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An Object Oriented Intelligent Tourist Advisor System

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Abstract

This paper describes the design and development of an expert system for tourist information center. The expert system was built to recommend a suitable travel schedule that satisfies user input constraints such as time period, budget and preferences. Tourist center officers need to answer similar set of queries in their day-to-day work which could be replaced by an intelligent tourist advisor system. There are many different tourist information such as activities and places which can be stored as similar data structure and can be modeled into a object-oriented knowledge-based system. A highly generic knowledge structure is proposed to generalize the commonalties and eliminate duplication. The proposed knowledge structure would be flexible enough to cope with high volatility in some tourist information such as transportation routes. Object-oriented modeling has been used for the entire development of the proposed intelligent expert system. A case study is presented to demonstrate the benefits of such an approach for an expert system with repetitive and volatile problem domain.

The system was developed using an expert system development environment - Kappa-PC and was migrated to Power Builder. Such migration of the expert system demonstrates how conventional business decision support system can be integrated with expert system approach without using expert system shell. Furthermore, most of the expert system shell are either very expensive or provide very restricted features other than an inference engine such as lack of database engine, windowing facilities, etc. The proposed framework should be applicable to any popular event-driven development environments. An expert system will not be of practical use without a good user interface. The inference engine was partitioned as an object-oriented sub-system. Thus, another benefit of the proposed system is that the inference engine sub-system can be easily "plug-and-play" with other expert systems.

1. Introduction

The tourist industry faces a high labour turnover rate in Hong Kong with a consequential cost in training new staff. In addition experienced tourist information officers have to update new knowledge to hitch with what has been changed in those associated with tourist information. The cost for training new officers is very high and the archived tourist information document becomes unmanageable as the volume of data increases. An expert system is believed to be the solution to these problems for intelligent information retrieval, training of new staff and automatic tourist schedule generation. The proposed expert system should achieve the following:

1. Dissemination of expertise.
2. Formalised expert knowledge.
3. Integration of expertise from different sources.
4. Distribution of expertise in a cost effective manner.
5. Standardisation of problem solving processes.
6. Preservation of expert knowledge.
7. Facilitation of training.
   Handing of incomplete and uncertain information.

2. System Layers of Object-Oriented Analysis and Design

An object-oriented approach[Yourdon 91] has been adopted for the analysis, design and implementation of the Intelligent Tourist Advisor System. Problem domain and system responsibilities have been directly partition into five system layers and into four system components as shown in Figure 1. The following sections elaborates these system layers and components in details.

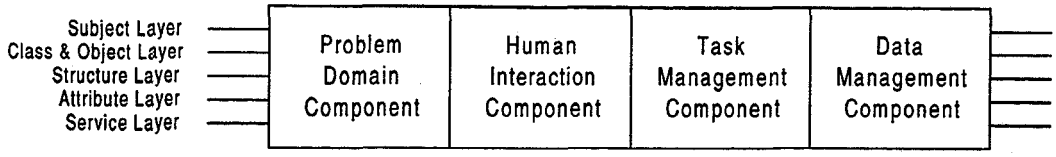


Figure 1 - The Five Layers and Four System Components

2.1 The Subject Layer

The objective of the subjective of the subject layer is to identify subjects in the problem domain. As such, it given an overview of the object-oriented analysis model. The subjects of the Tourist Advisor System are shown as follows:

services of the object. The service layer defines the required behaviour and communication necessary between objects. It details the abstraction of the reality being modeled, indicating what behaviours will be provided by an object within a class. This layer is concerned with the fundamental processing that is to take place on the data described in the higher layers.

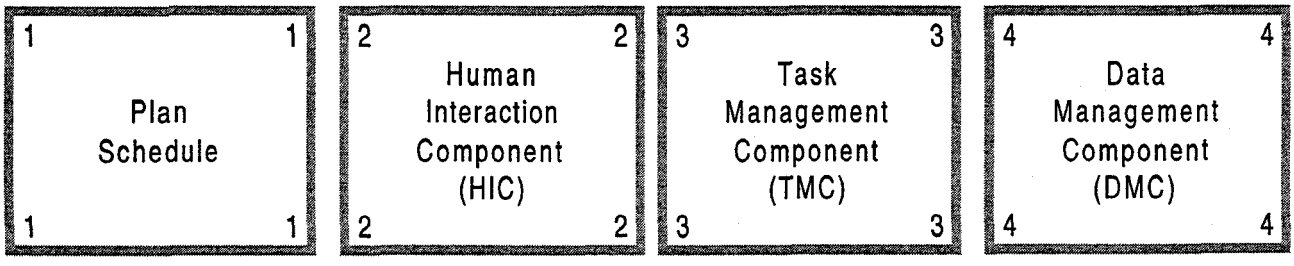


Figure 2 - System Layers and Components

2.2 The Class and Object Layers

Each of the system components above would be undergone the five system layer decomposition. The decomposition of the first system component "Plan Schedule" will be describe in this section.

2.2.1 The Class and Object Layer

The advisor's subject layer is further refined into the Class and Object Layer. This involves object Identification techniques such as Textual Analysis, CRC or Behaviour Analysis[Rambaugh91] [Booch95]. The following classes and object were found to be relevant to this layer.

