Personal Robot with a Sense of Taste

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1 Introduction

This paper describes an artificial sense of taste and the world's first "Tasting Robot", which was developed under support by the New Energy and Industrial Technology Development Organization (NEDO) for the Robot Project: Prototype Robot Exhibition at EXPO 2005 Aichi, Japan. The robot has a sense of taste based on an optical tongue concept. The optical tongue is the integration of infrared (IR) spectroscopy with pattern recognition technologies.

It acquires an IR spectrum of a food sample, spectroscopically and quantitatively analyzes the food components, and identifies the name of the food. As these results are transmitted to the body of the Tasting Robot, it evaluates them and promptly gives various advices on health and meal to a user in natural language with graphical images. It sees if foods are best to eat, the taste has deteriorated, or if they are good for health from the point of the content of sugar and fat and gave advices to users by referring to food and health knowledge bases. Especially in case of wine, the robot behaves as the Sommelier Robot (Wine-Bot). The Wine-Bot is a functionally enhanced version of the Tasting Robot.

2 Artificial Sense of Taste

The robot could be expected to have at least three major potential uses when it has a sense of taste. The first potential is to qualitatively and quantitatively analyze the major components in a food sample. The second potential is to express a similar taste feelings of food sample to a human's feelings. The last potential is to identify the names of food products. It requires a human with special skills and training.

3 IR Spectral Characteristics of Foods

It is known that each food has different IR spectral characteristics. Figure 1 shows the absorption spectra characterizing the wine components other than ethanol and water. The spectral differences among the wine brands are then clearly observed and the fingerprint information is able to be confirmed. Based on the above improvements, the robot could identify several tens of wine brands.

4 Conclusions

Aimed for the realization of a robot with close-to-human efficiency, the five senses of human nature are drawing attention. The goal of this project is to build a robot sommelier. Wine is one of the most sophisticated and hard-to-identify food. The achievement is made possible by combining robot technologies and pattern recognition technologies with the analytical techniques in the infrared spectroscopic technology for food. We will continue to lead the industry in robotic development that supports the prevention of lifestyle-related diseases and help in the treatments for those diseases through dietary therapy and elemental technology.

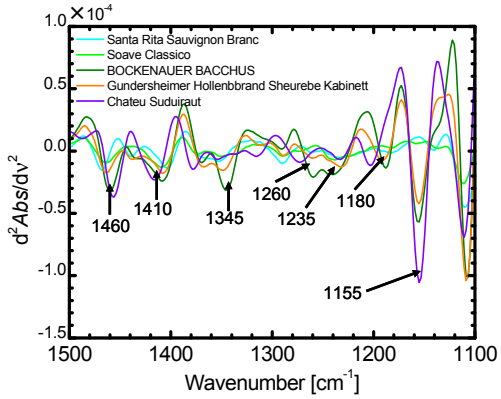

Figure 1: IR Spectra of Wine Components.

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