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Cooperative Parsing in SMABO Guo Yuanbo, Kunihiko Takamatsu, Naoki Hayashi Fuji Xerox Co., Ltd.

## 1. Introduction

Our SMABO system is an experimental trial which aims to realize a distributed intellimedia handling environment. It serves in this research as a testbed of DAI techniques which are used to address the gesture-based parsing issues in it. Gesture is treated as visual command related to the operation on media object.

Efficient parsing is necessary and essential. However, we will discuss below that gesture-based parsing is quite different from other conventional parsing and visual language interpreting as well, largely due to its dependency on referent objects and their semantically coupling. Parser itself is insufficient for fulfilling the parsing tasks. We propose the cooperation between parser and dynamic model manager, which maintains the semantic model of media objects, and describe the communication between two components.

In response to the cooperative work and with the consideration of efficiency, we exploit cache mechanism to reduce the duplicate communication. Also we adapt the blackboard, and integrate so called Supporting Object ID(SOI) into nodes of blackboard.

# 2. Examining gesture-based parsing and proposals

Gesture is not only visual language but also visual command, for a parsing result will call forth the execution of certain command, either UI operation or modification of object relations.

The most feature we think of gesture is its

dependency on referent objects. A gesture is meaningful only when special objects are referred. On the other hand, meaning of same gesture varies with the referent objects. Gestures acquire their semantics from relationships to referent objects.

Referent objects should include multiple abstraction levels, from the media object to the combination of media object and gesture.

Obviously, model of referent objects could not be predefined, and they will change dynamically as well. Parser lacks of knowledge of referent objects. As a solution, we propose the cooperative work between parser and model manager.

Also due to the dependency, nonmonotonic events such as deletion of an image always require updates to intermediate parsing. We adapt the basic blackboard node structure, and integrate so called Supporting Object Id (SOI) into nodes of blackboard.

# 3. Cooperation between parser and model manager

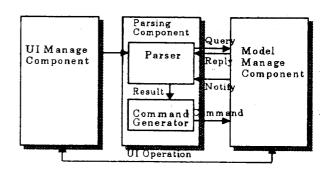


Figure 1: Cooperation between components

We adopt component design mode. (Figure 1)

Query and reply are the basic forms of communication between parser and model manager. Also model manager will keep parser aware of any changes of model by notification.

## 4. Design of parsing component (Figure 2)

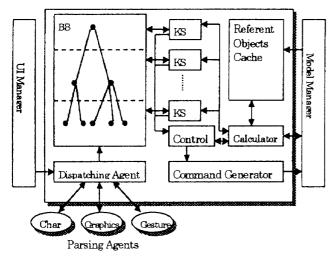


Figure 2: Parsing Component

Recognition tasks are completed via the cooperative works among three kinds of parsing agents, dispatching agent coordinates their works with some strategies and passes their recognition results to blackboard. These agents are not designed to work together, We interlock multiple agents and blackboard as the underlying architecture.

Prediction of each rule in knowledge sources may indicate the condition on not only the state of blackboard but also the state of referent objects. Thus, prediction validation of rules in KS may lead to the query to model manager from time to time. It is the same with the evaluation rules in scheduler and heuristics for hypothesis pruning.

We have noticed that duplicate queries will often occur. As a solution to the problem of inefficiency, we use a cache function, which is organized in hash table and stores all the past query results, i.e., states of referent objects ever got from model manager.

Another additional function is called calculator, wherein some algorithms lend support to calculation on state of referent objects. The calculator will not fire any query to model manager unless it can not find the information in the cache.

In SMABO, three components share a list of referent objects, each with an ID. Adaptation of blackboard can benefit from this, although it is originally used for other purposes.

If a node on the first layer of blackboard depends on certain referent objects, it is attached with the IDs of them. They are called Supporting Object ID (SOI). And on upper layers, the SOI list of each node is the union of the SOI list of the nodes it derives from. In this way, parser can easily response to any changes of the model. For example, once an image is deleted, on the blackboard, from top to bottom, all the nodes whose SOI list contains its ID will be removed.

#### 5. Conclusion and future plan

There are two kinds of cooperation during parsing, one is between parser and model manager, the other is among the parsing agents, which in this paper we have given less descriptions. However, it will not prevent coordination of parsing agents from being one of the most important issues, and we will go on investigation on it.

#### 6. References

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