Smart Process Management: automated generation of adaptive cases based on Intelligent Planning technologies

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Abstract

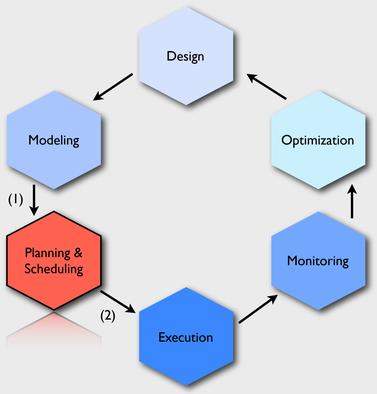
This poster presents a proposal for the seamless integration of Intelligent Planning & Scheduling techniques into the BPM life-cycle. The integration is intended to leverage current BPM techniques by allowing them to manage Smart Processes as adaptive business cases that can be automatically generated from original process models, and later executed in standard BPM runtime engines.

The presented framework is able to extract the knowledge embedded in a BPMN process model, representing this knowledge by means of a Hierarchical Task Network planning domain. An intelligent planner can interpret this domain, obtaining automatically the corresponding process instance for the original model (carrying out process planning and resource allocation), that is finally deployed for execution into an open source BPMS. The demo is directed to managers and decision makers in organizations, but it is also interesting for researchers on the field of business performance, optimization and Adaptive Case Management.

Aims

Smart Processes may be viewed as business cases that demand some kind of intelligent management since, on the one hand they are very difficult to foresee, as they respond to unstructured sets of procedures which reside either in experts mind or in documents, making difficult to devise a priori which tasks to execute. On the other hand, they need to be adaptively generated, since they are unpredictable and they strongly depend on the context of the organization and do not respond to a fixed pattern. Finally, they have to be flexibly and interactively executed by humans since they are subject to change.

So, new techniques must be developed at both steps, process modeling / generation and process execution, in order to fully cover the needs of knowledge workers on Smart Processes. In this sense, we present in this work a proposal that leverages the current BPM life-cycle in order to support smart processes through the development of Knowledge Engineering and intelligent Planning & Scheduling techniques, focused on a two-fold transformation process.



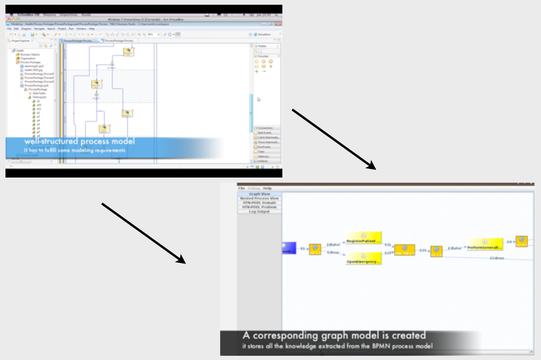
On the one hand, a transformation from business models into planning domains (1), in order to make the output of a business process modeling tool interpretable by an intelligent planner. On the other hand, a transformation from a plan representation into an executable process (2), in order to make the output of the planner understandable by a BPM runtime engine. Thus, these are our main goals, and so the basis to to develop **JABBAH**, a software framework that carries out both transformations.

Jabbah in action

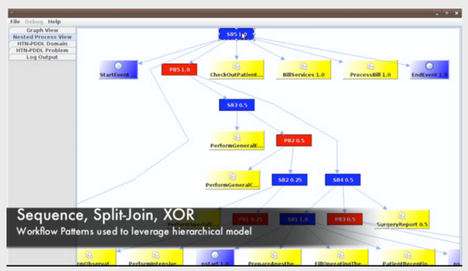
Transformation from process models to planning domains.

Given an XPDL process model as input (which can be clearly seen as a graph), JABBAH proceeds by identifying common workflow patterns (that is, sequential, parallel, subprocess and conditional structures) as process blocks in the process model, and then generate a tree-like structure, much similar to HTN planning domains.

