How much Ice do You need?

Midterm Presentation

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Content

Sponsor: McDonald's Coporation

- McDonald's Corporation is the world's largest chain of hamburger fastfood restaurants, serving around 68 million customers daily in 119 countries.

- Mcdonald's primarily sells hamburgers, cheeseburgers, chicken, French fries, breakfast items, soft drinks, milkshakes and desserts.

- In response to healthier consumer taste, the company has expanded its menu to include salads, wraps, smoothies and fruits.

- Soda drinks is a significant portion of McDonald's business, since it is often offered as a beverage along with the extra-value meals.

Problem Statement

- Selling soft drinks is a complement to any meal that a customer purchases at McDonald's. However, the server is not accustomed to putting much thought in measuring the amount of ice put in the cup.

- This often results in a overly diluted, overly concentrated or overly cold drink for the customer. This is likely to lower overall customer satisfaction, since a drink is a significant complement to a meal. Thus, customers are likely to appreciate if the right amount of ice was added for optimal satisfaction.

- To further define this problem, the exogenous variables are the proportion of ice to put in a drink. The endogenous variable would be the resulting temperature and concentration of the drink, as we are assuming that a customer's satisfaction is affected only by the temperature and concentration of the drink.

Deliverables

1. From Team to Sponsor
   - A table of optimal ratios for each different type of soda (namely Coca Cola, Sprite, Fanta Orange, Diet Coke),
   - Matlab code with complete set of documentations that resulting temperature and dilution based on specific heat capacities and ice proportions,
   - Numerical experiment results reporting success rate of different ice ratios,
   - Technical report and presentations summarizing the work.
2. From Sponsor to Team
   - Sufficient supply of the 4 different sodas we are concentrating on,
   - Computing resources,
   - Timely responses to inquiries.

Approach 1: Experimental

- Experimenting with different types of soda - namely McDonald's, Coca Cola, Sprite, Fanta Orange, and Diet Coke.

- Using different proportions of ice, we will then find the resulting temperature of the drink, as well as calculate the resulting dilution of the drink.

- By experiment, we will test out which combination of temperature and dilution will yield the highest satisfaction from the test subjects. In doing this, we assume that all customers have the same preferences for combinations of temperature and dilution.

Approach 2: Physics-based

- Utilizing the specific heat capacities of soda and ice (already found as specific values), we can calculate the different temperatures and dilution that the resulting drink will be.

- Using a similar survey of our sample group, we can determine which is the most popular combination of temperature and dilution. From there, we can figure out the optimal combination of ice proportion as well.

Possible Results/Analysis

- Experiment results will show which combination of temperature and dilution is the most popular

- The physics-based approach will be able to tell us the expected temperature and dilution of any proportion of ice that we use

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Advantages/Disadvantages

1. Advantages
   - Utilizing the specific heat capacities of soda and ice (already found as specific values), we can calculate the different temperatures and dilution that the resulting drink will be.

   - Using a similar survey of our sample group, we can determine which is the most popular combination of temperature and dilution. From there, we can figure out the optimal combination of ice proportion as well.

   - We are able to use physics calculations to compare the accuracy of the experiments.

2. Disadvantages
   - Assumption that all customers have the same taste regarding temperature and dilution is false

   - Desired temperature of drink may also depends on location of branch and climate

   - Physics-based calculation might not be as accurate since it assumes that there is not heat inteference with the environment, which is not true in reality

Further Recommendations

- Perform experiements on different days with different climates

- Split sample group based on gender and age