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<td>TÍTULO PROYECTO</td>
<td>A CONCEPTUAL MODELING METHOD FOR ADAPTIVE WEB APPLICATIONS</td>
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OBJETIVOS

Cumplimiento de los Objetivos planteados en la etapa final, o pendientes de cumplir. Recuerde que en esta sección debe referirse a objetivos desarrollados, NO listar actividades desarrolladas.

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<td>1</td>
<td>Definition of a set of conceptual primitives that support the modelling of Adaptive Techniques.</td>
<td>TOTAL</td>
<td>Conceptual structures that were introduced in the first stage of the project and that support the modeling of adaptive techniques were intensively used in the development of several case studies. Going beyond other model-driven proposals for adaptive applications, this project put special emphasis on the application of these primitives in the development of recommender systems, which are the most featured adaptive systems on the Web. Pursuing the needed accuracy of the provided recommendations and preserving the scalability of the implementation in demanding interaction scenarios, the development of this kind of systems considers multiple aspects not only related to the adaptation of the interface, but also involving decisions about persistence and business logic tiers of the system. Therefore, extensions of the navigational model have been accompanied by interface elements that integrate the navigational model with the rest of the application.</td>
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<td></td>
<td>Definition of a set of modelling patterns to specify Adaptive Methods, in terms of the introduced Adaptive Primitives.</td>
<td>TOTAL</td>
<td>Adaptive Hypermedia community has identified the most frequent techniques used to implement each of the defined methods. In the context of this project, we have defined modeling patterns to guide the use of the defined conceptual structures in the modeling of respective adaptive techniques. In this way, the inclusion adaptive methods into a web application is guided by a set of modeling patterns, each of them corresponding to respective adaptive techniques. Furthermore, specific patterns were designed for the development of adaptive recommender systems. Structural and dynamic aspects of collaborative filtering algorithms, are expressed through two main models: (1) an Abstract Model of the structure of recommender systems, and (2) a Repository of Abstract Recommendation Algorithms, as extensions of UML. The Structural Model supports the specification of contextual variables that influence recommendations: a multigranular specification of time, and the participation in social networks.</td>
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<td>3</td>
<td>Definition of a modeling workflow to define the complete specification of adaptive characteristics.</td>
<td>TOTAL</td>
<td>Preserving the two main phases of OOWS Development Process (System Specification and Software Development), their steps were enhanced, obtaining a general development workflow for adaptive Web systems. A new navigational analysis phase has been defined, based on the concept of task, which allows analysing how adaptive aspects can be included in different user tasks. Two model transformations were defined: a model-to-model transformation from task analysis diagram into an extended OOWS diagram; and a model-to-code transformation that automatically generates the implementation of navigational structure from OOWS navigational model. In order to support the development of Adaptive Recommender System, the workflow also considers the automatic generation of code from abstract structural and dynamic models, including contextual aspects (a multigranular specification of time, and user relationships in social networks).</td>
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Otro(s) aspecto(s) que Ud. considere importante(s) en la evaluación del cumplimiento de objetivos planteados en la propuesta original o en las modificaciones autorizadas por los Consejos.

Two Model Transformations has been implemented in order to facilitate the use of the proposed method in a model-driven environment. These transformations link tasks analysis with navigational design, and navigational design with code. On the one hand, a model-to-model transformation allows transforming the performed task analysis into a preliminary version of the extended OOWS navigational model, which includes aspects related to information access and navigation, along with introducing the first elements of hybrid recommendation approach and presentation techniques. This preliminary model can be taken as a starting point...
for a complete navigational design. On the other hand, a model-to-code transformation allows generating the implementation of the navigational structure from the extended OOWS navigational model. These transformations have been implemented in a modeling tool, which provides a valuable support to the generation of rapid prototypes of the adaptive systems in development, along with supplying the proposal with actual implementations that permit validating the enhanced conceptual models and the proposed workflow.

In order to support the evolution of adaptive recommender systems, an abstract recommendation model was introduced, in which user profiles are integrated with domain-independent concepts of recommender systems, and with the specification of contextual specifications. From this model, a set of abstract specification of well-known collaborative filtering algorithms are defined, with independence from specific domain. From these models, conceptual specifications of specific adaptive recommender systems can be easily defined by inheritance of abstract concepts, and corresponding implementation code can be automatically obtained, through the implementation of model-to-text transformation rules (contained in a software plugin called Recommendation Support).

