Scale with Fruit Recognition

Intro: fruit is indispensable need of our healthy diet. From the stock to the supermarket, it is one of the best-selling goods for sure. Nevertheless, existing infrastructure has some issues such as congestion, delay, and food wastage. In the stores, these concerns are mostly addressed to human work force supported by smart devices. It is our intent to simplify the human-machine interaction in this context, to increase the affluences, to modernize the repetitive task of changing labels of the fruit, to make more accessible the scales so that everyone can buy more in less time. Automatic recognition of apples, oranges, mangos, bananas, pears, tomatoes is incorporated in a small device so that it can be put above the scales so that is visible and can communicate with people.

Our market:

The stores are just a final point where people buy groceries, but as in life the final point is the most crucial, the supermarkets or ipermarkets are the start point of a trip. There are people making lists before of this deal and people who goes and take the inspiration by just looking around, and the latter are those who are mostly addressed in the process called customer satisfaction.

Customer satisfaction1 is very important in supermakets. Data on customer experience gives the management team a certain amount of data (a lot) to improve all the processes of the business of big groceries stores.

Supermarkets and ipermarkets are the places where people can find what he/she is going to eat for the next events, this is done with a soft approach to not spend a lot of money. But, when people will come across the fruit and vegetables zone they are caught with a fresh sensation of healthy and colorful environment, that could lead to a very good perceived quality. Now, scale with fruit recognition module is installed in this environment. The task of automatic recognition takes away the work of continuously going around and searching for the label associated with the fruit. The person who wants to buy fruits usually buy more than one item, so this becomes a repetitive task. To collect all the fruits and vegetables takes some time, but to buy them the customer needs to follow three actions that are weight them, remember the number associated with that item and click the right button and in the end stick the printed label. The action associated with weighting the item cannot be removed, but for the last two there is automatic recognition of the fruit and vegetable and on-screen printed label such that can communicate with the people that has laser bar-code reader.

For the organization is crucial that the customer is followed-up in all his/her possible interactions. Many difficulties are listed now to understand better how it is important to remove some human workforce to increase the level of customer satisfaction. There is a crowded lane, labels incorrect, quick sale, empty boxes, sensation of feeling lost, selection of the pieces.

Our way to solve all of them is to introduce a starting point in the trip of the supermarket or ipermarket: the scale fruit recognition. Now, the person that has collected a lot of bags with fruits and vegetables, can go towards the scale waiting for his/her turn, and one after the other put the bag containing the item on the scale, with open bag handles so that the camera can see through the compostable bag. After less than one second, the display shows a prediction of the most probable fruit or vegetable with an option to see other few predictions, in the possible case of mismatch. The customer can proceed reading the bar code already displayed or by selecting the optional item in the case of mismatch.

Business:

Our Business is to sell a product that has a high-resolution scale, an Arduino board with microcontroller, a camera module, and an LCD display. All the computation, that is incorporated in an AI powered model, is run on-device without needs of connection with servers. This is achieved using a TinyML device which focuses on keeping the data private and energy efficiency.

“In 2019, 1 in 3 people (33%) in the EU reported not consuming any fruit or vegetables daily and only 12% of the population consumed the recommended 5 portions or more daily. On average, over half of the EU population (55%) said they ate between 1 and 4 portions of fruit and vegetables daily”.2 This means that it is important to follow-up the customer for two reasons, the first is that is normal to find fruits and vegetables in healthy diets, the second is that we care on the amount of fruits or vegetables that is going to be put in the shopping cart. In fact, people care about the experience, organization care about keep their customers while acquiring new ones.

Our product is like an NPC, it interacts and communicate while helping the customer in lower the sensation of loss around the lanes. The situation in the supermarkets is so improvable in this context. The experience now is made up of smart device with laser bar-code reader, such that the customer can focus more on buying and in the end skip the line.

We want to introduce in this context a new agent in the fruits and vegetables zone capable of recognizing the item and printing the label on screen. In most of the supermarkets in Italy, scales have a plain metal screen with a plastic layer with printed buttons numerated from one to many hundreds. This installation is the first issue tracked by the customer, that it can be misleading, or it can be unreadable for someone, thus leading to a wrong decision. The button can be clicked only by the customer who must choose among those numbers. Also, the workers who set up the shelves and move the items with their labels around according to the retail department, has a lot of responsibilities in the fundamental success of acquiring more perceived quality from the customer point of view.

Much more effort can be put in the arrangement of the shelves that certainly contributes on the customer perception. Also, workers can now be more present if issues are encountered during the customer tour in the store. By removing repetitive human tasks, we are also lessening the errors in reading numbers on buttons and in bad short-range memory of customers. This impacts on the sales correctness and in the right adjustment on store’s lanes.

