

Face Mask Inspection Made Better and Faster with Basler ace Cameras

Customer

- O-Net Industry
- Location: Shenzhen, China
- Industry: Medical supply inspection
- Implementation: 2020

Application

An acute shortage of face masks caused by fear of the spreading coronavirus pandemic has been straining global medical supplies since the start of 2020. The smart face mask inspection system designed by O-Net Industry boosts productivity and increases product conformity rate for the manufacturers. By making the inspection process faster and more effective, this solution can both ease the pressing market need and help face mask manufacturers drive production cost down.

Headquartered in Shenzhen China, O-Net Industry is a leading company dedicated to machine vision automation. The vision systems designed by O-Net Industry are used in various applications including visual inspections, geometry measurement and OCR among others; they are also able to provide customized solutions tailored to the products to be inspected.

In a traditional production line, a high scrap rate is inevitable due to interference by environmental factors and the inconsistent working conditions of face mask making machines, resulting in lower efficiency and conformity rate. The application of a vision inspection in the production process, however, can significantly improve the situation.

All parts of a face mask need to be inspected, including the covering, the edges, the ear loops and the metal strip that lets the wearer bend the mask around the bridge of the nose (Figure 1). Quality control needs to identify and remove masks that are overlapping, broken, contaminated, askew or in the wrong size.

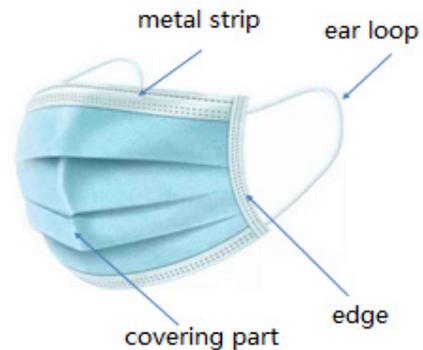


Figure 1: Vision inspection for a face mask

Face mask inspection is also made more complex by factors including:

- Uneven illumination occurs during inspection due to the grainy surface of the non-woven fabric of face masks
- Face masks to be inspected are moving and their positions are random on the conveyor
- The edge, ear loop and metal strip are difficult to distinguish in inspection images.

Solution and Benefits

With the help of customized lighting and the Basler ace 5 MP camera, the smart face mask inspection system developed by O-Net can obtain excellent images of each mask. The system can then use the alignment algorithm to check whether the face mask meets standards.

In the inspection process, the system finds the center and corners of the covering part of face masks via the image acquired (Figure 2), to identify products that are miss-happen. Exact measurement of face masks can also be done. With the center confirmed, the software defines the region of interest (ROI) as well as the baseline, to measure the specific size of a face mask and determine whether it meets standards.

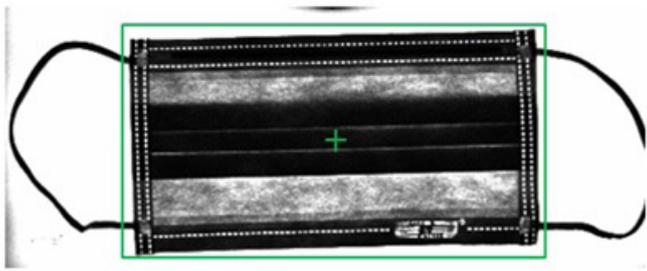


Figure 2: The center of a face mask

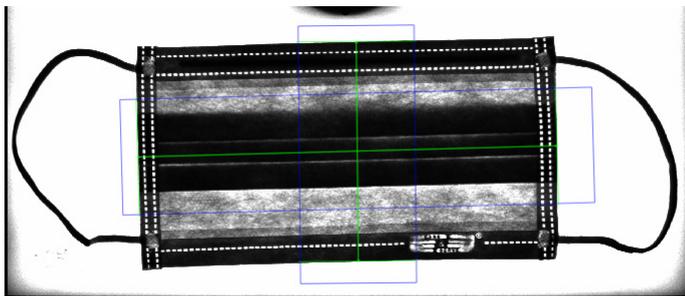


Figure 3: Size measurement of a face mask

Non-woven fabric allows some light to get through, but extra layers can significantly increase its opacity. Thus the folded section of a face mask will appear much darker than the rest in the image. In Figure 4, the upper and bottom part of the face mask appear pale; O-Net's software is configured to accept an image where the paler area is 374550 pixels in size. By contrast, the paler area drops to only 28894 pixels, which is almost ten times less, when two face masks overlap (Figure 5). By using such features, O-Net's system determines whether the face masks are overlapping.

