earthquake and tsunami. The government urged companies and households to reduce their peak-level electricity consumption by 15ex-post evaluation on the electricity-saving efforts in the residential sector, by a questionnaire survey of 2,970 households. The result shows that 10adjustment. We elaborate the differences in the electricity conservation rate by household types. Moreover, the main conservation measures are analyzed by both the econometric-based method and the engineering-based method.

[o-fu-04:2012] Kenta Ofuji and Naoki Tatsumi. A quantile regression analysis on the determinants of credit issuance rates of CDM projects. *Journal of Public Utility Economics, Japan Society of Public Utility Economics*, 64(2):31–44, 2012.

Credit issuance is among the major determinants of commercial viability in CDM projects. In this paper, we empirically analyzed the factors that impacted the realized credit issuance rates in existing CDM projects. We found that project type choice had the greatest impact, ranging from -48host country choice with -23did not influence the issuance rate variations as much, certain combinations of project type and investing countries, such as wind power projects developed by Japan, are found to be issuing statistically lower amount of credits.

[o-fu-05:2012] Kenta Ofuji and Naoki Tatsumi. A quantile regression analysis on the determinants of credit issuance rates of CDM projects. *Journal of Public Utility Economics, Japan Society of Public Utility Economics*, 64(2):31–44, 2012.

Credit issuance is among the major determinants of commercial viability in CDM projects. In this paper, we empirically analyzed the factors that

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[o-fu-06:2012] Kenta Ofuji. Situations surrounding Electric Power Stations in Fukushima before and after 3.11-Importance of Existing Generation Technologies and Expectations on Renewables Energy Sources -. *Journal of Public Utility Economics, Japan Society of Public Utility Economics*, 64(2):45–56, 2012.

In this paper, the author analysed the situation surrounding electric power stations in Fukushima prefecture before and after the March 11th disaster. Before the nuclear incident, Fukushima had a rich variety of generation technologies not limited to nuclear, ranging from conventional hydro, coal and oil thermal and recent IGCC(Integrated coal Gasification Combined Cycle) plants, to large-scale renewable technologies like wind, biomass and geothermal. The article first surveys historical background of such generation stations, followed by the damages as well as the restoration work after the great earthquake and tsunami. The contribution of the prefecture to the national demand of electricity was significant, coupled with strong economic benefit brought back to the region. In contrast, after the March 11th, the region sees a rising expectation towards renewables because of the surge in unemployment and the fear from nuclear energy. By 2020, the official installation target in particular for wind and photovoltaic generation amounts to 3,000MW altogether, equivalent to the gross hydro capacity of the Tadami- and Agano-river basins. The author calculated the expected job creation level due to the renewables, and concluded that within the gross potential impact of more than 2,000 jobs for 20 years, manufacturing and installation jobs play the vital role, while operation and maintenance jobs are marginal. Caveats include that this is realised only under the condition that the bold installation target is met despite the various technical difficulties and international manufacturing competitions.

[paikic-01:2012] Eigo Fujikawa Incheon Paik. Web Service Matchmaking Using Web Search Engine and Machine Learning. *International Journal of Web Engineering*, 1(1):1–5, 2012.

Web Services discovery that locates adequate services, has been studied very

actively for better quality of service retrieval. Starting from conventional keyword matching, logic-based matching and combination of the methods with information retrieval approach have been proposed to enable better discovery performance. The combining method using term-similarity can overcome the decision failure when the keyword or the logic-based methods were applied, and it was shown that the methods outperform the existing methods. And researches to aggregate matchmaking variants by machine learning has been attempted, and it also improves the discovery performance. The approaches still suffer from fixed corpus set for term similarity calculation. In this research, we attempted to calculate the similarity based on search engine to reflect the current Web context. Tokenized terms are used for the matchmaking degree. Variants for the matchmaking from ontology and term similarity are aggregated using Support Vector Machine (SVM) with non-linear kernel function. Matchmaking test on the trip domain service discovery was conducted. Experimental result based on the standard measure of precision and recall rate for the top 1-20 services of matched result on the trip domain test set are shown.