Experimental evaluation of our proposal (see Anexos section) showed a good perception of our method by developers, and appealing results in comparison with implementation-based development approaches.
RESULTS OBTAINED:
For each specific goal, describe or summarize the results obtained. Relate each one to work already published and/or manuscripts submitted. In the Annex section include additional information deemed pertinent and relevant to the evaluation process. 
The maximum length for this section is 5 pages. (Arial or Verdana, font size 10).

Goal 1: Definition of a set of conceptual primitives that support the modeling of Adaptive Techniques.
From the analysis of the adaptive techniques that best support the interaction of current Web applications, corresponding conceptual primitives of the models of OOWS Method will be defined. Each of these conceptual structures will allow expressing one or more technique of adaptive navigation (such as link-hiding or link-ordering) and adaptive presentation (e.g., conditional fragments, stretchtext).

Results

The term “adaptive techniques” is applied to the set of technologies that allow automatically adapting the interface of hypermedia applications to the particular preferences and needs of different users. As the main goal of this project, the first stage was dedicated to propose a conceptual model of Web interfaces that give support to the high-level description of these technologies, in order to focus the development efforts on the problem specification rather than on implementation details, by adopting the Model-Driven paradigm to develop adaptive Web applications.

As a result of this first stage, two sets of conceptual structures were incorporated to the OOWS Navigational Model, supporting the description of adaptive navigation and adaptive presentation techniques, respectively. Adaptive navigation is based on the selection and sorting of hyperlinks according to the predicted preference of users for the linked object. Two new structures support these processes, respectively: Adaptive Population Filter and Adaptive Ordering Pattern. From a large set of multiple navigational alternatives, the adaptive system filter those items that do not properly fit the current user's characteristics, by applying user-based constraints to the retrieval of objects from the database. Once selected, the candidate items are sorted according to different criteria.

In the second stage of this project, these structures were intensively used in the development of several case studies. Going beyond other model-driven proposals for adaptive applications, this project put special emphasis on the application of these primitives in the development of recommender systems, which are the most featured adaptive systems on the Web. Pursuing the needed accuracy of the provided recommendations and preserving the scalability of the implementation in demanding interaction scenarios, the development of this kind of systems considers multiple aspects not only related to the adaptation of the interface, but also involving decisions about persistence and business logic tiers of the system. Therefore, extensions of the navigational model have been accompanied by interface elements that integrate the navigational model with the rest of the application.

Concerning to adaptive presentation techniques, four primitives have been defined and incorporated to the OOWS Navigational Model: adaptive visibility of attributes and operations (supporting conditional fragment technique and stretchtext), adaptive ordering and visibility of navigational relationships (frame-based technique), and mixed navigational relationships (stretchtext). Two alternatives have been adopted to evaluate the expressiveness and implementation feasibility of the enhanced model: a single layer that shares the implementation of navigational and presentational specifications, including both types of techniques; and a specific presentational implementation through CSS templates. Some application logic procedures were needed to fully implement some adaptive presentation techniques.

Besides the already informed, the Final University Project entitled “Desarrollo de sistema de recomendación adaptativo basado en tecnología Mobile Tagging”, by Nicolás Spencer, was developed in the context of this goal. This work uses the introduced adaptive navigation and presentation primitives in order to develop a mobile-based touristic guide, which keeps track of the places that each user visits, recommending similar places and adapting its presentation, giving higher priority to the most recurrently used functions. Currently, two Final University Projects are in development, adopting a similar approach to the development of an adaptive
Digital TV guide that recommends movies and TV series from a content-based perspective, and a geographical mobile guide that provides visual clues of the visited places based on augmented reality technology, and recommendations of touristic routes.

**Goal 2:** Definition of a set of modeling patterns to specify Adaptive Methods, in terms of the introduced Adaptive Primitives. Adaptive Methods are high-level strategies to support users in their browsing experience, by means of the implementation of different Adaptive Techniques. To incorporate Adaptive Navigation and Presentation methods in OOWS navigational schemas, we introduce a set of modeling patterns that guide the use of the introduced Adaptive Primitives in the modeling of these methods.

Adaptive Methods represent different adaptive goals that are implemented through different adaptive techniques. Adaptive Hypermedia community has identified the most frequent techniques used to implement each of the defined methods. In the context of this project, we have defined modeling patterns to guide the use of the defined conceptual structures in the modeling of respective adaptive techniques. In this way, the inclusion of an adaptive method into a web application is guided by a set of modeling patterns, each of them corresponding to respective adaptive techniques.

