Product Report

Team YesYepYeah!

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1.0 Introduction

The product we design is a SMART fridge which can detect items in the fridge and their ‘best before’ information. In fridge, we maintain two kind of operations. We also design a application called FRESH to collaborate with the fridge.

When user put something IN our product, we use some real-time Objective Detection technique, for instance YOLO v3(Redmon J, Farhadi A), to capture what they put in. After that, we clip the picture using the information Objective Detection technique has served. Then, we upload clipping picture to an API that a SHOPPING APP expose to get a class information and further information. That means we use API to know what user is putting IN. Our application can take the actual date and remind user the food may got rotten with respect to the class food belongs.

When user take something OUT from our product, we use also use some real-time Objective Detection technique to crop the picture. Then we see this problem as a ReID issue. We can match this OUT picture to the database to know what it is.

In addition, users can check their food and the application will message them when something are going bad. We plan to sell the fridge and the application together. To boost the sale, we are going to cooperate with some big brands so as to sell our fridge together. When it comes to advertisement, since our target customers are those who have a big family and in the middle class, we choose transportation centers like railway station and airport to throw in our posters. At last, when the sale is large, the way of profits may change to add advertisements, sell data and cooperate with some food industry company. The report will cover Specific Techniques, Major Functions, Marketing Survey, Business Analysis, Product Development, Market Testing, Conclusions and Recommendations.

2.0 Idea Generation and Idea Screening

This section will centre on how we generate our ideas and how we pick the optimized one. In the background of current world, ideas we generate appear to have new technology and potentials to realize. For example, we cover the smart shoes, navigation glasses, social media. Finally, we decide to choose the smart fridge as our product.

2.1 Idea Generation

Focus groups have become popular vehicles for generating new product ideas. (Jeffrey Durgee) The idea is generated and perfected by the whole group rather than single person. The initial perception is to design a screen outside the fridge which customers can buy goods thorough it. After considering that customers really need to know items in their refrigerator. That appears to be the centre of requirements.

Therefore, the main function of the product is to detect different kinds of food and message customers when something is about to go bad.

2.2 Idea Screening

One approach to classifying sources of new- product ideas is to describe them simply as either consumer-activated or business-driven（Stanley F. Stasch Ronald T. Lonsdale Noel M. LaVenka). In the process of idea screening, we tend to focus on

these two ways. The reason why we decide smart device in fridge as ideal product is based on the market. First of all, refrigerators appear to be needed by every family. It might be other kinds of necessity for modern people. Therefore, the market of fridges tends to be infinite. Second, the product may have value in every process of sale.

When the sale is small, cooperating with big brands tend to be a win-win tragedy, since the big company may sell better with this equipment. In addition, when our company reaches certain scale, we can get profits by adding advertisements on the application and selling data. Third, the machine is environmentally friendly. The aim of the device is to reduce unnecessary wastes. It tends to improve people's living experience. Finally, in the consideration of these three aspects, this ideal product appears to be the best.

3.0 Specific Techniques

Objective Detection is a Computer Vision technique that can clip the picture to capture what the things are, i.e. classification, and where they are, i.e. localization.

3.1 YOLO

The state-of-art model that are end2end trainable is YOLO v3. YOLO means You Only Look Once. It uses information of the whole picture and can be end-to-end trainable. Thus, it can run really fast and can be optimized.

3.2 ReID

Re-identification(ReID) is a technique that check a vedio stream or another pciture whether it exists a specific item. It can be seen as subsection of picture matching.

We can use ReID techniques to match the taking OUT object to the putting IN object

3.3 API of SHOPPING APP

We can use APIs that SHOPPING APP exposes to get all information in the app.Thus we can use the information to purchase what we are in shortage.

4.0 Major Functions

4.1 Putting in

While putting in, the fridge will use YOLO to detect what we are interested in and crop it. Then we use APIs to know what we already have, and have a multivariate information of the product.

4.2 Taking out

While taking out, we also use YOLO to crop what we are interested in. Then we use ReID technique to match the OUT item in the database of IN items.

