Shelfie
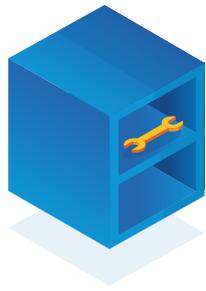## Intelligent shelf demo

Shelfie

The purpose of the demo

The purpose of the Shelfie demo was to present how powerful the technology around the computer vision is today. We believe that various challenges, restricted to date by human brain, could be solved using Artificial Intelligence. Object recognition is one of them. We also wanted to present that neither lengthy nor expensive research is required to solve some problems using computer vision techniques. We believe that nowadays, also thanks to Microsoft, the level of sophistication and accessibility of technology enables IT teams to solve real business problems efficiently.

The Shelfie demo was built for the Future Decoded 2018 conference, the flagship Microsoft AI event in London, where it was received with a lot of interest.

Business case

The initial story is concerned with retail industry, as this is the domain that people can easily refer to (everybody is doing shopping from time to time). A regular user of the Shelfie system is a shop assistant. In our case, this person is responsible for manging a shop floor, where they may have lots of shelving with various products placed on the shelves. The person is responsible for making sure that products are properly placed on the shelves, nothing is missing, proper prices are attached, etc.

In a large and busy store this becomes a big challenge, as missing products cannot be sold (lost revenue) and wrongly attached prices may result in customers' dissatisfaction (lost revenue and a risk of complaints).

Shelfie functionality

The system is utilising a regular camera to observe what is happening on the shelf. In case of our demo, the camera is observing three shelves, analysing the situation after each change made by the customers or the shop assistant. The system keeps the information about the products on shelves, their positions and state and reacts to changes and events.
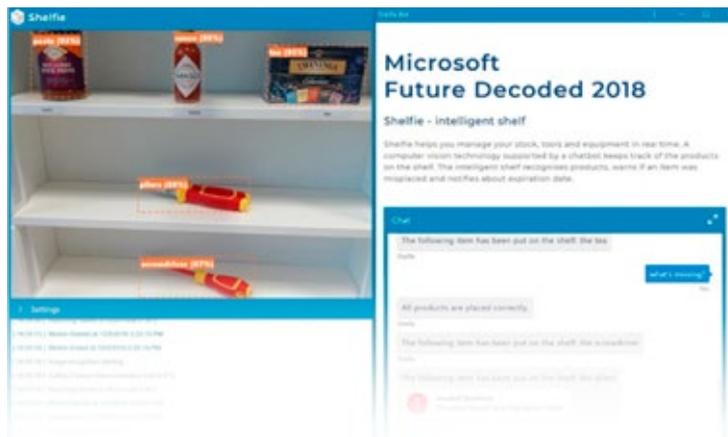
The shop assistant communicates with the system via a chat bot, that may be available on any device such as a mobile phone or a tablet. The system, thanks to the ability to recognise objects ("there is a can of corn") and to localise objects ("the can of corn is on the top shelf on the right side"), is able to deliver the following multiple functionalities:

- The assistant may ask bot to list the products that are currently on the shelf
- The bot informs the user that a product has been put on or removed from the shelf.
- Some products have dedicated shelf position (Tea, Sauce, Paste). The user may ask the bot if there is anything missing. The system will check if there are prope products in the assigned shelf positions and will inform about any shortages.
- There are certain rules that have been defined for the shelving, e.g. tools may only be placed on the bottom shelf, while food products may be placed in the middle and on the top. The system will recognise if a product is misplaced and chatbot will inform the user immediately. The user may also ask bot at any moment whether the products are properly placed.
- The system will calculate the remaining shelf life of the product based on how long it has been on the shelf and it will notify the user via chatbot window that the expiration time is running out.

The listed functionalities by no means complete the potential of the system. However, they are illustrating that by recognising and locating objects (in space and time), it is possible to define rules that may be controlled. Breaking of the rules may be communicated and acted upon.

Technology used

We have based our solution solely on the Microsoft technologies. The part of the system responsible for recognising and localising objects is implemented as a Universal Windows Platform application. It is recording pictures using a regular USB camera and utilises the Microsoft Custom Vision Azure service to process them. By using this service, we didn't have to build our own neural network and we just provided pictures of objects that should be recognised. The service managed the process of training the model for us.

The user communication part was implemented using Microsoft Bot Framework. Our bot is available through a web page. All the components were connected together using Azure Functions. The whole system was constructed by a small team in just a few weeks of work.

Recorded demo

You may find the short video of the demo here.

If you are interested in seeing the live presentation or talking about the concept or technology used, don't hesitate to contact us!

About Objectivity

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