Along with these elementary patterns, specific patterns were designed for the development of adaptive recommender systems. Structural and dynamic aspects of collaborative filtering algorithms, which correspond to the most used recommendation approach, are expressed through two main models: (1) an Abstract Recommendation Model, which specifies both the items that must be included in the recommendation process and the preferences of users, as well as structural elements that support the recommendation process such as specific classes, attributes, and services. This is made through a set of abstract classes that inherit their descriptions to specific application domains, in order to guide the construction of the structural schema of the recommender system; and (2) a Repository of Abstract Definitions of Recommendation Algorithms, which captures the functionality of collaborative filtering algorithms in terms of interactions between objects from the abstract classes of recommender systems. Thus, in order to use a recommendation algorithm within the implementation of a system, we just need to select it from the repository and include it into the Dynamic model of OOWS, in terms of concepts of the particular application domain.

Due to OOWS is an extension of the OO-Method automatic code generation process, OO-Method model compiler can be used to automatically generate the implementation of the selected algorithm by using the proper implementation technology and the repository of the corresponding structural schema.

Interface of the adaptive application is generated through the definition of two model transformations, in order to facilitate the use of this approach in a model-driven environment. These transformations link tasks analysis with navigational design, and navigational design with code.

In the second phase of this project, the following Final University Projects has been developed in the context of this goal:

- "Directorio de Usuarios para adaptatividad basada en Tags", by Stefano Salvatori. This work implements a Web-based User Directory, which allows collecting data of user interactions in different Web applications, providing a comprehensive user profile from adaptive characteristics can be implemented. These characteristics are implemented by following modeling patterns of recommender systems. Once finished, this project is currently being extended in a Master Degree Thesis of the same author, defining optimization mechanisms of composition and retrieval of user profiles, defining user hierarchies as an evolution of the Abstract Recommendation Model.
- "Diseño de un CMS adaptativo orientado a plugins", by Jorge Fuente-Alba. Different recommender algorithms were implemented by following the defined patterns as pluggable components of a content-management system. The structure of this system inherits the concepts of the Abstract Recommendation Model, and is implemented in a distributed way between a core kernel and the implemented recommendation plugins.
As an outcome of the Master Degree Thesis “Presentación adaptativa de contenidos para aplicaciones Web: un enfoque dirigido por modelos”, by Leonardo Ramos, a modeling tool was implemented, supporting the definition of adaptive presentational techniques as part of navigational schemas. This tool also provides automatic code generation capabilities, through a model-to-text transformation process based on the defined extended metamodel of the OOWS Navigational Model. In this way, rapid prototypes were obtained, permitting to validate the introduced structures through different case studies.

Goal 3: Definition of a modeling workflow to define the complete specification of adaptive characteristics. In order to promote a robust modeling process of Adaptive Web Applications, the modeling decisions that are made in the four main schemas of the application (user, domain, navigation and presentation descriptions) must be consistent, and following a proper sequence. The fulfillment of this goal demands the study of the activities that must be performed in order to maintain that consistency and the analysis of the most suitable order of execution.

The contributions introduced above extend the OO-Method/OOWS development process. Although preserving its two main phases (System Specification and Software Development), the steps included in each of them have been modified, obtaining a general development workflow for adaptive Web systems. Furthermore, a new navigational analysis phase has been defined, facing the difficulty in designing a navigational structure that fits users preferences and needs without a previous analysis of the different navigational alternatives that support the user interactions. The introduced analysis phase is based on the concept of task that allow developers to study together with users the tasks that they need to perform by interacting with the web application. In this technique, mechanisms that allow studying how adaptive aspects can be considered along the different identified user tasks are also included.

Finally, two model transformations have been defined. On the one hand, a model-to-model transformation allows transforming the performed task analysis into a preliminary version of the extended OOWS navigational model, which includes aspects related to information access and navigation. This preliminary model can be taken as a starting point for a complete navigational design. On the other hand, a model-to-code transformation allows generating the implementation of the navigational structure from the extended OOWS navigational model.

With these modifications, the final workflow of the defined method can be summarized as follows:

1. **System Specification steps:**
   a. First of all, the structure of the application under development must be defined, by means of the OO-Method structural model. In order to include structural aspects related to recommendations, the structural model must inherit from the recommendation abstract model.
   b. Next, the behavior of the system must be defined by means of the OO-Method dynamic and functional models. In this step, the definition of recommendation algorithms to be used must be included in the dynamic model.
   c. Once the structural and behavioral aspects of the application are clear, we must define the navigational structure that must provide user with access to data and functionality. To perform this step, three sub-steps are proposed:
      i. First, tasks that users need to perform with the web application are analyzed, including aspects related to adaptive navigation and presentation techniques to be used.
      ii. Next, a model-to-model transformation is applied in order to obtain a preliminary version of the extended OOWS schema.
      iii. Finally, the definition of the extended OOWS model is refined in order to create a complete design of the navigational structure.