4.3 Replenishment

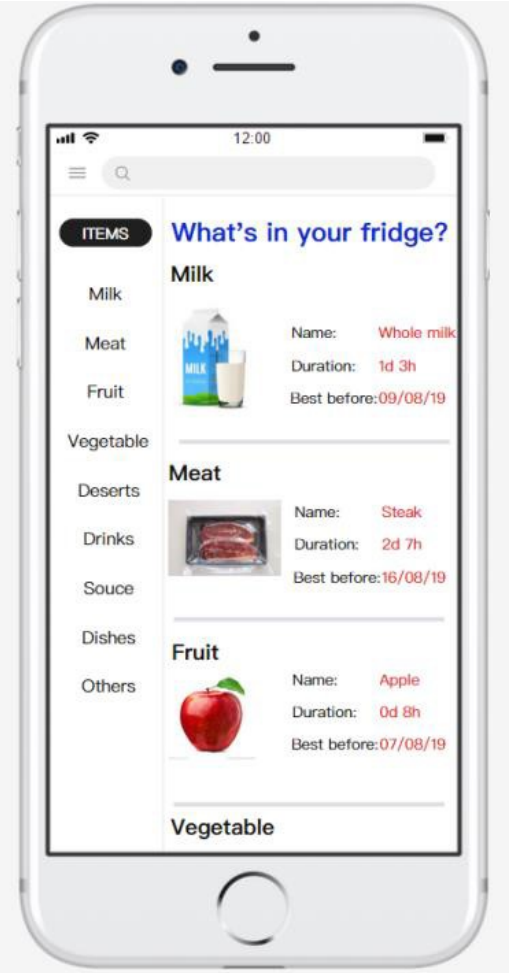
We can use the API of the SHOPPING APP, to complete the replenishment operation.

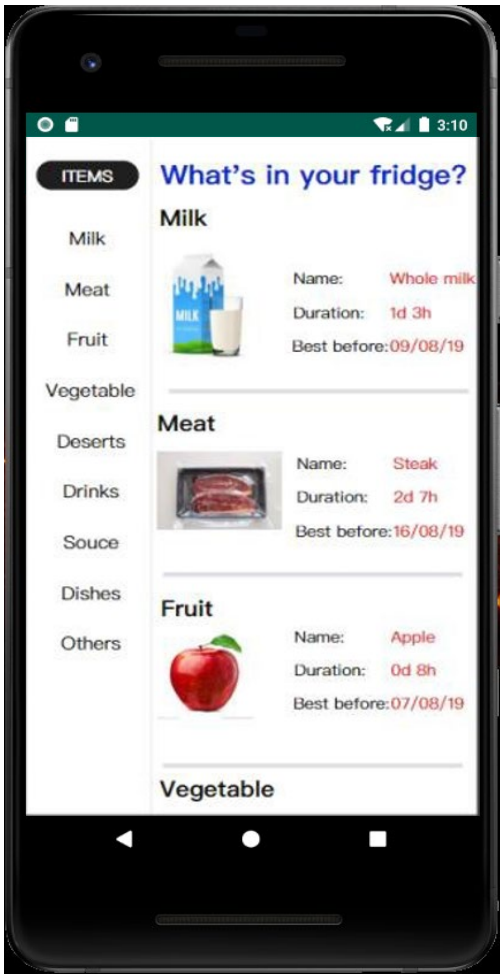
4.4 Fresh Remind

Users can set their own eating time when they want to remind themselves.

4.5 Voice Service

We maintain a voice assistant to interact with the user and do some confirmation and inquiry.





5.0 Concept Development and testing

In order to further develop our product idea, we choose the qualitative method of research when doing test with potential target customers. Qualitative research, as a type of social science research, collects and works with non-numerical data to help us have an deep understanding of the attitudes, behaviors and interactions of our target populations and identify large-scale trends. Besides, it has the benefit of being flexible and easily adaptable to changes in the research environment. (Ashley Crossman)

To start our research, two major problems to be solved are the topics of questions to ask and the type of people to look for.

As for the first problem, open-ended questions are used in our interview to make the

interviewees express themselves as much as possible. For example, instead of asking them ‘Do you know clearly what's in your fridge?’, we set up the question as ‘How well do you know about what's in the fridge?’. The answers will be more flexible and contain more personal information compared with simple responses.

