Capgemini and SEeMAx improve automated egg quality detection for Rica Granja

In collaboration with SEeMAx and Capgemini, Rica Granja, a Portuguese food manufacturer, uses artificial intelligence and automatic learning to control and classify eggs according to their quality

Monitoring egg quality

Eggs are unstable and heterogeneous products that present a natural variability, mainly linked to the age of the laying hen. Planned production methods and effective quality control procedures make it possible to limit egg variation by sorting the eggs that will be offered to the consumer from those that will be used by the food or pharmaceutical industries.

Overview

Client: SEeMAx

Region: France

Sector: Consumer Products

Client challenges:

SEeMAx wanted to expand on its existing artificial intelligence technology to process food products more quickly and with more reliable identification of defects

Solution:

Partnering with Capgemini, SEeMAx introduced deep learning algorithms into its systems, enabling sorting machines to rapidly scan eggs and sort them with far greater detail and accuracy

Benefits:

- 1.8 million eggs saved through identification of false defects
- 270,000 eggs processed per hour
- Reduction of manual labor involved in egg inspection

Egg quality measurements are not limited to macroscopic characteristics (size) and (identification number, laying date). It is mainly a matter of identifying shell defects that could make the egg unfit for consumption according to consumer standards, such as micro cracks, stains, soiling, or an abnormal shape. These quality measurables can also help producers as they provide information on overall production performance. Despite the existence of automated detection, these defects are often still checked manually, which is very tiring for the employees involved.

Sensors for automated control

Capgemini has supported the development of SEeMAx, the only player in quality control and egg detection to use images, for the past 25 years, both to ensure the ongoing technological evolution of the system and to facilitate the increase in egg production capacity. In 1995, SEeMAx was founded on the idea that the measurement of quality, until then manual, could be automated by image for greater reliability, better productivity, the possibility of evaluating the complete quality of a batch (control of all the eggs in a batch) and not by sampling. To achieve this, the founders of SEeMAx, whose core business was egg production, called on Capgemini's expertise in image processing to develop the first prototype of non-destructive inspection. Since then, Capgemini teams have been working to enrich and improve the computer vision technology that is at the heart of the SEeMAx solution.

Decisive factors in the choice of automated testing techniques include the ability to ensure reliable measurements, the speed of measurement, the cost of the instruments and the required sorting adequacy. The availability of powerful computers and new detection technologies has made it possible to develop systems that meet these requirements.

Cameras and artificial intelligence detect the undetectable

Depending on the size of the conveyor and the number of rows, the system includes nine to 27 high definition cameras coupled with strobe flashes to photograph the eggs. At each row, a flash of light takes a picture of the eggs arriving on the conveyor belt, whereupon the image is processed in a few milliseconds. This device is connected to computers with the latest-generation Intel I9 processors and GPU cards. Specific lighting has been specially developed for this application to highlight shell defects invisible to the naked eye.

In 2018, a team from Capgemini's Digital Engineering and Manufacturing Services specializing in artificial intelligence successfully implemented deep learning algorithms within SEeMAx systems, thereby enhancing the flexibility of the organization's sorting criteria. Together, the organizations then installed this system for Rica Granja, a Portuguese food manufacturer, in an effort to improve the producer's ability to sort eggs and more effectively identify actual defects. Since then, the machine has learned to distinguish a crack from a scratch to provide an answer and a solution to the problem of false cracks and eggs rejected by mistake.

With these new systems, an egg is no longer sorted as simply good or bad, as was the case with the previous system. Instead, it is divided into 20 different classes that include thousands of eggs. Once this artificial intelligence module was installed, Rica Granja was able to save 1.8 million eggs (1% of its annual production of 180 million eggs) that had previously been downgraded from consumption grade to food-industry grade. Additionally, Rica Granja has now improved the speed with which it performs this analysis, spending only 40 milliseconds on each egg to create 36 images, resulting in the processing of 270,000 eggs per hour.

Since the beginning of the project, SEeMAx and Capgemini have installed more than 100 sorting machines containing these algorithms throughout facilities in France, Europe, and Brazil. By doing so, the partners have improved the operations of egg packing centers, industrial poultry houses, and even laboratories. Using deep learning and algorithms developed by Capgemini's data scientists, SEeMAx has increased the egg detection rate, reducing false rejections and ensuring food safety. With artificial intelligence, SEeMAx and Capgemini will continue to ensure that food producers around the world can maximize their production while guaranteeing the quality and safety of their products.

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