2. **Software Development steps:**
   a. First, the business logic and persistent tiers are generated by means of the OO-Method model compiler.
b. Next, the new model-to-code transformation is applied in order to obtain the implementation of the interface tier from the extended OOWS navigational model.

In the context of this goal, a Final University Project was developed. Navigational analysis phase was validated through the implementation of an automatic code generation tool, which allows obtaining rapid prototypes from analysis schemas, supporting adaptive navigation specifications. This work was highly extended in a Master Degree Thesis, “Diseño e Implementación de Sistemas Híbridos de Recomendación: un enfoque dirigido por modelos”, by Francisco Domínguez (currently in its final review phase), which supports the entire development workflow for recommender systems, implementing both model transformations. From a navigational analysis schema, it is possible to automatically obtain its corresponding design schema, which can be edited and augmented in a graphical modeling environment. Furthermore, the resulting navigational design schema generates the corresponding implementation code, which is integrated with system database, recommendation algorithms and presentation templates in order to obtain the final implementation of the system.

In the already mentioned Master Thesis by Leonardo Ramos, a code generation strategy is also implemented, but from conceptual specifications of adaptive presentation characteristics. Both tools have been integrated, supporting the development of systems with adaptive navigation and presentation techniques. In order to enrich the introduced analysis phase, a Final University Project currently in progress proposes an analysis-to-design transformation but including the specification of data provided in each navigational steps, which will support the analysis of adaptive presentation characteristics in a more precise way.
OTHER ACHIEVEMENTS OF THE PROJECT:
- Research visit(s) to other institution(s).
- Outreach activities related to the project’s main topic.
- Any other contribution, not addressed elsewhere, that you consider important.

The maximum length for this section is 1 page. (Arial or Verdana, font size 10).

1. Research stay at ProS Research Centre, at Technical University of Valencia, Spain (1-10 sept, 2010). The main goal of this stay was to present and discuss the different characteristics of the development tools implemented to support the proposed method. Usability and learnability of tools and the difficulty of proposed method and models for developers were analyzed. Fruitful discussions about the proposed model-to-model transformation process from analysis to design of navigational aspects of recommender systems, and about the model-to-code transformation process implemented to automatically obtain the code of the modeled navigational description of adaptive techniques. From the feedback obtained in this stay, final modifications were introduced to the development tools, which allows performing evaluations and obtaining experimental results of the application of the proposed method.

2. An optional subject for undergraduate and graduate students, called “Adaptatividad en Aplicaciones Web” (Adaptivity in Web Applications) has been created and implemented every year, from 2008. In this course, characteristics of the proposed method are discussed with students, which develop toy examples of adaptive web applications by using the proposed models. Most of the students that have participated in the project have previously taken this subject.
PROJECT SUMMARY: Using non-specialist language, provide a precise and brief description of the project goals, objectives and results obtained. This summary may be published in CONICYT’s web page. The maximum length for this section is 1 page. (Arial or Verdana, font size 10).

In this project, we introduce a Model-Driven method for the development of adaptive web applications. The main goals of this project are:

(1) Specification of the main concepts of adaptive hypermedia applications at a high abstraction level, through the definition of conceptual structures that enhance an already defined navigational model. These structures directly support the specification of well-known adaptive techniques;

(2) Definition of modeling patterns that support the modeling process of adaptive Web applications, in terms of Adaptive Methods, which correspond to adaptive goals that the application must fulfill; and

(3) Definition of a modeling workflow to define the complete specification of adaptive characteristics from a methodological perspective.

As a result, this project proposes a development method for adaptive web applications, as an extension of the object-oriented production method for Web Applications OOWS. The phases of the introduced method are the following:

- A Conceptual Modeling phase, in which structural aspects of the system are defined, comprising the modeling of users and their preferences, and concepts that specifically support the implementation of recommendation algorithms.
- A Dynamic Modeling phase, in which methods of recommendation algorithms are specified through interactions between objects.
- A Navigational Analysis phase, where different navigational alternatives to provide recommendations are analyzed;
- A Navigational Design phase, where developers decide about the definition of the final navigational structure that supports the analyzed alternatives.

