

Figure 4: flowchart of complete work in this research

In mode2 the flag value turns 1, 2, and 3 as per the area threshold of different values. Shape and size classification are very important for packing purpose. Here we have taken tomato for our analysis part. Size is estimated by calculating the area covered by tomato. To capture area, first the tomato is binarised to separate the tomato image from its background. Then the numbers of white pixels are calculated which gives us the estimation of area. Tomatoes are classified in three categories according to the projected White areas as shown in fig 5. Table1 shows the range of pixels value for considering big,, medium, and small tomato Similar is the case for green & yellow color part.

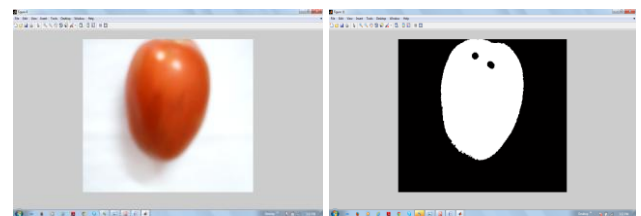
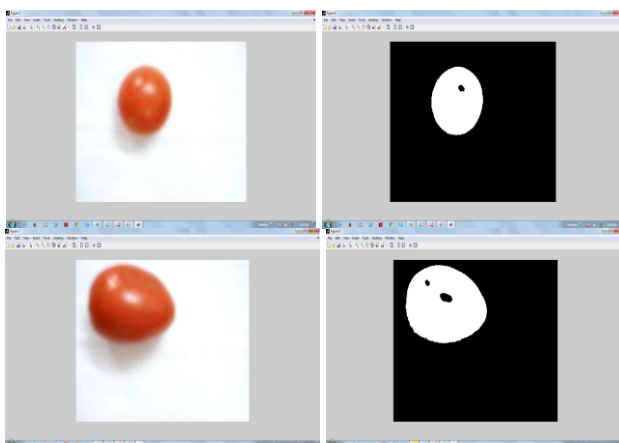


Figure 5: Resultant image obtained in shape and size based sorting

Table 1: showing projected white pixel area for classification based on size of tomato

Grading tomato	no	Min. (pixel)	Max. (pixel)	Average (pixel)
Small category	14	1000	80000	40500
Medium category	23	80000	170000	125000
Big category	55	170000	250000	210000



Mode 3 is spot detection. For spot detection we are creating a bounding box across the white detected region. In that region we are checking for number of zeros found. If the number of zeros (black pixel) is greater than a threshold which is decided by user than t red spot _flag or goes high else its zero, thus good quality and bad quality fruits or vegetables can be distinguished. Here while experiment we have taken red colored tomato for spot detection, but we can choose any colored vegetable, just we will have to do little calibration. Snapshots of the processed images for spotted tomato i.e.

defected tomato original image and corresponding its binary image is shown in figure 6.

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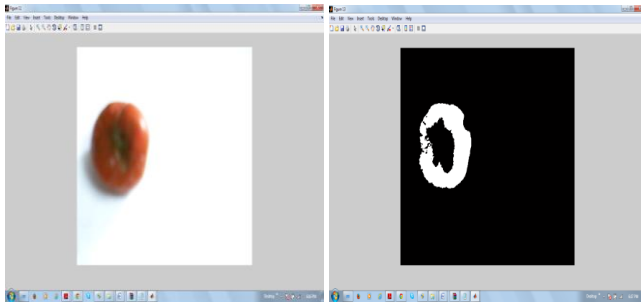


Figure 6: Resultant image obtained in quality based sorting

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