International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 7, July - 2013

Analysis And Design Technique Using Agent Based Tropos Methodology

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Abstract

In recent years, the agent technology has evolved rapidly along with a growing number of agent architectures, theories and languages. Tropos is a methodology for agent-oriented software development and is designed specifically for the development of agent-based systems. The agent-related concepts such as goals, plans, tasks, etc. are included in all stages of development. The tropos methodology is illustrated with the help of a case study and an extension to the tropos methodology will be provided in this paper.

Keywords: tropos methodology, personal itinerary planner system, agent oriented methodologies.

1. Introduction

Tropos is based on two key ideas. First, the notion of agent and related mentalistic notions all (e.g., goals and plans) are used in all phases of software development, from early analysis to actual implementation. Second, Tropos covers also the early stages of requirements analysis, allowing a deeper understanding of the environment in which the software must operate, and the type of interactions that must occur between software and human agents.

2. The Modeled System

2.1Early requirements:

The main objective of the early requirements analysis is to

identify the stakeholders in the target domain and their Intentions. Tropos uses the concepts of actors and objectives to model stakeholder's intentions respectively. In Tropos, the objectives are divided into two different groups. "Hard goals" can lead to functional requirements, while "soft goals" refer to the non functional requirements.

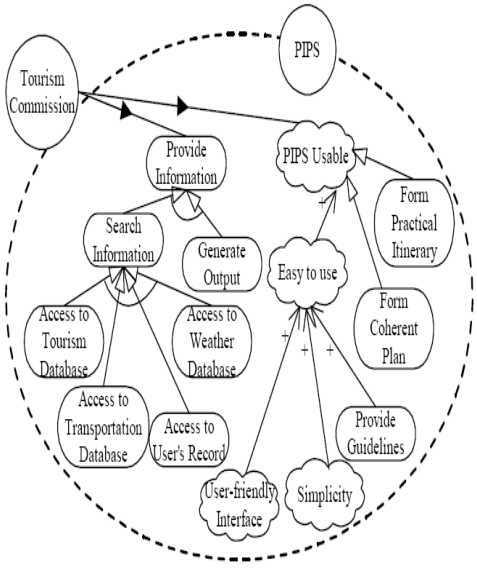


Fig 2.1: PIPS Goal Diagram in connection with Tourism Commission

Figure 2.1 shows the dependence of the Tourism Commission of PIPS (Personal Itinerary Planner System) to provide information (hard goal). PIPS also required (soft goal). These objectives are decomposed into sub-goals.

2.2 Late Requirements

As in the Early Requirements stage, requirements analysis of late has the same conceptual and methodological approach. The importance of this phase is the modeling of the target system (or "system-to-be", as it is called in Tropos) within their environment. The system-to-be is modeled as one or more actors. The dependencies of these special actors also identified by a process similar to that used in the early phase requirements. These dependencies in the course define the functional and non-functional requirements of system.

3. Design phase

3.1 Architectural Design

Subsystems (actors) and data and control flows (connectors) are defined to form the system architecture.
Figure 3.1 shows the decomposition into sub-actors of the Personal Itinerary Planner System (PIPS) and the delegation of some of the objectives of the PIPS to them. The PIPS depends on Tourism Database Manager to access the database of tourism, on the User Record Manager to access user records to generate the output, and so successively. In addition, each sub-actor (e.g., User Info Manager) may itself be decomposed into sub-actors (e.g., Account Manager and Manager of interest) responsible for achieving one or more goals (e.g. store user account and store user interest).

