

Computer vision goes to t



Have you ever wondered why products in stores are organized precisely the way they are? A strong correlation has been established between the product location with regards to customer eye level and sales. To put it simply, products that are more aligned with an average customer's eye level are more likely to be bought. How many times have you bought a product in the store even though it wasn't on your shopping list? Research suggests that 76% of all shopping decisions are made on the spot, i.e. in the store. Therefore, for an average customer it wouldn't be unreasonable to assume that that style of purchasing products is impulsive and a bit reckless to a certain extent.

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However, this assumption fails to account for the great amount of effort manufacturers and distributors put in *retail execution*. *Retail execution* is a term that describes the optimization of these processes in order to maximize the sales and it is most commonly used in the context of *FMCG* (*Fast Moving Consumer Goods*).

There are several challenges retail execution tackles:

- detecting missing items on shelves (*out-of-stock* detection)
- share of shelf
- planogram compliance

DETECTING OUT-OF-STOCK ITEMS

Say you have decided to go to the store and buy yourself your favorite sparkling beverage.

What you did not expect is to see your favorite beverage out of stock, in which case the second best option is most likely going to be a beverage from a competing company. In order to prevent this scenario from happening, manufacturers and distributors need to make sure that stores restock their products regularly. Usually this is done by hand, i.e. travel agents visit the stores to check if any restock is needed.

MONITORING COMPETITIVE PRODUCT SHARE

When manufacturers launch a new product they negotiate certain elements of product display on shelves. One of the most common ones is shelf share. Simply put, it is a proportion of one manufacturer's products relative to all the products on the shelf. Since the shelves are arranged to contain products of

the same category, from the manufacturers' point of view, their product is side by side with the competition. Similarly to the out-of-stock problem, travel agents are sent to the stores to manually check shelf share.

CONTROLLING COMPLIANCE WITH THE PLANOGRAM

The main focus of planogram compliance is assuring that items are displayed properly and in correct positions on the shelf, unlike the share of the shelf where most of the focus is on acquiring a better position than the competition. A planogram is a detailed visual layout of positions on a store shelf. Manufacturers are obtaining facings (a facing is a shelf share that one product can occupy) on a shelf. Therefore the planogram defines where those facings are and which products occupy them. Since the position on a shelf highly affects if the product will be purchased, ensuring that the product is in its right position is a great way to cut down loss-

the store

es. Thus far, manufacturers are sending their employees to check if planograms match the layout in the store. That employee has to go to the store and check each shelf and item individually.

If there was a way to automate the procedure that each employee has to do it would have great benefits:

- high cost and time savings – employees would be more efficient when checking the layout
- more precise data – human error would be avoided
- instant and frequent insight of the store layout

The SOVA project is an automation solution for exactly such a situation. The solution we are developing is based on computer vision technology enhanced by artificial intelligence.

If provided with a photo, our solution can produce this information in real time:

- coordinates of each product on a shelf
- name of each product
- ordinal number of the shelf in reference to other shelves (the bottom shelf is the first one)
- position in a queue on the shelf (positions are assigned numbers, from left to right, in ascending order starting from 1)
- product size

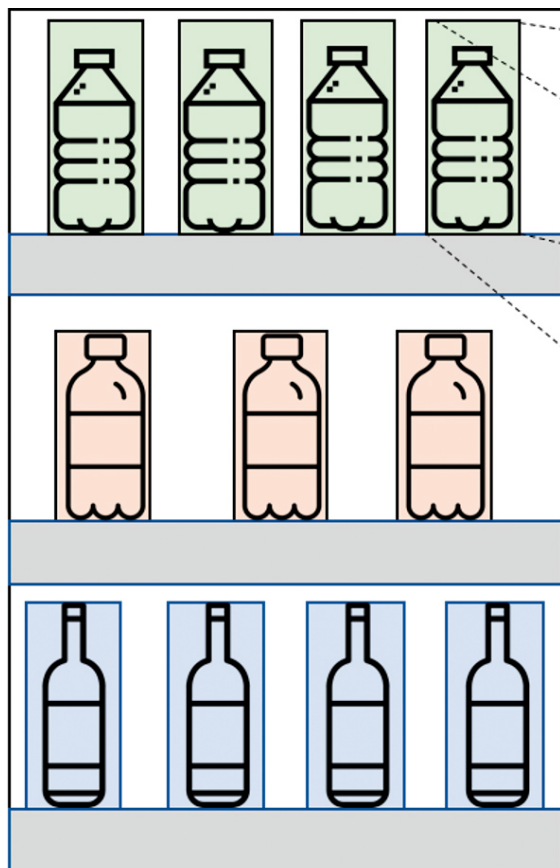
Commonly used terms when discussing computer vision are object detection and object classification. Mathematical models that are used to perform these tasks are called deep neural networks. If trained on a sufficient amount of data, such models perform extremely well, satisfying all the business re-

quirements. In the deep learning domain, sufficient amount of data almost always means large amounts of data. In our case, gathering such amounts is a lengthy process, not only because it requires manpower to go to the store and take as many images as possible, but because it also requires manpower to go over those images and assign correct product coordinates and names. This process is known as data annotation.

Although we are happy with the progress we have made so far we are looking forward to implementing some of these new features:

- determining which way the label of the product is facing
- price detection
- matching prices and products
- generating 3D visuals of the the store shelf layout

Going forward, we will also add more products into our data collection to try to appeal to a wider set of manufacturers. We are also planning on expanding not only to the local market but the global market as well. And we are sure that with our many plans to expand and improve we will encounter new difficulties and obstacles, but we are eager to dive into new areas of research and development.



Naziv: Sky Cola 2L
Koordinate: (500, 10, 550, 200)
Redni broj police: 3
Redni broj lica: 4

simplified display
of the information analyzed by the system