The second consideration is what type of people to look for and then, whether the research participants should be kept in the dark about the topic or should be prepared for the interview to maximize productivity.(Clive Nancarrow, Andy Barker and Len Tiu Wright) Since we need to conduct the interview on social media, most of the interviewees are our relatives or friends, whom we are very familiar with. So we intend to interview various types of people to find out our target audience, such as students, office workers, housewives (or househusbands) and elder people. Due to the condition of our research, the interviewees need to have a general picture of our products to give useful answers. So before asking them questions, a brief introduction of how the device works will be given to our interviewees.

Our questions are divided into four aspects: fridge basic condition, using habit, privacy and user willingness. At the end of the interview, they are asked for proposals

and suggestions to improve our products. We design the questions for the following reasons. Firstly, we aim to find out their using habit and knowledge of the items in the fridge to decide whether they are our target audience. Then, when it comes to privacy issues, if the interviewees appear to be worried about their personal data, it will be less likely that they will purchase our products. Besides, their willingness to get our products can be shown by the answers of our questions. So, we could conclude what types of people are more interested in our products and what functions attract them more.

The survey results show that most of the interviewees are interested in our products. And a large percentage of students and office workers have the habit of storing items in their fridges and have problem remembering what is in the fridges. Our products are exactly what they need. However, some elderly people, part of the students and a portion of the housewives show relatively negative attitudes, holding the opinion that there is no need for such a product since they know clearly of the content in their fridges and do not mind checking it themselves.

In conclusion, there is still a large market for our products and our idea appear to be visible. In the next stage, the interviewees’ suggestions could be applied to improve the function of our products.

5.1 Marketing Strategy Development

Based on the ‘bases of segmentation’ theory, main target audience to this product are family users aged 30 to 50 and student users who use a public kitchen aged 18 to 30. About geography, target areas are big cities, for example Manchester or Shanghai. In demography part, target audience of the product are the people who are aspirational, having middle or higher income and command of using mobile-phone.

According to the target audience analysis, marketing strategy to the product Fresh-smart fridge high-tech is following.

First, we will complete the research and development, and apply the patent of the product. Then we plan to open the market, increase the sales. When the sales improved, we are going to cooperate with a big brand, for instance, Haier in China. Through cooperating with the brand, their newest refrigerator will carry our technology which can be a highlight of the whole fridge. And the highlight can help the big brand to keep and increase the market occupancy. In this way, our company may become the subsidiary company of the big brand.

Therefore, about the marketing mix (7Ps) model (Booms and Bitner, 1981), the product, People have described above, and the Price is in the appendix. The Physical

Evidence mainly depends on the app. While the rest 3Ps are rested with marketing department of cooperative brand.

5.2 Business Analysis

Starting with a small factory whose monthly average production is 400 pieces, assume that all products sell out every month. To make it easier, the cost is averaged to each piece of product.

Each device costs 35 pounds including material cost and labour charges. And it is priced at 50 pounds. Considering overheads, such as electricity, app maintenance and advertising fees, it's about 24 thousand pounds. So, in total, the income is 36 thousand pounds a year.

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5.3 Product Development

The product is basically a module and a mobile app that need to be installed on to the refrigerator and the smart phone separately. It enables customers to check an

up-to-date list of fridged items on phone with ease so that users can keep things organized and be free from redundancy. What's more, the app can send notifications when the food is about to go bad in order to reduce waste of food and money.

Next is how the product works. Scanning the bar-code on the food before putting it in with the purpose of knowing more details about the item, such as the best before information. If it fails, the algorithm will give the best before information based on what kinds of goods are. After that, when the food is put into the fridge, cameras inside will automatically take pictures from all directions. Based on computer vision technology, they can recognize what the item is. Then, pictures will be sent to server which will analyse the data it receives. Finally, this information will be sent to mobile phone, realizing functions mentioned above.

(The design model of app is shown in the appendix.)

5.4 Market Testing

To have a better understanding of the market we targeted, an online survey was conducted. The questions were mainly designed to test the actual needs and demands of the customer, after providing detailed descriptions of the product. Moreover, users were prompted to evaluate the product both before and after a price is offered.