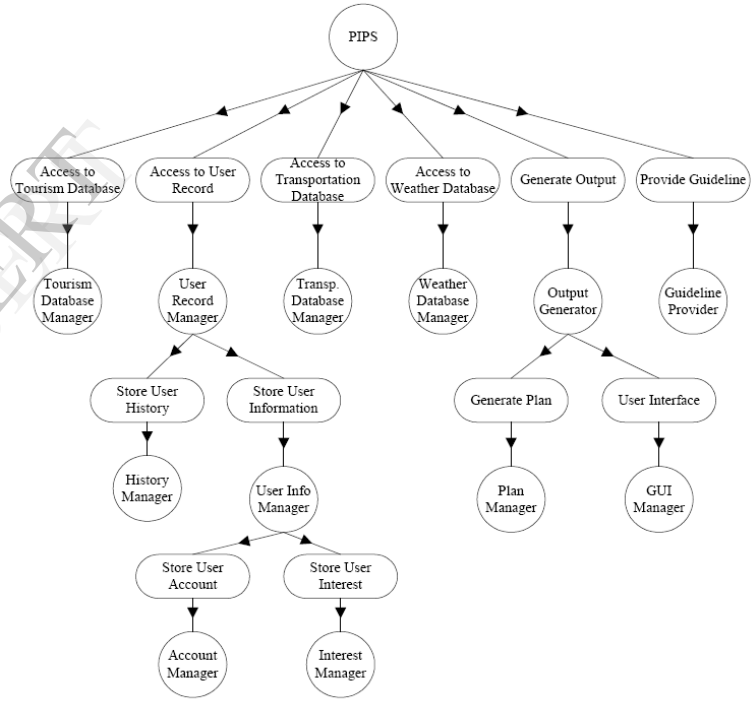
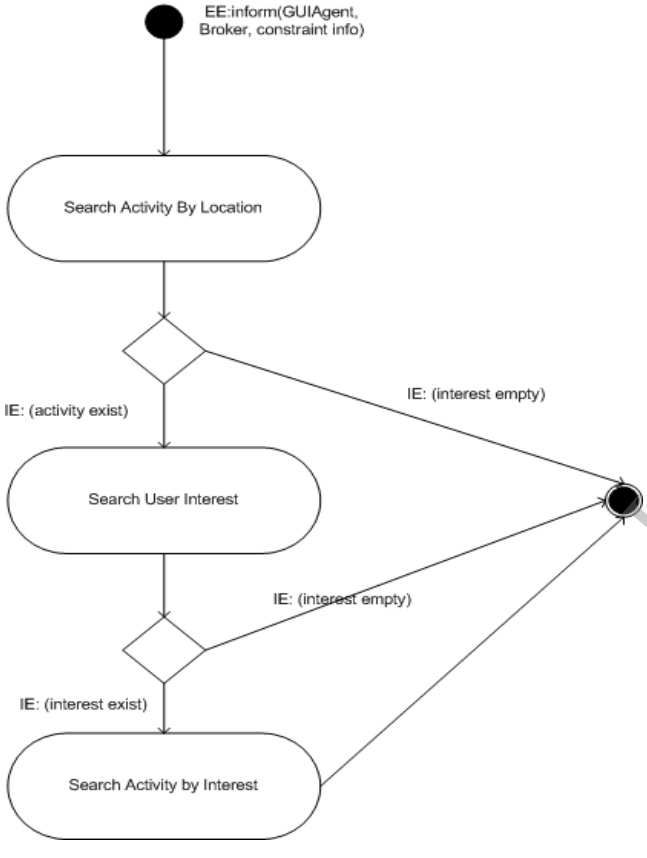


Figure3.1: PIPS architecture Actor Diagram

3.2 Detailed Design

The Tropos detailed design phase involves defining the specification of the agents at the micro level. There are three different types of diagrams that designers need to produce the ability to describe the plan of the agents and their interaction.
Tropos uses UML activity diagrams to represent the

capabilities and plans in detail. For capability diagrams, the initial state is about external events. Each plan is a node of activity, while the transition arcs model events. Plan diagrams are fine-grained representation of each plan node capability diagrams. For example, Figure 3.2 represents the ability of search activity of the ItineraryPlanner agent, which is responsible for generating itineraries based on user requests in terms of their interests and locations.



Figur3.2: Search Activity Capability Diagram

4. Amendments to the Method

In Tropos sequence numbers or priority was missing on early requirement phase. Therefore the requirements do not always appear in correct numerical order and it was hard to find which one is most important and which is least important. The complex system designing is currently reusing the existing design but they are not appropriate and correct. The exact matching is the problem with current methodology that is to be solved.

4.1 Requirement Analysis

Sometime customers come with an application that has varying requirements. Requirements vary according to the customer needs. The proposed analysis paradigm/technique will rank each requirement based on the keywords repeated by the customer.

The algorithm that is used for the classification and ranking of analysis is as follows:

Suppose that customer A wishes to develop a complex system for which the requirements are M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z. During the project lifecycle, customer makes several meetings with the organization. These meetings are represented in cycles. A zero value means first cycle, one means second cycle and so on.

1. Cycle = 0 (First meeting with customer)

Coordination Pattern Agent (A) = M->N->X->Y->Z

Coordination Pattern Agent (A) means Agent is in active state for customer A.

Result: M->N->X->Y->Z are arranged in this way of knowing that the customer first emphasized on requirement M, then N, and so no. These are the requirements that the client thinks are important during first meeting.

Priorities: M=N=X=Y=Z=1

2. Cycle = 1 (Second meeting with customer)

Coordination Pattern Agent (A) = M->O->P->Q->R->S->T->N

Result: M-> O-> P-> Q-> R-> S-> T> N are arranged in this way of knowing that the customer first emphasized on requirement M, then O, and so on. These are the requirements that the client thinks they are important during second visit. At this meeting the client strong emphasis was on the requirement M and N, because they are repeated twice. All other requirements are new and discussed first time.

