A GWAP Approach for Collecting Consumer Perception of a Product

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Abstract

This paper develops an output-agreement game for collecting words and phrases which represent consumers' perception about a commercial film of a product or service. It also analyzes how players will behave in the game by using game theory, and discusses how to analyze the collected data to effectively use them for branding.

Introduction

Branding is an important marketing technique for a company to improve and maintain the value of its products or services by finding and making up for the gap of their perception between consumers and the company. In branding of a product, consumers' perception about the product needs to be captured. Questionnaire survey is often used but has some problems. For example, the data quality tends to be low due to the low engagement of respondents. Pecuniary incentive, if used, will cost a lot. This paper argues that these problems can be tackled by GWAP (game with a purpose) approach, which collects valuable data from a lot of people by having them play a game. It has been confirmed to be a time and cost-efficient approach for subjective data collection by a growing number of applications (von Ahn and Dabbish 2004, von Ahn et al. 2006a, von Ahn et al. 2006b, Law and von Ahn 2009).

Thus, the objective of this work is threefold; (1) to develop a new output-agreement game for collecting consumers' perception about a product, (2) to analyze how players will behave in this game by using game theory, and (3) to propose an analysis method for the data collected by the developed game to effectively use them for branding.

Proposed Game for Perception Collection

The proposed game is similar to ESP game. Two players are randomly paired and provided a same input, and if their outputs match with each other, they will be given some points. In order to collect words and phrases describing how a commercial film of a product is perceived, the film is used as the input of the game.

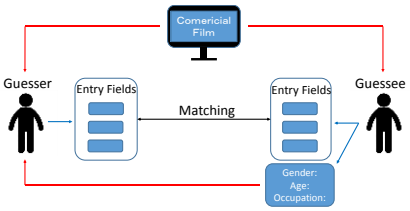

Figure 1: Outline of proposed game

Further, this game has three important differences from ESP game, as shown in Figure 1. First, the proposed game has asymmetric structure between players. One player is called the guesser, and is expected to guess the perception of the other player. The other player is called the guessee, and is supposed to enter his/her own perception in some words or phrases to be correctly guessed by the partner. Second, the guessee is required to enter not only the perception but also some additional information, such as his/her gender, age, occupation. This information is disclosed to the partner, and functions as a clue in the game. Further, it can be used for market segmentation in the posterior analysis Third, only three entry fields are provided for the perception, and the players are expected to fill them in by a specified time limit. This will induce the players to deliberate deeper about what outputs to provide.

Simple Game Theoretic Analysis

The words and phrases which a player can provide for a commercial film can be divided according to their commonness and fitness into four categories. Category 1 is composed of the expressions of high commonness and high fitness, category 2 involves those of high commonness and low fitness, category 3 includes those of low commonness and high fitness, and category 4 contains those of low commonness and low fitness. Any word or phrase of high

commonness can be seen everywhere and easy to recall, whereas the one of high fitness can be associated with the film naturally.

Although there are countless verbal expressions in the world, those of high commonness are only a limited portion of them. The same will apply to the fitness. Further, commonness and fitness may be assumed to be independent or at least not strongly correlated. Under the assumptions, it can be said that the size of category 1 is smaller than those of the others, and that of category 4 is significantly larger than the rests. The classification of some expressions may differ between the players, but their whole categorization will not be independent but positively correlated. Thus, it is also assumed that not all but a largest portion of the expressions in a category of a player will also be classified in the same category by the other.

If it is treated as the strategy from which category to choose an output and only one entry field is considered for simplicity, a 4×4 symmetric matrix game is obtained. If a player takes strategy S_i, that is, chooses an output from category i, and the other player takes S_j, the expected payoff of each player will be proportional to P_{ij}, the matching probability, and is given by $P_{ij} = n_{ij} / n_{i0} n_{0j}$, where n_{i0} is the number of possible expressions classified into category i by player A, n_{0j} is that of those classified into category j by player B, and n_{ij} is that of those included in the intersection of these two sets. Since the equation

$$\log P_{ii} - \log P_{ij} = \log \frac{n_{ii}}{n_{0i}} - \log \frac{n_{ij}}{n_{0j}} > 0 \qquad (1)$$

is satisfied for all i and $j \neq i$, Nash equilibrium of this game is (S_1, S_1), (S_2, S_2), (S_3, S_3) and (S_4, S_4), and the Pareto optimum is (S_1, S_1). Thus, expressions classified into category 1 are most likely to be collected by this game.

Preliminary Experiment and Data Analysis

A prototype system of the game is developed and a pilot experiment is conducted. In the experiment, a commercial film of Hyoketu, an alcoholic drink supplied by a Japanese company KIRIN is used, and 15 subjects played the game. As the result, the 30 words and phrases shown in Figure 2 were successfully collected.

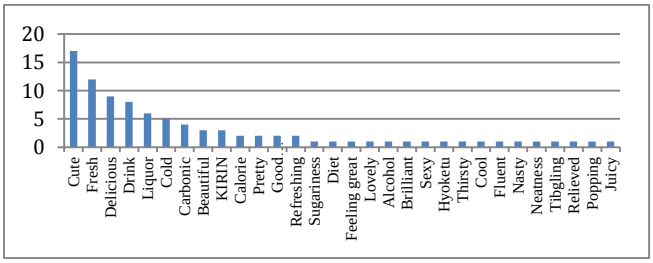

Figure 2: The frequency of collected words

Next, we propose an analysis method for the collected data. Specifically, by using correspondence analysis, the relationships among the collected expressions and personal attributes are visualized as a simultaneous mapping. First, the raw data are summarized into a table whose rows correspond to the game rounds and columns to the collected expressions and individual attributes. Weather every column item occurred in each game round is represented by 0-1 variable. Then, it is translated into a create contingency table between the expressions and attributes. The basic idea of correspondence analysis is to rearrange both rows (individual attributes) and columns (verbal expressions) to maximize the correlation between them.

Figure 3 shows an example of the resultant simultaneous mapping. Those which have strong relationship with each other are mapped nearly, so it can be understood visually what kind of people perceive the film how.

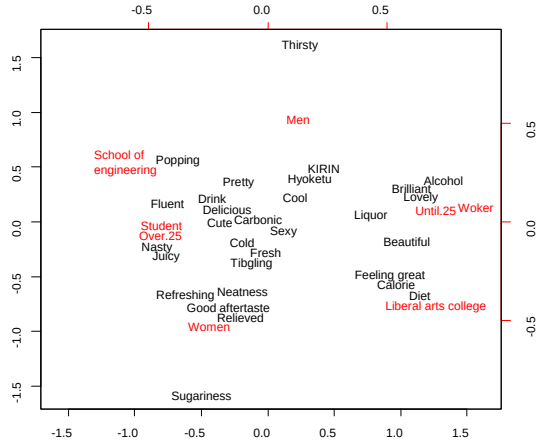

Figure 3: Simultaneous mapping

Conclusions

This paper developed a human computation game for collecting consumers' perception of a product, and investigated its performance by game theoretical analysis and pilot experiment. In addition, the proposed data analysis method is applied to the data collected in the pilot experiment.

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