HIGH SPEED REAL TIME BISCUIT INSPECTION SYSTEM

IMPORTANCE OF BISCUIT INSPECTION SYSTEM:

Since the biscuit belongs to premium class, quality of the biscuit is very important. Cracks over the biscuit, improper baking, non-uniform distribution of nuts, improper shape etc will cause consumer complaints. Therefore a real time high speed biscuit quality inspection system is sufficient for detecting proper biscuits and rejecting false biscuits.

Figure: Biscuits with Rich nuts on it

CURRENT FOCUS OF RESEARCH

The existing bakery inspection systems are inefficient to give the real time robust inspection of the quality of the biscuits. The focus of the Research in the area of biscuit inspection is to build a robust and high speed system which will process 5 biscuits per second with a false rejection of 1%. Also the work focus on exact crack detection, shape detection, proper bake detection and no: of almond detection.

APPLICATION OF BISCUIT INSPECTION SYSTEM

This work is an industrial application which will decide the quality of the rich biscuits. It can be built in real time. As a part of NDA (Non Disclosure Agreement), the name of the company and biscuit model are kept confidential.

PROBLEM DEFINITION

- To find out whether the Biscuit is in proper circular shape or not.
- To find out absolute color gradient of the biscuits.
- To find out whether it is properly baked or not.
- To find out the proper quantity of the nuts on the biscuits.
- To find out cracks on the biscuit.

RESEARCH OBJECTIVE:

The objective of the work is to design, implement and verify a computer vision system for quality control of the biscuit.

PERFOMANCE MEASURES:

Inspection speed : 5 biscuits per second
Error allowance :
False rejection : 1 %
False selection : 0.1 %

TOOLS:

- Scientific python
- OpenCV
- Linux
- IBM PC or ARM architecture

METHODOLOGY:

1.Image Aquisition: After production and baking, biscuits comes through a conveyor belt and a camera mounted above the belt. Camera will capture each biscuit frame as they comes.

2.Changing Colour Space: Each RGB biscuit frame is then conveted into gray and HSV colour space.

3.Colour Picker: HSV Biscuit colour is picked through mouse clicks.

4.Thresholding: Using minimum and maximum of hue and saturation a threshold is set. Using the threshold, a binary biscuit mask is created.

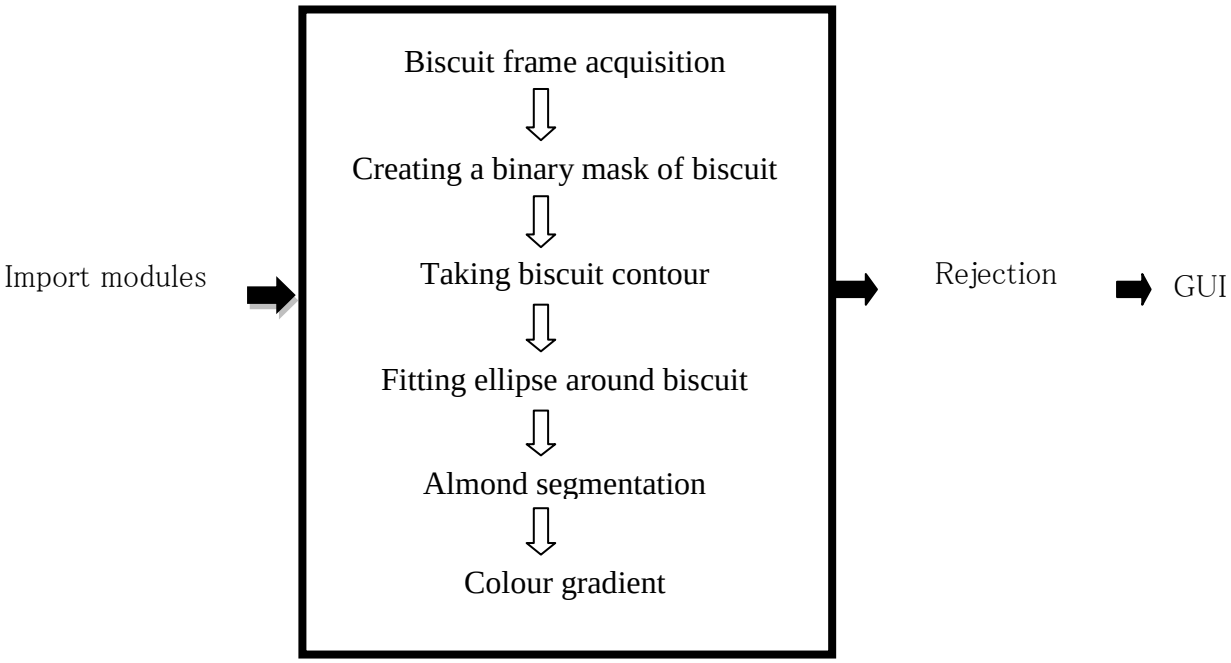
5.Contours and hierarchy: Coutour of binary mask and maximum area of biscuit is foundout. Then biscuit region is filled with exact biscuit colour and background is set to black.

6.Ellipse Fitting: An ellipse is fitted over the biscuit and its major axis and minor axis is calculated. If the difference between major and minor axis is lage, then it shows the indication of cracks and those biscuits are rejected out.

7.Almond Mask creation: Almond colour picker is created and threshold is determined. Then no: of almonds is counted and area is calculated.

8. Baking curve: Variation in colour from centre of biscuit towards edge is plotted. Using graph values, it is possible to find out whether biscuit is overcooked or under cooked. Only normal ones are kept and others are rejected.

FLOW CHART:


Import modules
Biscuit frame acquisition
Creating a binary mask of biscuit
Taking biscuit contour
Fitting ellipse around biscuit
Almond segmentation
Colour gradient
Rejection
GUI