Also, sustainability mission is addressed with Fruit Scale Recognition. It adds value4 to our product by removing sticky labels to compostable bags make them fully recyclable. Consumers are increasingly inclined to buy from sustainable companies. This is because people are very sensitive to environmental issues, equity, and social issues, to the point of requiring goods and services that clearly represent these values, even at the cost of spending more. By removing the architectural barriers and the creation of accessible spaces also for those suffering from physical or behavioral disorders. Also, guarantee employees an inclusive and equal work environment from the point of view of promoting well-being5.

* Values
* Actual situation of experience in the supermarket
  + Pictures and tell story of old person.
  + Supermarket issues: label problem, change label numbers, human error of labels,
* Our customer:
* After deployment of the AIVision:
  + Supermarket: initial big cost, incentives in buying more fruits, less concerns on labels problem
  + Customer: experience improved

Technical:

Illustration of model

Ethic:

* The digital revolution in supermarkets and ipermarkets is underway and supermarkets are becoming increasingly digitalized and automated. However, the installation of new digital technologies in supermarkets must be carefully evaluated to ensure that they do not infringe the rights of consumers and workers.
* Inclusivity: The protection of human health and the creation of more inclusive environment in supermarkets and ipermarkets is obtained through the never-ending development of technologies and their significant association with humans. The Fruit Scale Recognition is just a product easy to use from the customer perspective, and this increase the value offered by the organization. The customer now can buy more without feeling lost between the fruit and vegetables lanes. A blind person can now go to supermarkets and ipermarkets to buy healthy food. A person with autistic disability disorders can now feel less hindered by sounds and lights. In fact, our product is designed to be a “speaking calculator” without really speaking but communicating with the monitor the result obtained by calculating the recognition task.
* Job displacement: According to an article in Harvard Business Review Italy3, the use of artificial intelligence (AI) algorithms in many areas of our lives is not recent but is now characterized by greater speed and pervasiveness. However, AI will not completely replace human work force, but rather transform it, making it more creative and value-added tasks. Our product is going to make the same in the supermarket and ipermarkets, triggering a big change in customers and workers. With careful consideration and collaboration between workers and customers, for the customers it is easier to buy fruits and vegetables. For workers, it is crucial that their job is reformulated to be more creative and more connected, behaving as intermediary between the communication team and the customers.
* Good care and user well-being: Technology empowered with AI can have a positive impact on the well-being of customers in supermarkets. For example, the use of smart technologies can help improve the customer shopping experience, making it more efficient and convenient. But this also means new emergent issues such as transparency, quality, and responsibility of evaluation.
* Privacy: the final responsibility on who take the decision in selecting the right item after the weighting of the fruit or vegetable is performed is always of the customer. The weight of the decision is important for the sales because there are items which price is higher than other, and you can be accused of stealing if this operation is not correctly performed. By removing the mistakes caused by the many buttons on the metal layer, the remaining cause of a mistakenly labeled bag is that a person chooses the optional items. When someone choose the optional items (remember that the prediction finds the most four probable items) the recognition is flagged, such that an ulterior control by the cashiers can be performed at the end of the tour. No other data is collected to other intentions out of helping the user in removing the repetitive task of scale and remember the numbers.
* Inizio modulo
* Fine modulo

Similar project:

* [Colruyt](https://press.colruytgroup.com/colruyt-is-the-first-belgian-supermarket-to-test-automatic-fruit-and-vegetable-recognition) – Belgian supermarket first to implement in a supermarket.

Sources:

1. Customer satisfaction is defined as a measurement that determines how happy customers are with a company’s products, services, and capabilities. Customer satisfaction information, including surveys and ratings, can help a company determine how to best improve or changes its products and services. [what is customer satisfaction [https://asq.org/quality-resources/customer-satisfaction]](https://asq.org/quality-resources/customer-satisfaction)
2. [Eurostat - Infographic: Daily consumption of fruit and vegetables in the EU, 2019](https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220104-1)
3. [Come l’intelligenza artificiale sta ridisegnando il lavoro - Hbr Italia](https://www.hbritalia.it/draft/2022/05/02/news/come-lintelligenza-artificiale-sta-ridisegnando-il-lavoro-15268/)
4. [I vantaggi della sostenibilità per le aziende (asvis.it)](https://asvis.it/approfondimenti/22-11366/i-vantaggi-della-sostenibilita-per-le-aziende)
5. [Supermercati sostenibili: stop plastica ed emissioni e salvare il cibo (ilfattoalimentare.it)](https://ilfattoalimentare.it/supermercati-sostenibili-stop-emissioni.html)