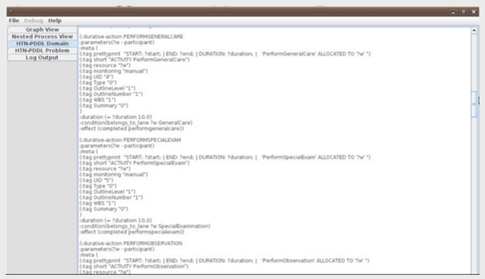
i) Firstly, the XPDL document is parsed, transforming it into an intermediate data structure and graph model that can be easily managed throughout the next stages



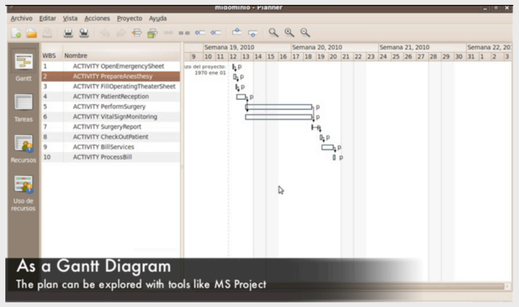
ii) Then, the different blocks of workflow patterns (serial, parallel, subprocess and conditional blocks) are detected and a tree model is built.



iii) Finally, we carry out the planning domain generation, where the tree model is analyzed, trying to identify workflow patterns found in the graph, and writing the domain code that corresponds to that tree fragment.



iv) Having the planning domain and problem generated, the IACTIVE intelligent planner is able to interpret them, obtaining a corresponding plan instance that respect the constraints imposed in the process model. This instance, can be shown as a Gantt diagram.

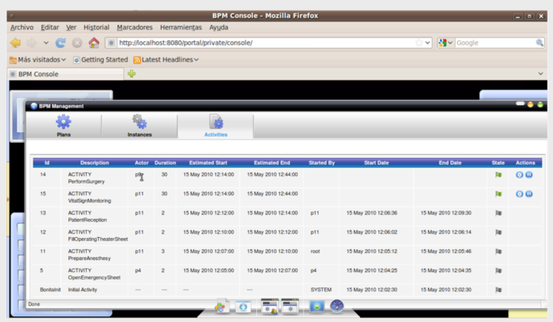


Transformation from plans to executable process models.

BPM engines are commonly endowed with the necessary machinery in order to interactively execute every task in the process (allowing to start, finish, suspend or abort it) by following an execution model based on state-based automata.

Hence, the plans generated by the IACTIVE intelligent planner (interpreting the planning domains and problems previously generated by Jabbah) are represented in XML as a collection of Task nodes where every node contains information about: actions (*activities*) and their parameters; temporal information as *earliest start* and *earliest end* dates for the execution of every activity; *order dependencies* between actions which allow to establish sequential and parallel runtime control structures; and metadata which allow to represent additional knowledge like its *type* (manual, auto) or its *performer*.

Thus, we have implemented a translation process from the generated plans that automatically develop XPDL processes which can be directly deployed and executed in a BPM runtime engine (concretely, open source Bonita BPMS) offering users the possibility to interact with them on an underlying BPM console.



Remarks

HTN Planning

Compound tasks, decomposition methods and primitive actions represented in an HTN (Hierarchical Task Network) planning domain mainly encode the procedures, decisions and actions that are represented in the original BPM model. More concretely, the knowledge representation language, as well as the IACTIVE planner used, are also capable of managing different workflow patterns present in any BPM process model, allowing to represent control structures that define both, the execution order (sequence, parallel, split or join), and the control flow logic of processes (conditional and iterative ones).

Case studies

To date, JABBAH has been tested in two case studies drawn from different domains, e-learning and e-health. The first model represents the whole process to develop and deploy a specific course within the e-learning center at the University of Granada. So, having an incoming course request, as well as some available workers with different capabilities each, we want to assign an activity to every worker, so that a plan over time can be obtained, providing the e-learning managers information that helps to do decision-making upon the course request. The second one represents a general care-process starting from a patient admitted into the hospital and finishing when the health insurance billing for this patient takes place. In this second process, we can better observe how process planning is carried out, given different input parameters which can vary in real situations (e.g. is it an emergency? does it need an urgent operation?).

More info

* The framework will be presented on **Thursday** 16th September, at the Demonstration Track Session.

* Information and details about implementation, source code, and scientific papers about the tool can be found at the JABBAH website:

http://sites.google.com/site/bpm2hth/

DECSAI Universidad de Granada — http://decsai.ugr.es

IActive intelligent technologies — http://www.iactive.es

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