2.2.2The Structure, Attribute and Service Layers

In the structure layer we identify the structure in the model which exhibit Part-Whole and Generalisation and Specification behaviour, and the attribute allocated to each class and object. These attribute describe value kept with an object, to be manipulated exclusively by the

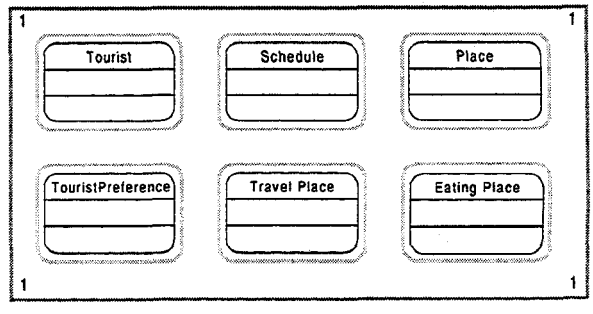


Figure 3 - The Plan Schedule Layer

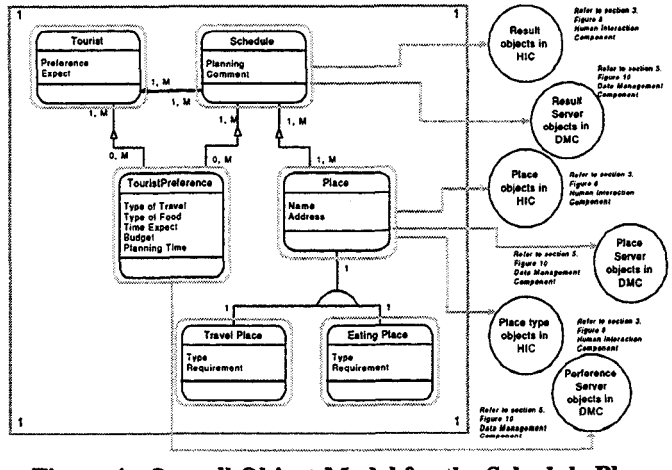


Figure 4 - Overall Object-Model for the Schedule Plan System Layer

3. Knowledge Flow in the Inference Process

The user interface is event driven. The users may input their preferences and constraints by a set of stateboxes and list boxes. The expert system then applies forward chaining to the knowledge base and asserts potential activities on to the knowledge base with the use of uncertainty factors. Backward chaining is then used to identify a sorted tourist plan. Each plan is then fetched with its associated descriptions, text, sound, images and explanations.

4. Conclusion

An intelligent tourist advisor system having a multimedia user interface has been developed. The system is designed and built using object-oriented techniques. The study is used to demonstrate the applicability of this approach. A "plug-and-play" standalone inference engine has been built for any commercial application and development environments. This subsystem can greatly promote the popularity of the using of expert system approach for commercial decision support systems.

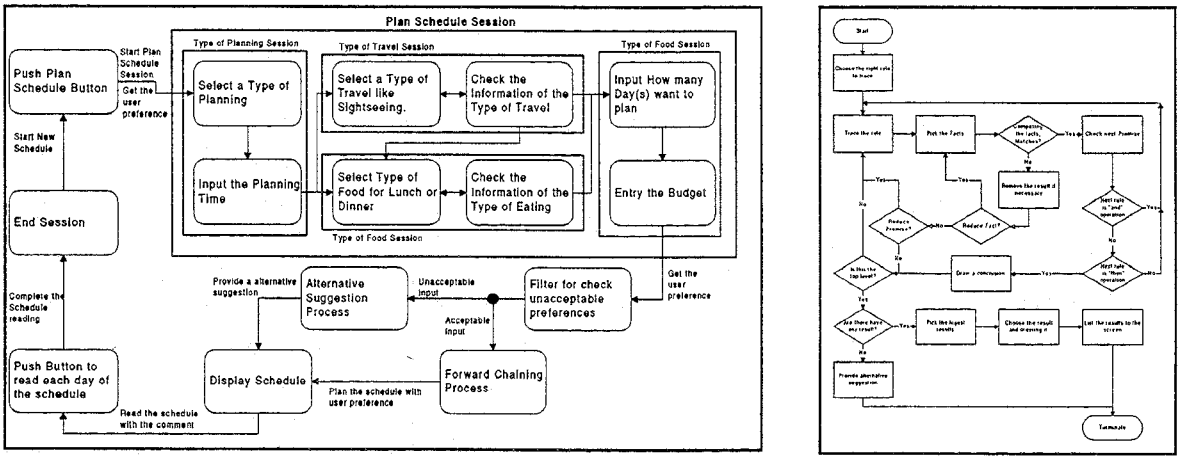
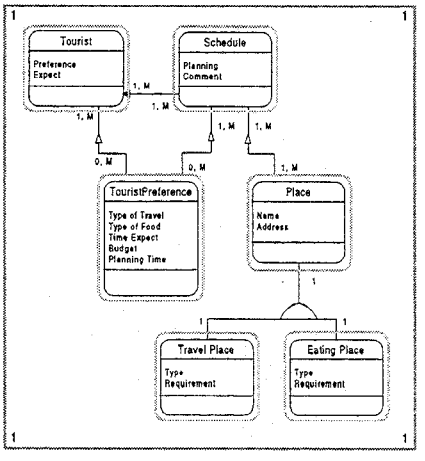
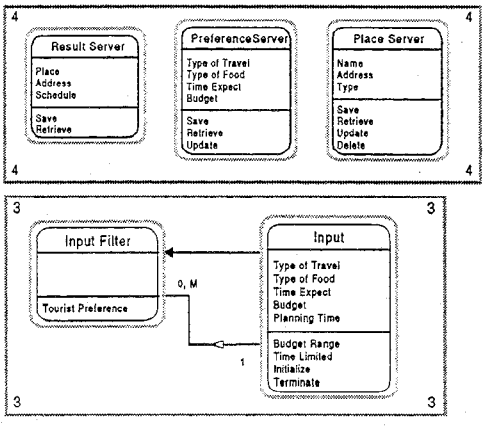


