AUTOMATIC PRESENTATIONS GENERATION BASED ON PATTERNS FOR TOUR-GUIDE ROBOTS*

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This paper proposes an automatic presentation generation for a tour-guide robot making use of natural language processing and patterns. To reach a suitable approximation in a believable presentation some parameters are identified and described in this paper. Automatic Presentations Generation is based on XML-patterns. The generation process selects information items and obtains the prone of the tree with fuzzy rules.

1. Introduction

From the times of Leibniz and Babbage until the late 1950s, computation has been understood as calculation, or the manipulation of numbers. Throughout the next decade computation came to be understood as information processing, or the manipulation of data. With the rise of AI, logic programming, and expert systems, the idea of computation as cognition or the manipulation of concepts has come to the fore [1].

Many information sources were designed to be presented in a fixed structure. As a consequence the user is often bound to what the author deemed to be the most interesting topics and structure to express them. On the other hand there can be no single general-purpose presentation format for all users, because user differs in all aspect from interests and expertise levels to devices used to visualize the requested information [4].

Our goal is to create an automatic presentations generator that it can show the information in a flexible manner depending on the different types of audiences. The most recent research on automatic generation are: [2], [3], [4], [6], [7].

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1.1. *Automatic Text Generation*

A natural language generator typically has access to a large body of knowledge which has to select information to be presented to users in several ways. To generate text is therefore a problem of decision-making with multiple restrictions: knowledge, linguistic tools available, communication objectives, the situation and discourse. The aim is to identify the factors involved in this process and find the best representation based on the dependencies.

The items selected in the generation process contain information about the presentation subject including the items that are semantically related to the topic, for example, if the presentation is about the painter Velazquez, the system will include any information to the Italian painter Caravaggio for his influence in Velazquez.

1.2. *Presentation Models*

Introducing a character causes the presentation to include facts related to that character; therefore, using characters can potentially provide a way to stress a particular fact or a particular point of view, i.e. the character's point of view. A similar approach is used in Agent Stories [5]. Different strategies can be deployed when selecting the Actors that will take part in the story. These strategies could be different in their level of complexity, depending on the level of expertise of the user. For example, when presenting a theory to a domain novice, a less complex strategy would select only two characters, the main supporter or inventor and the main detractor or creator of an alternative theory, and build the "biography" of the theory based on these two characters. A more complex strategy could introduce more characters and nuances within the two main streams.

Such an improvement of the story line can also be achieved by adopting structures from other genres. For example, a biography and a monograph share a similar overall structure, where the details of substructures vary. The decision rules to establish the fact that a particular swap in the presentation strategy is useful and required are not clear yet. This also requires a better understanding which genres can be mixed and when the mix does not work. An interesting situation is when the data changes and the environment is dynamic.

In this case the presentations should be generated in a coherent way and new characters need to be consistent with those previously introduced [4].

Beside the name a presentation is composed by four parameters that allow its characterization: nature, purpose, duration and number of participants [13].

2. URBANOntology

URBANOntology consists of a foundational ontology (DOLCE) plus different domain specific ontologies, like art, history etc. The robot is able to give Presentations about as different topics as domain ontologies are mapped to DOLCE [15], [16], [17].

Using DOLCE as a fundamental ontology, we are setting out a general framework that can be tailored to any specific domain; in this way the URBANontology, gets to furnish a reliable tool for potentially generating Presentations generations in all possible areas. Every component in the Museum Ontology must be mapped to his respective fundamental concept in DOLCE.

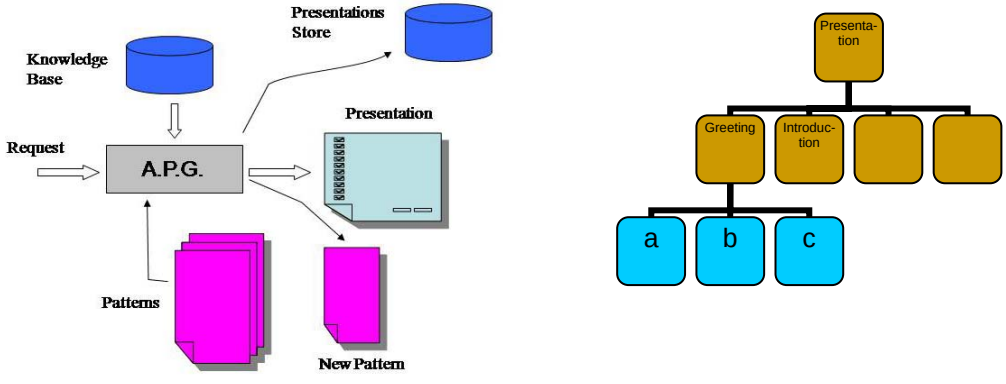
3. Tour-Guide Robot Implementation

URBANO robot has a technology based on distributed application software. The recent version is an agent based architecture using a specific CORBA approach as integration tool. The robot has many functions: speaking, listening, navigates through the environment, moves his arm, manages stimuli that affect its feelings.