[paikic-02:2012] Incheon Paik Wuhui Chen. Improving efficiency of service discovery using Linked data-based service publication. *Information Systems Frontiers, Springer*, pages DOI: 10.1007/s10796–012–9381–x, 2012.

It is considered that Web services have had a tremendous impact on the web as a potential silver bullet for supporting a distributed service-based economy on a global scale. However, despite the outstanding progress, their uptake on a web scale has been significantly less than initially anticipated due to higher usage thresholds. For instance, it is a hard task for service provider to seek appropriate semantic information such as OWL ontologies for service annotation in the service publication stage due to the fact that nowadays we are suffering from serious lack of available and ubiquitous ontologies for global consensus. Also it is not realistic for query users who do not possess much semantic knowledge to specify their requests with associated semantic information in the service discovery stage. In this paper, we propose a methodology to build a global social service network based on Link data principles for reducing the using thresholds. First, we propose Linked social service which is published on the open web by following Linked data principles with social link, and then we suggest a new platform for constructing a global social service network based on Linked social service. Then, an approach is proposed to enable exploitation of global social

service network, providing Linked Social Service as a Service. Finally, experimental results show that the Linked social service can reduce the using threshold by enabling exploring service to service based on the global social service network.

[paikic-03:2012] Wuhui Chen Incheon Paik. SEMANTIC PATTERN TEMPLATES FOR AUTOMATING BUSINESS CHOREOGRAPHY ON WEB SERVICES. *International Journal of Business Process Integration and Management (IJBPIM)*, 6(2):97–111, 2012.

Integrating and automating workflow processes have been investigated to decrease the resource requirements and increase the efficiency of e-business processes. Researchers have analysed workflow patterns, but little has been done to make the patterns semantically and systematically deployable in applications. In our research, we propose an ontological description of workflow patterns and templates to support established workflow patterns, and we have developed a framework to accommodate these templates. The proposed system identifies the pattern type from a workflow diagram based on the pattern ontology, collects the necessary information for the process, and makes a connection to an appropriate application system. A prototype implementation to show the effectiveness of our system for automated business choreography is described.

[paikic-04:2012] Michal N. Huhns Incheon Paik, Wuhui Chen. A Scalable Architecture for Automatic Composition. *IEEE Transactions on Services Computing*, page DOI: ¡http://doi.ieeecomputersociety.org/10.1109/TSC.2012.33¿, 2012.

This paper addresses automatic service composition (ASC) as a means to create new value-added services dynam-ically and automatically from existing services in service-oriented architecture and cloud computing environments. Manually composing services for relatively static applications has been successful, but automatically composing services requires advances in the semantics of processes and an architectural framework that can capture all stages of an application's lifecycle. A framework for ASC involves four stages: planning an execution workflow, discovering services from a registry, selecting the best candidate services, and executing the selected services. This four-stage architecture is the most widely used to describe ASC, but it is still abstract and incomplete in terms of scalable goal composition, property transformation for seamless automatic composition, and integration architecture. We present a workflow orchestration to enable nested multilevel

composition for achieving scalability. We add to the four-stage composition framework a transformation method for abstract composition properties. A general model for the composition architecture is described herein and a complete and detailed composition framework is introduced using our model. Our ASC architecture achieves improved seamlessness and scalability in the integrated framework. The ASC architecture is analyzed and evaluated to show its efficacy.

[paikic-05:2012] Wuhui Chen B. T. G. S. Kumara, Incheon Paik. Extract Features from WSDL Documents to Cluster Web Services with Ontology Learning. *Journal of Convergence Information Technology*, 8(5):920–929, 2013.