Most participants of the survey were among the potential users identified earlier, that is, office worker or university students in China’s major cities. It seems that refrigerators are common in their households, within which many items would be stored. Further questions about the habits of using refrigerators reveals that, participants among target audience do not always have a clear memory of the foods stored in the refrigerators, and over 27% of them reported the losses of wasted food associated with this phenomenon. That can provide opportunities of our product to thrive.

An additional question is asked in order to test the strategies of pushing notifications to smartphone. In accordance with general impressions of many, that idea seems promising as most of our target audience would check the mobile notifications on a regular basis.

When opinions of the products were asked, 85 per cent gave positive responds (‘the

product is of great/a certain degree of help'). Even after a price of around 35 pounds was offered, the reactions from the participants remained largely enthusiastic, with almost a half of them willing to pay the price.

6.0 Conclusions and Recommendations

At this stage, some conclusions could be drawn based on the research and surveys of various kinds.

The product we are suggesting is essentially a module attached, which could make the home refrigerator more capable. The product is expected to help the customer to organize items and send reminders if recommended 'best before' date for foods is in near future. The usage of the product is greatly expanded as mobile apps are suggested to co-operate with the module.

Based on theories and observations, marketing strategies are developed. In particular, target audience is identified, which will be reflected in further recommendation.

In terms of operational and financial analysis, it is calculated that under the assumed conditions, the net profit for a single piece of product would be 15 pounds. Moreover, an estimated 2400 pieces would be sold during the initial six months, thus the expected revenue would reach 36000 pounds.

The online survey we conducted received generally positive feedbacks. Target audience reported their needs of a better refrigerator, suggesting that unclear memory of stored items brought difficulties to their life and resulted waste of food. Credits

were widely given to the idea of the product, and almost half of the interviewees remained potential customers after a price is offered.

In light of the above findings and conclusions, the product seems ready for commercialization. It is recommended to target office workers in Chinese major cities as potential customers, and to set a price of around 50 pounds at the initial stages.

Furthermore, expansion of production scale could bring down the costs, which are beneficial to maximize profits. The restrictions of capital input would be an obstacle, but practices like crowd-funding are possible options to attract investors. Finally, with the growth of our business, cooperation with major refrigerator brands might be greatly rewarding if possible, especially in the form of integrating our module into their products.

Appendix

Questions of the online market testing survey

1. Would you tell us your age?
   A.Under 18 B.18-25 yrs old C.26-30 yrs old D.31 - 50 yrs old E.50 yrs old
2. Would you tell me about where you live?
   A.Tier-1 city B.Tier-2 and Tier-3 cities C.Smaller cities D.Countryside
3. What's your current occupation?
   A.Student B.Office workers C.Housewives (House-husbands) D.Retired
4. How often do you check the notifications on your mobile phone?
   A.Rarely B.Sometimes C.Quite often D.Always keen to do so
5. Which fridge brand are you currently using? Does it work well now?
   (options omitted for brevity)
6. Do you store a lot of items in your fridge?
   A.Yes B.No
7. Do you often have a clear memory of the items in the fridge?
   A.Rather clear B.Mostly clear, but sometimes not so C.Not really
8. Would you forget your items in the fridge and they end up going bad? How often does that happen?
   A.Never B.Once every few months or even less C.Once or twice a month D.More than three times a month
9. Do you think it would be helpful for you to organize your items or save some money?
   A.Of great help B.Of certain degree of help C.Of limited help D.No help at all
10. Would you be prepared to pay above 300 yuan (around 35 pounds)?
    A.Yes B.No
11. Do you have any further suggestions? We'd very much appreciate it.
    (open-ended question)

Results of survey

Sample size N = 161

Results are showed in percentage.

	A	B	C	D	E
1	1.86	31.68	19.25	42.86	4.35
2	29.19	45.96	21.74	3.11	
3	29.19	57.76	9.32	3.73	
4	5.59	22.98	42.86	28.57	
6	74.53	25.47			
7	19.25	68.94	11.8		
8	17.39	55.28	24.84	2.48	
9	19.88	66.46	9.32	4.35	
10	47.83	52.17			

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