We propose a *new agent* that it can create a new presentation when it receives the new request. After this request, the system will receive other significant necessary data.

4. A.P.G. Diagram

An outline of the overall process is shown in Figure 1 (a).



(a) (b)

Figure 1: Architecture and tree data structure

Considering, for example, a new request, the system generates a presentation by the set of patterns that it maintains. It is possible that several presentations exist for the same pattern, because a new presentation is stored with an index of success. The result was shown in Figure 1 (b), this is a tree-shape structure with different alternatives.

5. Patterns and Tree

In our approach, the pattern is a definition of the contents, using a high-level abstraction. The pattern is a definition of the sequence and the content expressed as an index. XML-based representation is our specific presentation structure. The patterns are stored in XML format. An example is shown in Figure 2.

```
<pattern>
<id> children_visit_museum </id>
<date_creation> … </ date_creation >
 <date_lastuse>…</ date_ lastuse >
<item>
        <item_id> Museum_ Presentation
        </item_id>
        <item_order> 1 </item_order>
        <item_priority> 10 </item_priority>
        <item_data> Pres_Museum </item_data>
</item>
<item>
        <item_id> Tour_Guide </item_id>
        <item_order> 2 </item_order>
       <item_priority> 20 </item_priority>
        <item_data> Tour_Guide </item_data>
</item>
<item>
<item_id> Pictures presentation </item_id>
             <item_order> 3 </item_order>
             <item_priority> 40 </item_priority>
             <item_content>
                <item_data_id> key_picture
                </item_data_id>
                <subitem> title</subitem>
                <subitem> date </subitem>
                <subitem_multiple>description
                </subitem_multiple>
                <subitem_multiple>period
                </subitem_multiple>
            </item_content>
</item>
</pattern>
```

Figure 2

XML guarantees a great facility with different tools and programming languages. Our proposal is to design a software tool that helps the user to create and maintenance the patterns.

In this scenario we only consider some attributes of the objects and other information is ignored to simplify the example in Figure 2.

The result is a tree structure; showed in Figure 1 (b). The knowledge system is in these *leaves* added to the *tree*. The system adds the information stored in a database to these leaves or items and sub-items. It is important to emphasize that one item may have many variants. In a particular presentation, selection and pruning contents are necessary. To do them, the system requires the highest intelligence degree. In our example *Museum_Presentation* has several possibilities.

After consulting the data-base, the search tree (item and Sub-items) has some branches with several leafs. The different alternatives can only be one.

The search space can be solved by specific heuristic search methods of Artificial Intelligence, but our proposal has preferred a more flexible approach based on fuzzy logic.

In a dynamic scenario as ours, and because of the nature of the information that the system will treat, proper tools are needed to provide the intelligence for decision-making and supervision.

The proposed solution uses fuzzy rules to prune the tree items to submit. It will use a variable that indicates the likelihood inclusion in the submission of a particular content. The fuzzy system will generate these values.

The fuzzy rules enable more flexibility. These rules will be adjusted and expanded.

At the current stage, Urbano robot has the necessary infrastructure to do automatic presentations. This presentation can be viewed as a table that contains different parameters like the content identifier.

In our proposal an important aspect is the granularity content, item is a word, a phrase, a paragraph or something more complex.

Another advantage, in addition of the fuzzy rules, is when the system has *n* patterns, in this case it has *n* tables, and it is possible to select a random one of them; to define a quality function, in these cases use a pedagogical or psychological index.

Finally for future presentations it is necessary and important to have a feedback about the presentation acceptance. It will allow system to have several presentations about the same subject; it will take the best acceptance index.

6. Conclusions and Future Work

In this paper we explain and propose one mechanism for automatic generation presentation. We have illustrated our experiences based on this method. The proposed approach uses a pattern and semantic network describing accessible information items.

The information is structured as a tree. It is necessary a method, like fuzzy rules, that will allow to obtain the best presentation.

In the future we will extend our studies in the automatic generation in order to improve the tour-guide robot communication.

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