In order to support the fulfillment of these phases, a set of conceptual models from the OOWS Method has been extended:

- An Abstract Structural Model, containing the basic elements of an adaptive web application, with special emphasis on the abstract description of user profiles, relevant domain concepts and navigational actions, in order to inherit its specification to the structural schema of a particular application;
- An Abstract Repository of Adaptive Algorithms, which describes adaptive algorithms in a high abstraction level, in order to be inherited by particular services;
- A Navigational Analysis Model, which introduces primitives to analyze navigational aspects of adaptive systems, such as the provision of recommendations in different pages and item evaluation capabilities;
- A Navigational Design Model, from which the access to adaptive features is clearly defined.

Finally, two model transformations are defined: a model-to-model transformation, which allows automatically obtaining a preliminary navigational design schema from analysis diagrams; and a model-to-code transformation, which permits to obtain the implementation code of the navigational interface of the adaptive systems. This implementation is integrated with the data repository, algorithm definitions and presentation templates, obtaining prototypes that allow evaluating the conceptual descriptions and preserving the traceability of development decisions.
La estancia del Dr. Valderas aún no se concreta. Se espera resolución a la solicitud formulada a Fondecyt para coordinar esta visita para comienzos del 2011. De esta forma, el Dr. Valderas participaría como miembro del tribunal de dos de las tesis de magíster enmarcadas en el Proyecto, junto con colaborar en la finalización de manuscrito a ser enviado a revista ISI. (Los campos Fecha de la estadía han sido llenados para validez del formulario).

--- Actualización---

La segunda estancia del Dr. Pedro Valderas, de la Universidad Politécnica de Valencia, España, se concretó entre los días 25 y 30 de abril de 2011. En dicha estancia, el Dr. Valderas participó en las pruebas y ajustes finales de la herramienta Recommendation Support, correspondiente a un plugin del entorno de desarrollo Eclipse, que implementa el Modelo Abstracto de Recomendación y el Repositorio Abstracto de Algoritmos de Recomendación, permitiendo al desarrollador confeccionar diagramas estructurales específicos de un sistema de recomendación adaptativo y utilizar directamente algoritmos de recomendación. Además, la herramienta cuenta con reglas de transformación de los modelos resultantes a código Java. Desde entonces, esta herramienta ha sido la base experimental del método propuesto. Además, en esta estancia, el Dr. Valderas colaboró en la confección de la versión revisada del artículo “A Model-Driven Development Method for Web Recommender Systems”, enviado a la revista Software and Systems Modeling (finalmente no aceptado). Cabe consignar que los costos asociados a esta visita fueron debidamente informados y aprobados por Fondecyt.

La visita del Dr. Óscar Pastor (Director del Centro de Investigación en Métodos de Producción de Software, ProS, de la Universidad Politécnica de Valencia, España), permitió generar discusiones principalmente en torno a los trabajos de tesis de magíster que se desarrollan en el marco del Proyecto. Especialmente importante fue su apreciación sobre aspectos conceptuales en la definición de los procesos de transformación de modelos, desde análisis de requerimientos navegacionales a diseño navegacional, y en el proceso de generación automática de código, para los trabajos de presentación adaptativa y sistemas de recomendación adaptativa. En este sentido, se sostuvieron fructíferas conversaciones sobre la calidad de los metamodelos definidos, obteniendo por parte del Dr. Pastor algunas sugerencias relativas a la optimización de los procesos de transformación definidos, respondiendo a las transformaciones más usualmente demandadas en el desarrollo de sistemas web adaptativos.

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<td>Boosting Point-of-Interest Recommendation with Multigranular Time Representations</td>
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<td>Toward a rapid development of social network-based recommender systems</td>
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CONGRESOS

Nº : 1
Autor (a)(es/as) : Rojas, G.; Uribe, C.
Título (Idioma original) : A conceptual framework to develop mobile recommender systems of points of interest
Nombre del Congreso : 5th International Workshop on Advanced Software Engineering. IWASE’2013
País : CHILE
Ciudad : Temuco
Fecha Inicio : 14/11/2013
Fecha Término : 15/11/2013
Nombre Publicación : Proceedings Jornadas Chilenas de Computación
Año : 2013
Vol. :
Nº :
Páginas :
Envía documento en papel : no
Archivo Asociado : rojasIWASE2013.pdf

