POMDP planning for the creation of Service Packages

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The generation of complex systems where the user requires decisions based on several criteria involves building a relationship of global preference for a set of alternatives evaluated. Between these systems there are the Tourist Systems, that was impulse by internet like a facilitator in the access of different sources of information for travel planning. Currently, tourists should not only visit multiple independent Web sites (airlines, hotels, etc.) and await a considerable time receiving confirmation responses. All these actions required generating a stochastic system that can meet the services and generate plans. Are being studied POMDP algorithms, in order to obtain a method for packages tailored to user requirements. Under the hypothetical-deductive methodology, this includes the study of service pakage´s composition, application, comparison and validation by a computer prototype with real users for a Web Recommender System. This thesis is framed within a PICT project called "E-OASIS Integrated Travel Services to facilitate easy access to Local Cultural Heritage" whose technical objective is to develop a Customized Recommender System for Tourist Services in the Province of San Juan. The automatic planning in real world problems has become a subject of interest to the scientific community because it allows computationally establish courses of action in cases where a human cannot addressed adequately for the complexity. The motivation for this work focuses on two aspects of the automatic planning, the scientific contributions and its practice application. On the one hand, looking to expand the results of scientists in the automatic planning to improve the efficiency of actual systems, and secondly, to take advantage of the latest scientific advances to broaden its application to planning problems of the real world. In particular, dynamic nature problems, and where uncertainty plays an important role to consider while searching for solutions. One of the practical problems that motivated this work is the design of a computational tool to assist tourists in decision-making and travel planning, the tourist by its multicultural features, Internet impulse as a facilitator in access to a variety of resources for travel planning, is regarded today as one of the largest industries in the world, currently, the tourist must, first, visit multiple independent web sites (airlines, Hotels, travel agencies, etc..) and second, await a considerable time receiving confirmation responses. Given these elements, we must recognize the need to create a system that can meet all these services and create service plans, taking into account its stochastic nature. This requires a model of mathematical reasoning for planning and decision-making in environments with uncertainty, it is why is being working with POMDP algorithms (Decision Processes Partially Observable Markov), with the purpose of obtaining a new method and / or modifies an existing one for generation packages tailored to the requirements of the users.

The work was organized in 6 phases as described below:

Phase 1: Initial - School graduation. Constituted a crucial part in the scientific and exclusive training required in the PhD in engineering from the National University of Cuyo. It consisted in assist, approbation, and accreditation of 400 hours postgraduate

courses at the Academics Committee (taught by Doctors) in different disciplines involved in the subject of the Proposed thesis.
Phase # 2: Research - Study the art. All Contributions were investigated, in order to take advantage of other progress in Investigations and to contribute with new proposals. The state of the art mainly focuses in the following disciplines: Artificial Intelligence, Multi Agent Systems, Complex problem solving, planning and resource allocation, Decision theory and planning with uncertainty.
Phase # 3: Problematization - Problem formulation. Identification and definition of variables. Hypothesis Formulation.
In this moment, the hypothesis is that it is possible to improve the quality of results obtained by the POMDP algorithms, SARSOP Particularly, storage and incorporating feedback from the history of states and actions that the agents perform into a multiagent System.
Phase # 4: Construction – Proposal Development.
Currently being implementing the SARSOP of POMDP algorithm in order to prove computationally with test data generated, to rectify and improve the algorithm.
Phase # 5: Validation - Experimentation, analysis and evaluation of the results. Modification of the Proposal. Once completed, Phase No. 4, it will experiment and it will evaluate the Proposal in the studies cases of Tourism and Education with real users, to ensure the reliability of the proposal
Phase # 6: Communication and Dissemination: This phase is composed of two activities being carried out simultaneously and both are still in process: writing a doctoral thesis, published in scientific journals and conferences.

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