Web service discovery is becoming a challenging and time consuming task due to large number of Web services available on the Internet. Organizing the Web services into functionally similar clusters is one of a very efficient approach for reducing the search space. To cluster Web services, take out the Web services description languages documents and extract the features (e.g., service name) to measure the similarities. Complex terms are used as Web service features in some contexts. Current approaches do not consider about the hidden semantic pattern exists within the complex terms. We present an approach to cluster the Web services into functionally similar Web service clusters that mine Web Service Description Language (WSDL) documents and generate ontologies by using complex terms for the measuring purpose of similarity. We use both logic based reasoning and edge count base similarity measuring techniques for calculating the similarity using generated ontology. Experimental results show our clustering approach with ontology learning, has better performance comparing with approach which is not consider about the ontology learning

[paikic-06:2012] Patrick C.K. Hung Wuhui Chen, Incheon Paik. Constructing a Global Social Service Network for Better Quality of Web Service Discovery. *IEEE Transactions on Services Computing*, page DOI: ¡http://doi.ieeecomputersociety.org/10.1109/TSC.2013.20¿, 2013.

Web services have had a tremendous impact on the Web for supporting a distributed service-based economy on a global scale. However, despite the outstanding progress, their uptake on a Web scale has been significantly less than initially anticipated. The isolation of services and the lack of social relationships among related services have been identified as reasons for the poor uptake. In this paper, we propose connecting the isolated service islands

into a global social service network to enhance the services' sociability on a global scale. First, we propose linked social service-specific principles based on linked data principles for publishing services on the open Web as linked social services; then, we suggest a new framework for constructing the global social service network following linked social service-specific principles based on complex network theories. Next, an approach is proposed to enable the exploitation of the global social service network, providing Linked Social Services as a Service. Finally, experimental results show that our approach can solve the quality of service discovery problem, improving both the service discovering time and the success rate by exploring service-to-service based on the global social service network.

Refereed Proceeding Papers

[kanemoto-02:2012] Arkady Zgonnikov Toru Miyazawa Daichi Taniguchi Shigeru Kanemoto, Ihor Lubashevsky. Virtual Stick Balancing: Statistical Invariants of Human Response. In *The 44th ISCIE International Symposium on Stochastic Systems Theory and Its Applications*",, Tokyo, Japan, November 2012.

Human behavior during the process of virtual inverted pendulum balancing in viscous environment is analyzed. The results of the virtual experiments are compared to the results of previous studies on so called dynamical trap effect. It is shown that the phase trajectories and phase variables distributions of the virtual stick motion under human control are similar to those of an oscillator under the presence of noise described by the dynamical trap model. Moreover, it is discovered that the patterns of system dynamics under human control are similar for all feasible values of system parameters. We therefore suggest that the dynamical trap model could reflect certain features of human behavior during processes of dynamical systems control near equilibrium points.

[o-fu-07:2012] Ken ichiro Nishio and Kenta Ofuji. Behavior Change and Driving Forces to Save Electricity in the Electricity Crisis in Japan. In IEPEC(International Energy Program Evaluation Conference), editor, *International Energy Program Evaluation Conference (IEPEC2012)*, pages 1–12, Rome, June 2012. IEPEC(International Energy Program Evaluation Conference), IEPEC(International Energy Program Evaluation Conference).

Japan experienced an unprecedented electricity crisis in the summer of 2011 because of the earthquake and tsunami, along with the accompanying nuclear power plant shutdown. In response to this emergency, the government of Japan set electricity conservation targets of 15for electricity was curbed substantially, avoiding power outages. In this study we conduct the an ex-post evaluation focusing on the electricity-saving efforts in the residential sector, by conducting interviews with a focus group interview of 20 people and a questionnaire survey of 3,000 households. The result shows that 10normalization adjustment. It is estimated that about 40electricity use resulted from conservation of electricity used for air-conditioning. Moreover, we elaborate on the roles of incentives in changing consumer behaviors. It is revealed that while social norms played an important role in raising consciousness of electricity conservation, they tended to lead to electricity conservation through self-control on air-conditioning, lighting, and other uses and in some aspects these effects are difficult to maintain. Provision of information is effective for the purpose of planned electricity conservation, which can take firm root. Finally, we tested the degree to which people were conscious of peak electricity hours and how they acted on information provided about peak electricity conservation. Available at: http://www.iepec.org/conf-docs/papers/2012PapersTOC/2012TOC.htm

