Automatic Generation of Event Structure for Japanese Cooking Recipes

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We understand the whole temporal structure, analyzing structures of each event. In order to do this, we need to analyze aspectual information and events information each of eventuality.

The conventional aspect theories explain that aspects are determined by syntactic information, dependent on each specific language. However recent aspect theories explain that aspects are different ways of viewing the common event structure. Although it is possible for us to determine aspects by analyzing syntax from those theories, the event relation with other sentences is not able to analyze. Thusfor, most computer researchers have not considered this internal structure of aspect.

From such background, we analyze aspectual information and next information from natural language. The objective of this paper is to give automatic generation of event structure from these information. In this paper, we target in the domain of cooking tasks using a subset of Japanese. Since cooking tasks consist of the sequence of finite operations, we tend to think that cuisine would be easily made, just observing what is written. However, cooking recipes include such expression specific to cooking tasks and some of operations are omitted. For this reason, it is difficult for us to cook without the knowledge of cooking. Therefore, in this paper, we represent aspectual information that are specific to the cooking tasks.

We find such information as progress or completion from aspectual classes, and analyze such concurrent operations and precedence relations, and we complement omitted operations. Furthermore, we aim at displaying those event structure by two dimensional figures. Through this procedure, we realize the visualization of language expression.

For the above purpose, we first represent aspectual information that are specific to cooking tasks for Japanese. We refer to temporal ontology here. We classify aspects as 'Telic', 'Culmination', 'Progressive', 'Perfective' from Japanese text. 'Telic' is a state of affairs that also extends in time but that does have a particular culmination, at which point a change of state takes places. Most events in the cooking domain are 'Telic'. 'Culmination' is an event which accompanies a transition to a new state of the world. 'Culmination' are not extended in time. 'Progressive' is a state of affairs that also extends in time but does not have a particular culmination. 'Perfective' is a state which already finished a culmination, that is, an interval from the culmination point to the eternal future. In addition, we classify 'Telic' into three subcategories, and 'Perfective' into two subcategories. Thus, we could display concurrent operations and precedence relations.

In regard to the omitted operations, we classify the following three cases; and in each case, we complement operations as follows.

1. In case two or more operations are included in a action in the recipe, it is necessary to rewrite a operation to separately operation.

2. In case an operation by expression of only 'Perfective' is in the recipe, it is necessary to rewrite 'Perfective' to 'Telic' or 'Culmination'.

3. In case two or more ingredients are concerned with one operation, it is necessary to add a operation to each ingredient.

From the above result, we design the automatic generation system of event structure for Japanese cooking recipes. We first analyze the results of the morphological and syntactic analysis from cooking recipes. And, the result refers to the dictionary of ingredients, cooking utensils, and adverbial phrases. Next, aspect classes are specified and omitted operations are complemented. By these analyses, we express a time map with two dimensional figure. Furthermore, in addition to the time map, a photograph,

an ingredient quantity table, explanations of operations, etc. are added to the output screen. Thus, we could visualize the event relations of the processes.

However, the starting point or the terminal point of events may not be settled. In such a case, it is difficult to specify the relation of events. Moreover, since the output form of events are determined by aspectual classes, events were not displayed by concrete periods. A future subject is to display of the combination of complicated event structures, and to generate the time map which employs the event's time period.