Priorities: M=N=2, O=P=Q=R=S=T=1

3. Cycle=2 (Third meeting with the Customer)

Coordination Pattern Agent (A) = S->T->U->V->W->N->X

Result: Requirements S->T->U->V->W->N->X are arranged as customer emphasized on them. Requirement N is repeated thrice. S, T, and X are repeated twice other requirement U, V, and W comes first time in picture.

Priorities: S=T=X=2, U=V=W=1, N=3

4. Cycle=3 (Fourth meeting with the Customer)

Coordination Pattern Agent (A) = M->N->X->Y->W->T

Result: Requirements M->N->X->Y->W->T are organized according to customer needs. N requirement is repeated four times. M, X and T are repeated three times. Y and W are repeated twice by the customer.

Priorities: N=4, M=X=T=3, Y=W=2

5. Cycle = 4 (Fifth meeting with customer)

Coordination Pattern Agent (A) = M->X->N->Y->Z (Repetition)

Result: M->X->N->Y->Z is the group repeated second time by the customer. Customer re-emphasized on M, X, N, Y and Z. These are the requirements which customer again think they are important. M and X are repeated fourth time, N fifth time, Y third time and Z on second time.

Priorities: M=X=4, N=5, Y=3, Z=2

6. Cycle = 5 (Sixth meeting with customer)

Coordination Pattern Agent (A) = P->Q->R->V->X->Z

Result: P->Q->R->V->X->Z is the requirements group taken by Agent and are arranged as per customer requirements. P, Q, R, V and Z come second time in picture. X is repeated for the fifth time.

Priorities: P=Q=R=V=Z=2, X =5

7. Cycle=6 (Seventh meeting with Customer)

Coordination Pattern Agent (A) = Q->R->S->N->X

Result: Q->R->S->N->X requirement group is organized according to customer needs. Requirement Q, R and S are repeated third time. Requirements N and X comes sixth time in picture.

Priorities: Q=R=S=3, N=X=6

8. Cycle=7 (Eighth meeting with Customer)

Coordination Pattern Agent (A) = M->N->S->T->Z

Result: M->N->S->T->Z is organized according to customer requirements and recorded by analysis agent paradigm. Requirement N is repeated for the seventh time. M is repeated for the fifth time. S repeated fourth time. T and Z are repeated three times.

Priorities: M=5, N=7, S=4, T=Z=3

9. Cycle=8 (Ninth meeting with Customer)

Coordination Pattern Agent (A) = U->V->W->X->Y->Z

Result: Requirements U->V->W->X->Y->Z are arranged as per customer requirements. Requirement U is repeated for the second time, V and W repeated for the third time, X repeated seventh time; Y and Z are repeated for the fourth time.

Priorities: U=2, V=W=3, X=7, Y=Z=4

10. Cycle=9 (Tenth meeting with the Customer)

Coordination Pattern Agent (A) = N->X->S->T

Result: Requirements N->X->S->T are arranged as per customer requirements. Requirements N and X are

repeated for the eighth time, S is repeated for the fifth time and T comes fourth time in picture.

Priorities: N=X=8, S=5, T=4

At the end of analysis phase, proposed analysis phase result is:

1) Requirements N and X are repeated most of the time by the customer. These are the main requirements and have a higher priority. These requirements must be there in system and should be dealt with great care.
2) Requirements M and S comes at the second place. These requirements come after N and X and have a higher priority but lower than N and X.
3) Requirements T, Y and Z are repeated fourth times by the customer and have normal priority.
4) Requirements V, W, Q and R are repeated three times by the customer and have low priority.
5) Requirements P and U are repeated twice and have lower priority then V, W, Q and R.
6) Requirement O is discussed once by the customer and has least priority.

4.2 Design Technique

This technique is based on the concepts of data mining. An organization develops many applications during their life cycle. Most often they repeat the same task again and again. This is a time consuming process and may be defective. Once a design is ready then reuse will be the best solution. It will save time and produce accurate results. Further improvement to any existing developed design would increase efficiency. Data mining technique help to capture these predesigned diagrams based on the keyword of the software developer. So the design can be retrieved from the existing design.
The agent oriented design paradigm is based on two data mining algorithms:

1) Classification Algorithm: The algorithm predicts one or more discrete variables based on the attribute supplied by the customer. This algorithm is used by the agent for classification of different diagram developed by the organization.
2) Association algorithm: This is used to find the correlations between different attributes of a dataset. The most common application of this type of algorithm is to create association rules, which can be used in a market basket analysis. The algorithm concepts are used to help agent by associating the supplied keyword to the existing system design.

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