[paikic-07:2012] I. Paik W. Chen and P. Hung. Linked Social Service: Connecting Isolated Services into a Global Social Service Network. In IEEE APSCC 2012 Publication Committee, editor, *Proceedings of The 2012 IEEE Asia-Pacific Services Computing Conference (APSCC)*, page On-Line, Guilin, China, December 2012. IEEE APSCC 2012 Organizing Committee.

It is considered that Web services have had a tremendous impact on the web as a potential silver bullet for supporting a distributed service-based economy on a global scale. However, despite the outstanding progress, their uptake on a web scale has been significantly less than initially anticipated. The reasons are: first, the existing Web service frameworks such as "traditional" Web services, semantic Web services, and Web APIs have had a limited impact; second, isolated service islands without links to related services have hampered service discovery and composition. In this paper, we propose a methodology to drive innovation from isolated service islands into the global social service network to connect the islands. First, we propose Linked social service-specific principles based on Linked Data principles for publishing services on the open web as linked social services using our new service model, and suggest a new platform

for constructing a global social service network. Then, an approach is proposed to enable exploitation of a global social service network, providing Linked social service as a service. Finally, experimental results show that the Linked social service can solve the service discovery problem by enabling exploring service to service based on the global social service network.

[paikic-08:2012] I. Paik and R. Komiya. Active Situation Awareness on Web APIs for Information on Social Network Services. In IEEE ICWS/SCC/SE 2012 Publication Committee, editor, *Proceedings of IEEE International Conference on Service Economics 2012*, pages 68–69, Honolulu, Hawaii, USA, June 2012. IEEE ICWS/SCC/SE 2012 Organizing Committee, IEEE CPS.

Situation awareness can be achieved by the framework with three layers (Fig. 1): perception from world, comprehension of the perceived information, and projection based on the comprehended facts. The current awareness system cannot afford to support dynamic and active awareness of situations, and we provide a novel architecture for active situation awareness to integrate the existing system layers seamlessly. Perception by mining data on social network services (SNS) data using TF-IDF, comprehension of the information by inference of ontology and rule, projection of new suggest by rule inference on RESTful services are explained. Our new framework shows more enhanced situation awareness system and new vision of awareness computing.

[paikic-09:2012] T. Tashiro D. Kang W. Chen, I. Paik. Global Service Space for workflow as a service. In IEEE iCAST 2012 Publication Committee, editor, *Proceedings of International Conference Awareness Science and Technology (iCAST 2012)*, pages 269–274, Seoul Korea, August 2012. IEEE iCAST 2012 Organizing Committee.

Web service has been considered to have a tremendous impact on the web. However, despite the outstanding progress their uptake on a Web-scale has been significantly less prominent than initially anticipated. Isolated service islands without links to related services have hampered service discovery and composition. In this paper, we propose a methodology to connect isolated service islands into global social service network for service composition. First, we will give a definition of the Social Link for connecting isolated services. Then we propose global social service network for service composition. And then based on global social service network, we propose a method to provide users workflow as a service considering node-reduction for better performance. Fi-

nally, experiment result shows our approach can provide workflow as a service effectively.

[paikic-10:2012] I. Paik T. Tanaka W. Chen, R. Tashiro. Connecting Isolated Service Islands into Global Social Service Network. In IEEE iCAST 2012 Publication Committee, editor, *Proceedings of International Conference Awareness Science and Technology (iCAST 2012)*, pages 263–268, Seoul Korea, August 2012. IEEE iCAST 2012 Organizing Committee.