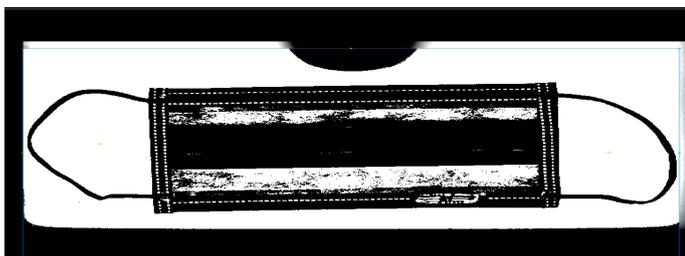


Figure 4: Area of light permeability of one face mask is 374550 pixels

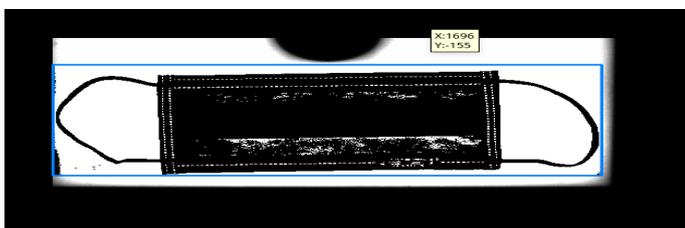


Figure 5: Area of light permeability of two face masks is 28894 pixels, which is almost ten times less

Inspection of ear loops focuses on whether the length of loops and the positions of the fixation points meet the set standards. In the image analysis process, ear loops can be defined as curved lines. The software will detect and extract these curved lines and determine whether they are broken (Figure 6), and if not, calculate their length (Figure 7). The system can detect the fixing points of the ear loops in the image (Figure 8) and measure the distances between the fixation points and their respective neighboring edges, to determine whether they meet standards (Figure 9).

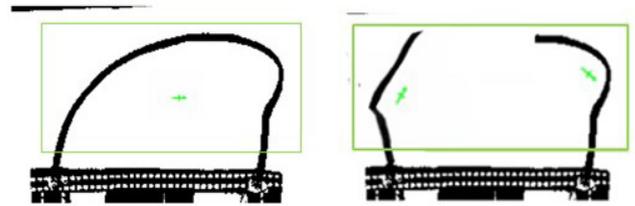


Figure 6: To detect whether a ear loop is broken

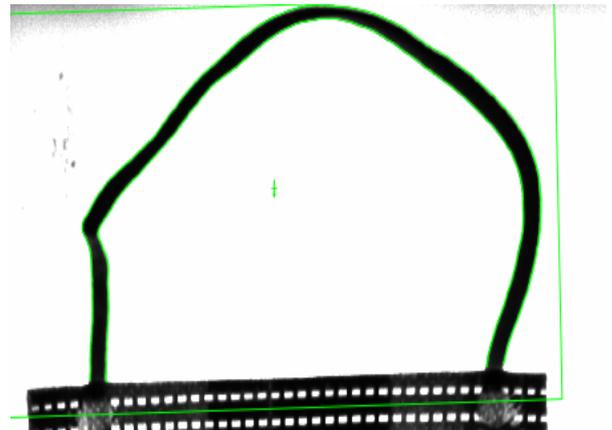


Figure 7: Length measurement of the ear loop

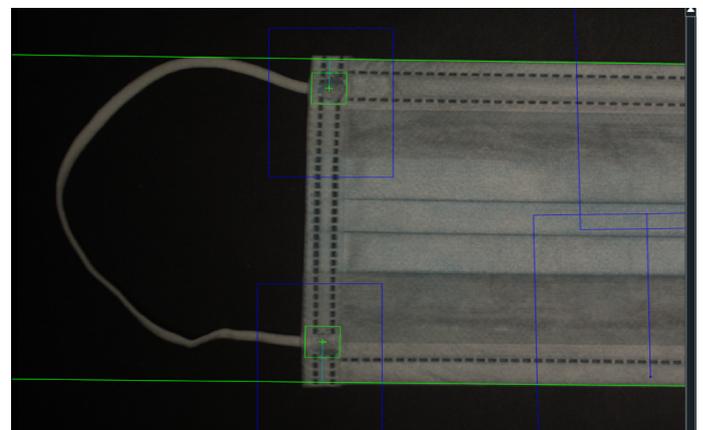


Figure 8: Ear loop fixation points on a face mask

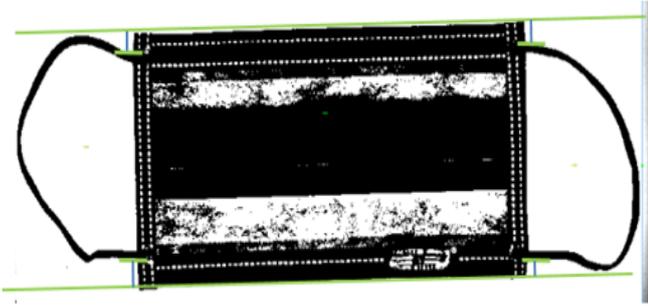


Figure 9: Position inspection of ear loop fixation points

Inspection of the length and position of the metal strip in a face mask is also required. By using the customized lighting, the inspection image can show both the metal strip inside and the non-woven fabric wrapping it. Once the ends of the metal strip are found in the image, the length can be calculated (Figure 10). Meanwhile, two baselines are drawn to check that the position of the metal strip is centered (Figure 11).