TESIS/MEMORIAS

1
Nº : 1
Título de Tesis : Generación automática de sistemas de recomendación adaptativos
Nombre y Apellidos del(de la) Alumno(a) : Francisco Domínguez Gutiérrez
Nombre y Apellidos del(de la) Tutor(a) : Gonzalo Rojas Durán
Título Grado : Pregrado
Institución : Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País : CHILE
Ciudad : Concepción
Estado de Tesis : Terminada
Fecha Inicio : 03/08/2009
Fecha Término : 29/04/2010
Envía documento en papel : no
Archivo Asociado : MTFranciscoDominguez.pdf

2
Nº : 2
Título de Tesis : Directorio de usuarios para adaptatividad basada en tags
Nombre y Apellidos del(de la) Alumno(a) : Stefano Salvatori Maldonado
Nombre y Apellidos del(de la) Tutor(a) : Gonzalo Rojas Durán
Título Grado : Pregrado
Institución : Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País : CHILE
Ciudad : Concepción
Estado de Tesis : Terminada
Fecha Inicio : 03/08/2009
Fecha Término : 29/03/2010
Envía documento en papel : no
Archivo Asociado : MTStefanoSalvatori.pdf

3
Nº : 3
Título de Tesis : Desarrollo de sistema de recomendación adaptativo basado en tecnología mobile tagging
Nombre y Apellidos del(de la) Alumno(a) : Nicolás Spencer Hernández
Nombre y Apellidos del(de la) Tutor(a) : Gonzalo Rojas Durán
Título Grado : Pregrado
Institución : Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País : CHILE
Ciudad : Concepción
Estado de Tesis : Terminada
Fecha Inicio : 06/04/2009
Fecha Término : 07/05/2010
Envía documento en papel : no
Archivo Asociado : MTNicolasSpencer.pdf


N° : 4
Título de Tesis : Transformación de modelos para el diseño navegacional de aplicaciones Web
Nombre y Apellidos del(de la) Alumno(a) : Daniel Gatica Elías
Nombre y Apellidos del(de la) Tutor(a) : Gonzalo Rojas Durán
Título Grado : Pregrado
Institución : Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País : CHILE
Ciudad : Concepción
Estado de Tesis : Terminada
Fecha Inicio : 23/06/2010
Fecha Término : 28/03/2011
Envío documento en papel : no
Archivo Asociado : MT_Daniel_Gatica.pdf


N° : 5
Título de Tesis : Desarrollo de sistema de recomendación adaptativo para TV digital
Nombre y Apellidos del(de la) Alumno(a) : Carlos Hurtado Belmar
Nombre y Apellidos del(de la) Tutor(a) : Gonzalo Rojas Durán
Título Grado : Pregrado
Institución : Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País : CHILE
Ciudad : Concepción
Estado de Tesis : Terminada
Fecha Inicio : 30/08/2010
Fecha Término : 24/08/2011
Envío documento en papel : no
Archivo Asociado : PropMTCarlosHurtado.pdf

Memoria_-_Carlos_Hurtado_Belmar.pdf

Título de Tesis: Guía adaptativa para dispositivos móviles utilizando realidad aumentada
Nombre y Apellidos del Alumno(a): Claudio Uribe Solar
Nombre y Apellidos del Tutor(a): Gonzalo Rojas Durán
Título Grado: Pregrado
Institución: Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País: CHILE
Ciudad: Concepción
Estado de Tesis: Terminada
Fecha Inicio: 01/09/2010
Fecha Término: 24/11/2011
Envía documento en papel: no
Archivo Asociado: PropMTClaudioUribe.pdf

Título de Tesis: Diseño de un sistema de administración de contenido adaptativo orientado a plugins
Nombre y Apellidos del Alumno(a): Jorge Fuente-Alba Hidalgo
Nombre y Apellidos del Tutor(a): Gonzalo Rojas Durán
Título Grado: Pregrado
Institución: Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País: CHILE
Ciudad: Concepción
Estado de Tesis: Terminada
Fecha Inicio: 06/04/2009
Fecha Término: 08/01/2010
Envía documento en papel: no
Archivo Asociado: MTJorgeFuenteAlba.pdf

Título de Tesis: Diseño e implementación de sistemas híbridos de recomendación: un enfoque dirigido por modelos
Nombre y Apellidos del Alumno(a): Francisco Domínguez Gutiérrez
Nombre y Apellidos del Tutor(a): Gonzalo Rojas Durán
Título Grado: Magister
Institución: Departamento de Ingeniería Informática y Ciencias de la Computación - Universidad de Concepción
País: CHILE
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A continuación se detallan los anexos físicos/papel que no se incluyen en el informe en formato PDF.