It is considered that Web services has been considered to have a tremendous impact on the web, as a potential silver bullet for supporting distributed service-based economy at a global scale. However, despite the outstanding progress their uptake on a Web-scale has been significantly less prominent than initially anticipated. The reasons are: first, isolated service islands without links to related services have hampered service discovery and composition; second, the existing Web service frameworks such as "traditional" Web services, semantic Web services, and Web APIs have failed to find an adequate trade-off between the expressivity and semantics of the service descriptions. In this paper, we propose a methodology to evolve from the isolated service islands into Global Social Service Network. First, we propose Linked Social service-specific based on Linked data principles to publish many services on the web as linked social services by using our new service model and suggest a new platform for constructing Global Social Service Network. And then, the experiment results show that Linked Social Service can connects distributed service into Global Social Service Network.

[paikic-11:2012] D. Kang T. Tanaka W. Chen, I. Paik. Service Discovery based on Tree Structure. In IEEE iCAST 2012 Publication Committee, editor, *Proceedings of International Conference Awareness Science and Technology (iCAST 2012)*, pages 218–223, Seoul Korea, August 2012. IEEE iCAST 2012 Organizing Committee.

Since more and more services are published on the open web, service discovery is becoming a critical technology for service applications. In order to discover services it is important to calculate the similarity between services. Current approaches, such as ontology concept-based techniques, and information retrieval-based techniques only consider service's input/output as a simple datatype for service similarity calculation. However real-world services published on the web always have input/output parameters with complex datatype. Therefore it is significantly important to discover services considering complex datatype. In this paper, we propose an algorithm considering

complex datatype of service's input/output by mapping services to tree structures for service discovery. And we calculate service similarity using the tree structure. First, we propose a method to mapping services to tree structure considering complex datatype. Second, we use the combination of depth among the trees to calculate the similarity between two service trees. Finally, an experiment is done and our evaluation shows our approach for service discovery based on tree structure has a better performance comparing with approaches which are only considering simple datatype.

[paikic-12:2012] R. Komiya K. Lee I. Paik, W. Chen. Active Situation Awareness Framework for Social Network Services. In IEEE iCAST 2012 Publication Committee, editor, *Proceedings of International Conference Awareness Science and Technology (iCAST 2012)*, pages 54–57, Seoul Korea, August 2012. IEEE iCAST 2012 Organizing Committee.

Awareness computing aims at our final goal in computer science to simulate human's awareness and cognition. Technical approaches to model the awareness in human have contributed to the current awareness system together with semantic technology. Usually awareness can be achieved by a framework with multiple layers: perception of information from data in the world, comprehension of the perceived information, and projection based on the comprehended situations. The current awareness system cannot dynamic and active awareness of situation, and we provide a novel architecture for active situation awareness to integrate the existing system layers. Active situation awareness for the cases of social network services (SNS) is illustrated. Perception by mining SNS data using TF-IDF, comprehension of the information by inference of ontology and rule, projection of new suggest by rule inference are explained. Finally system architecture and evaluation of the system are introduced. Our new framework shows more enhanced situation awareness system and new vision of awareness computing.

[paikic-13:2012] M. Li I. Paik K. Ryu E. Shin, T. Munkhdalai. A Self-training with Active Example Selection Criterion for Biomedical Named Entity Recognition. In ICHIT 2012 Publication Committee, editor, *Proceedings of 6th International Conference on Convergence and Hybrid Information Technology (ICHIT 2012)*, pages 485–492, Daejeon, Korea, August 2012. ICHIT 2012 Organizing Committee, Springer.

Biomedical named entity recognition is an essential prerequisite task before effective text mining of biomedical literature can begin. Exploiting unlabeled

text data with a relatively small labeled corpus to build an accurate classification model has been an active and challenging research topic in text mining, due to the recent growth of the amount of biomedical literature. In this work, we proposed a new semi-supervised learning method based on self-training for biomedical named entity recognition. In this method, one classifier iteratively labels informative examples queried from the unlabeled data and learns on the most confident ones of them. Performance of the classifier is therefore improved. The proposed method outperforms the traditional self-training algorithm in terms of f-measure as well as, the number of training iterations performed to build a good classification model.