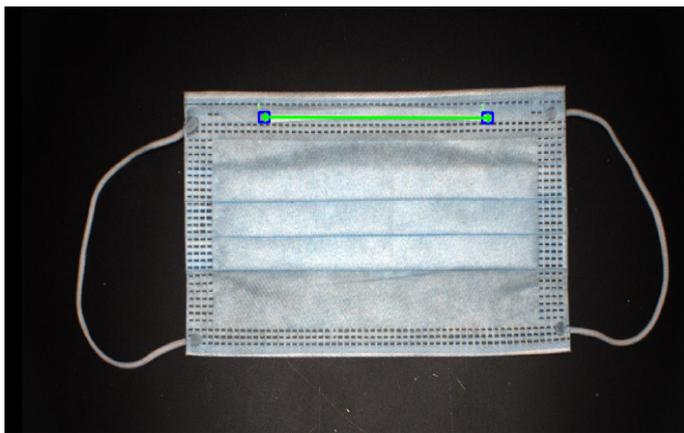


Figure 10: Size measurement of metal strip

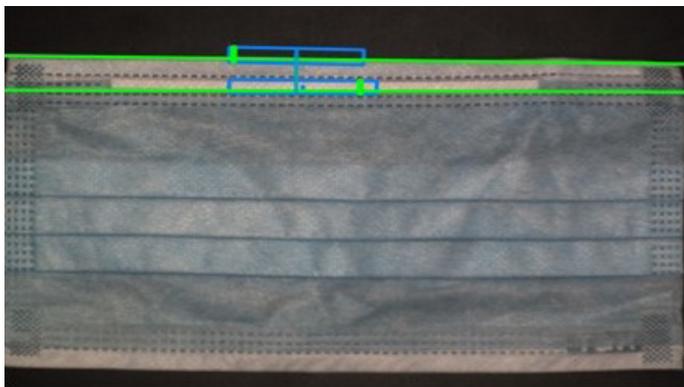


Figure 11: Position inspection of metal strip

Lastly, the edges of a face mask also need inspection. The system needs to check whether the pitting on the edges is well aligned. Two green baselines are defined based on the outer margins of a face mask. Then the vertical distance from each pitting line to the baselines is measured, so that the system can tell if the pitting on the edges is well aligned (Figure 12).

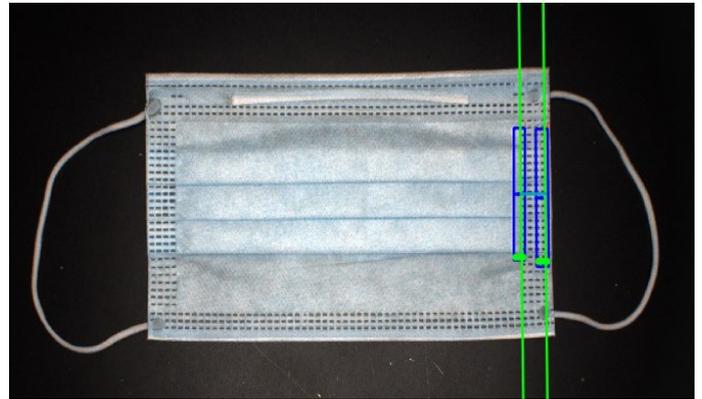


Figure 12: Edge inspection

The vision inspection systems developed by O-Net can effectively automate the tedious quality check process and significantly improve product conformity rate. On average, each system can replace up to four skilled human inspectors. In factory applications, the visual inspection system usually runs uninterrupted for long periods; therefore system stability is essential. O-Net decided on the Basler ace acA2440-20gm camera, due to the well-known stability of this key vision component. Mr. Wang, sales manager of O-Net, explains that “the stability of Basler cameras has helped save considerable maintenance costs. Our system development is quite smooth thanks to the Basler pylon Camera Software Suite, as it’s genuinely a developer-friendly software suite, and a short time-to-market gives us competitive advantages. The vision market is booming in China and speed is vital. Our customers are demanding ever-faster delivery, so the fast and reliable lead time ensured by Basler China is another attractive reason for us to work together.”

The smart software system offers high compatibility and can be customized, as O-Net develops everything from operator interface to architecture. This type of vision inspection software solution can apply to many applications.

Technologies Used

- Camera: Basler ace acA2440-20gm
- Lighting: Customized BT series lighting
- Software: SV Smart Vision System by O-Net

More Information

<http://www.o-netindustry.com/>



Basler ace - acA2440-20gm

For information on Disclaimer of Liability & Privacy Statement please see www.baslerweb.com/disclaimer

©Basler AG, No.1, 04/2020

Basler AG
Germany, Headquarters
Tel. +49 4102 463 500
Fax +49 4102 463 599
sales.europe@baslerweb.com
www.baslerweb.com

Basler, Inc.
USA
Tel. +1 610 280 0171
Fax +1 610 280 7608
sales.usa@baslerweb.com

Basler Asia Pte Ltd.
Singapore
Tel. +65 6367 1355
Fax +65 6367 1255
sales.asia@baslerweb.com

BASLER
the power of sight