Figure 5 - A Section of Tourist Advisor System and the Internal Inference Engine Process lifecycle





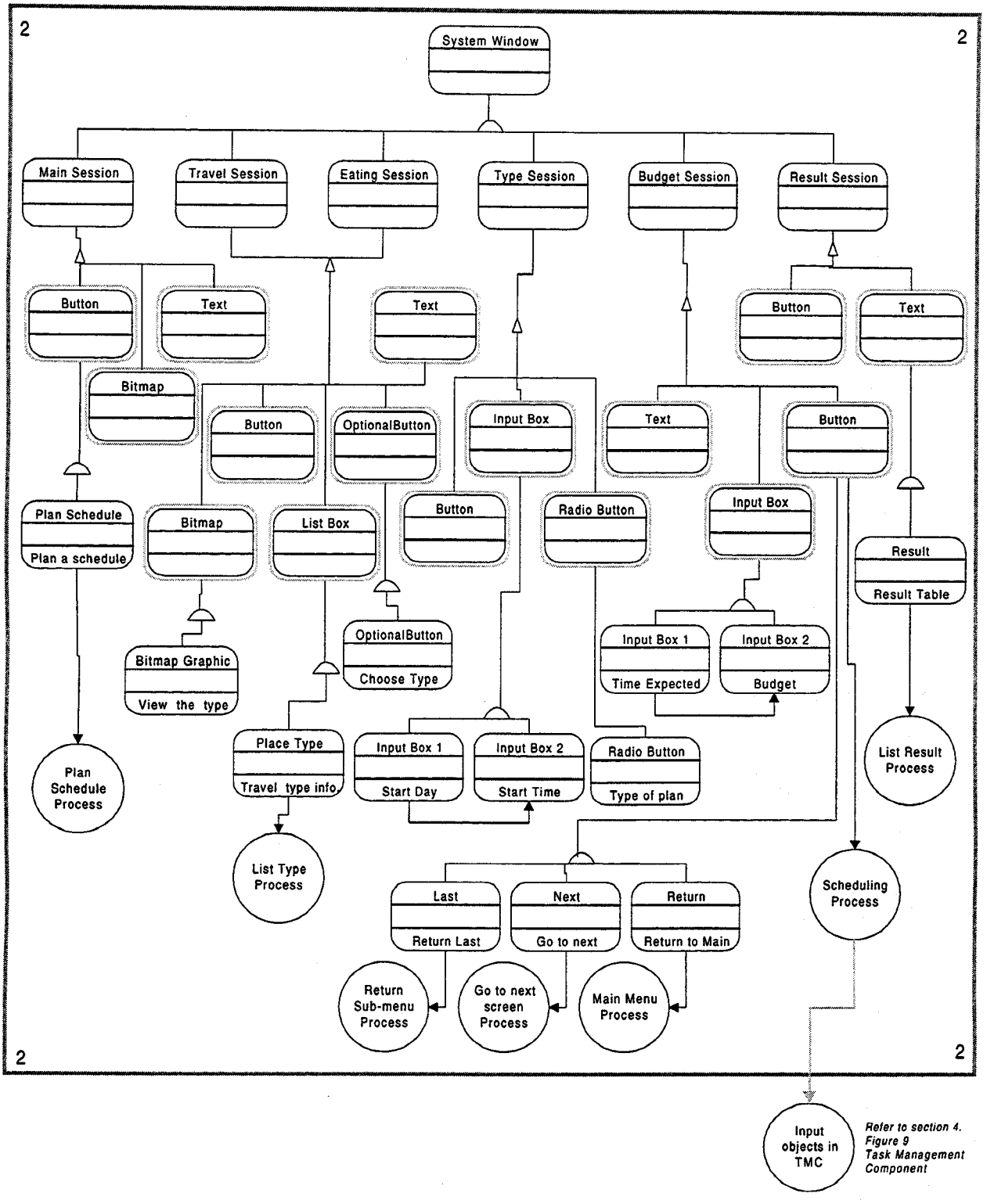


Figure 6 - The overall architecture of the proposed Intelligent Tourist Advisor System