[paikic-14:2012] I. Paik K. Ryu X. Yu, M. Li. Prediction of Web User Behavior by Discovering Temporal Relational Rules from Web Log Data. In DEXA 2012 Publication Committee, editor, *Proceedings of DEXA Conference*, pages 31–38, Vienna, Austria, September 2012. DEXS 2012 Organizing Committee, Springer.

The Web has become a very popular and interactive medium in our lives. With the rapid development and proliferation of e-commerce and Web-based information systems, web mining has become an essential tool for discovering specific information on the Web. There are a lot of previous web mining techniques have been proposed. In this paper, an approach of temporal interval relational rule mining is applied to discover knowledge from web log data. Comparing our proposed approach and previous web mining techniques, the attribute of timestamp in web log data is considered in our approach. Firstly, temporal intervals of accessing web pages are formed by folding over a periodicity. And then discovery of relational rules is performed based on constraint of these temporal intervals. In the experiment, we analyze the result of relational rules and the effect of important parameters used in the mining approach.

[paikic-15:2012] G. Lee S. Kumara, I. Paik. Ontology Learning Method for Web Services Clustering. In IEEE ICCIT 2012 Publication Committee, editor, *Proceedings of IEEE 7th International Conference on Computing and Convergence Technology (ICCIT 2012)*, page OnLine, Seoul, Korea, December 2012. IEEE ICCIT 2012 Organizing Committee.

Web service discovery is becoming a challenging and time consuming task due to large number of Web services available on the Internet. Organizing the Web services into functionally similar clusters is one of a very efficient approach for reducing the search space. To cluster Web services, take out the Web services description languages documents and extract the features (e.g., service name)

to measure the similarities. Complex terms are used as Web service features in some contexts. Current approaches do not consider about the hidden semantic pattern exists within the complex terms. We present an approach to cluster the Web services into functionally similar Web service clusters that mine Web Service Description Language (WSDL) documents and generate ontologies by using complex terms for the measuring purpose of similarity. We use both logic based reasoning and edge base similarity measuring techniques for calculating the similarity using generated ontology. Experimental results show our clustering approach with ontology learning, has better performance comparing with approaches which are not considering about the latent pattern exists within the complex terms.

[paikic-16:2012] W. Chen, I. Paik, and R. Komiya. Global Service Space Construction and Its Application to Workflow as a Service. In IEEE SCC 2012 Publication Committee, editor, *Proceedings of IEEE International Conference on Service Computing 2012*, pages 547–554, Honolulu, Hawaii, USA, June 2012. IEEE SCC 2012 Organizing Committee, IEEE CPS.

It is considered that Web services have had a tremendous impact on the web as a potential silver bullet for supporting a distributed service-based economy on a global scale. However, despite the outstanding progress, their uptake on a web scale has been significantly less than initially anticipated. Isolated service islands without links to related services have hampered service discovery and composition. In this paper, we propose a methodology to drive innovation from isolated service islands into the global social service network to connect the service islands. First, we propose Linked social service-specific principles based on Linked Data principles for publishing services on the open web as linked social services, and suggest a new platform for constructing a global social service network. Then, an approach is proposed to enable exploitation of a global social service network, providing workflow as a service. Finally, experimental results show that Linked social service can solve the service composition problem by enabling providing workflow as a service based on the global social service network, and has the potential to be the next wave of services.

[paikic-17:2012] W. Chen, I. Paik, and R. Komiya. Linked Social Service: Evolving from an Isolated Service into a Global Social Service Network. In IEEE ICWS/SCC/SE 2012 Publication Committee, editor, *Proceedings of IEEE International Conference on Web Service 2012*, pages 618–619,

Honolulu, Hawaii, USA, June 2012. IEEE ICWS/SCC/SE 2012 Organizing Committee, IEEE CPS.

It is considered that Web services have had a tremendous impact on the web as a potential silver bullet for supporting a distributed service-based economy on a global scale. However, despite the outstanding progress, their uptake on a web scale has been significantly less than initially anticipated. The reasons are: first, the existing Web service frameworks such as "traditional" Web services, semantic Web services, and Web APIs have had a limited impact; second, isolated service islands without links to related services have hampered service discovery and composition. In this paper, we propose a methodology to drive innovation from isolated service islands into the global social service network to connect the islands. First, we propose Linked social service-specific principles based on Linked Data principles for publishing services on the open web as linked social services using our new service model, and suggest a new platform for constructing a global social service network. Then, an approach is proposed to enable exploitation of a global social service network, providing Linked social service as a service. Finally, experimental results show that the Linked social service can solve the service discovery problem by enabling exploring service to service based on the global social service network, and has the potential to be the next wave of services.

[paikic-18:2012] I. Paik P. Hung, W. Chen. Privacy Issues in SOAP Message Exchange Pattern for Social Services. In ISMIS 2012 Publication Committee, editor, *Proceedings of The International Workshop on Privacy-AwaRe Intelligent Systems (PARIS 2012)*, page OnLine, Macau, December 2012. ISMIS 2012 Organizing Committee.

A Web service is defined as an autonomous unit of application logic that provides either some business functionality or information to other applications through an Internet connection. Web services are based on a set of eXtensible Markup Language (XML) standards such as Universal Description, Discovery and Integration (UDDI), Web Services Description Language (WSDL), and Simple Object Access Protocol (SOAP). As Web services are becoming more and more popular for supporting different e-business applications, there are also increasing demands and discussions about Web services privacy protection in the industry and research community. In general, privacy policies describe an organization's data practices what information they collect from individuals (e.g., consumers) and what (e.g., purposes) they do with it. To enable privacy protection for Web service consumers across multiple domains and services,

the World Wide Web Consortium (W3C) published a document called "Web Services Architecture (WSA) Requirements" that defines some specific privacy requirements for Web services as a future research topic. This paper discusses the privacy policies in SOAP Message Exchange Patterns (MEP). Further, this paper also presents the privacy policies in security tokens with SOAP messages.

Unrefereed Papers

[paikic-19:2012] I. Paik H. Ohashi. Calculating Word Similiarity for Context Aware Web Service Clustering. In IEICE SC Branch, editor, *IEICE Service Computing Branch Meeting Technical Report Vol. 112, No. 497*, pages 29–31, Tokyo, March 2013.

Web service discovery is becoming a challenging and time consuming task due to large number of Web services available on the Internet. Organizing the Web services into functionally similar clusters is one of a very efficient approach for reducing the search space. To cluster Web services, we first extract the features (e.g., service name) to measure the similarities from service descriptions from Web or registry. The services usually consist of complex terms, from which we can get service features in some contexts. Current works for service clustering have not considered the context. To make clustering of web services by domain context, we need calculation of terms similarity under a specific context. In this paper, we suggest a novel method to measure terms similarity consider the specific domain context using machine learning.

[paikic-20:2012] I. Paik T. Tashiro, W. Chen. Constructing Web-Scale Functional Map on Global Social Service Network for Workflow-as-a-Service. In IEICE SC Branch, editor, *IEICE Service Computing Branch Meeting Technical Report Vol. 112, No. 497*, pages 19–24, Tokyo, March 2013.

Web services has been considered to have a tremendous impact on the web, as a potential silver bullet for supporting distributed service-based economy at a global scale. However, despite the outstanding progress their uptake on a Web-scale has been significantly less prominent than initially anticipated. The main reasons are summarized as following: "Homepage-service" era has hampered service discovery and service composition. To solve this problem, we provide a new approach for automatic service composition based on social link. We propose global social service network which is constructed by linking services based on

relationship between services. We define web-scale functional map to composite service based on the global social service network using social link.

[paikic-21:2012] T. Tashiro W. Chen, I. Paik. Awareness of Social Influence on Linked Social Service. In IEICE SC Branch, editor, *IEICE Service Computing Branch Meeting Technical Report Vol. 112, No. 497*, pages 25–28, Tokyo, March 2013.

Linked social service considers not only the functionality and QoS of service but also the service ' s sociability, so that it knows not only about themself, but also the peers that they would like to work with in case of composition or they would have to compete against in case of service selection. Global social service network was constructed by connecting linked social services, to describe service societies ' features such as social relations and social states, and provide a basis for inferring, planning, and coordinating social activities. Therefore, awareness of the social relationship between linked social services can help many mining applications such as service recommendation and representative node identification. In this paper, we propose a flexible model for effectively and efficiently awareness of social influence to provide a quantitative measure of the influential strength. First, we formally formulate the problem of awareness of social influence in general domains; next, we observe some fundamental social factors which impact the social influence strength between Linked social services in global social service network; and then, a flexible model is proposed for awareness of social influence on Linked social service to provide a quantitative measure of social influence strength. Finally, some application examples, such as representative service identification and service recommendation are provided.

Grants

[o-fu-08:2012] Kenta Ofuji. Central Research Institute of Electric Power Industry, 2009-2012.

Academic Activities

[paikic-22:2012] Incheon Paik, Oct. 2012.

Program Committee Member

[paikic-23:2012] Incheon Paik, Aug. 2012.

PC Chair

[paikic-24:2012] Incheon Paik, Oct. 2012.

WIP Track Chair

[paikic-25:2012] Incheon Paik, May 2012.

Editorial Borad

[paikic-26:2012] Incheon Paik, June 2012.

Steering Committee Member

[paikic-27:2012] Incheon Paik, November 2012.

Expert Committee Member

[paikic-28:2012] Incheon Paik, January 2013.

Chair

Ph.D and Others Theses

[o-fu-09:2012] Honami Kon. Graduation Thesis: A quantity of generation evaluation of the solar power output and possibility examination of the peak cut in the University of Aizu, University of Aizu, 2012.

Thesis Advisor: K. Ofuji

[o-fu-10:2012] Yusuke Nishihata. Graduation Thesis: Elaboration of Minor Hydropower Output Forecast in the Tohoku Area in Spring, University of Aizu, 2012.

Thesis Advisor: K. Ofuji

[o-fu-11:2012] Hirofumi Hori. Graduation Thesis: Effective power-saving measures in commercial buildings in summer: A case study in the University of Aizu, University of Aizu, 2012.

Thesis Advisor: K. Ofuji

[o-fu-12:2012] Hiromu Kanomata. Graduation Thesis: Analysis of Trading of Forward Contracts in Japan Electric Power Exchange, University of Aizu, 2012.

Thesis Advisor: K. Ofuji

[o-fu-13:2012] Masahiro Okazaki. Graduation Thesis: Analysis of a Survey on Electricity Saving in 2011, University of Aizu, 2012.

Thesis Advisor: K. Ofuji

[paikic-29:2012] Ryusuke Tashiro. Constructing Global Social Service Network and Analyzing Its Social Influence, Graduate School, University of Aizu, 2012.

Thesis Advisor: I. Paik

[paikic-30:2012] Takazumi Tanaka. Calculating Word Similarity using Linked Data for Words Clustering, University of Aizu, 2012.

Thesis Advisor: I. Paik

[paikic-31:2012] Ryohei Komiya. Customizable Active Situation Awareness Framework Based on Meta-Process in Ontology, Graduate School, University of Aizu, 2012.

Thesis Advisor: I. Paik

[paikic-32:2012] Shohei Sugai. Extracting Related Concept By Statistical Clustering and Word Similarity From Web Documents, Graduate School, University of Aizu, 2012.

Thesis Advisor: I. Paik

[paikic-33:2012] Ryoma Abe. Design of Knowledge Sharing System Considering User's Preference, University of Aizu, 2012.

Thesis Advisor: I. Paik

Others

[o-fu-14:2012] Kenta Ofuji.

Invited Speech: English for Rikei, prepared for Iwaki High School Super Science High School project, UoA, Nov. 22, 2012