**Results and Discussions**

After analysis of the methods, various methods have slowly proven to improve accuracies for fruit recognition. Initial methods were restricted to extrinsic parameters like colour and hence proved to be inaccurate. Further the process was expanded to intrinsic parameters like shape and contours which resulted in better results.

The setup and input is semi-ideal situation taken at constant lighting, extreme light conditions are yet to be tested. A fair assumption that the software would work can be made due to the usage of intrinsic parameters.

An approximate accuracy (specific accuracy can’t be obtained as it has to be done manually over video stream) of 70% is obtained on far distanced images( >170cm) and an accuracy of over 90% is obtained when the images are close to the camera(<90cm).

The below chart depicts the rise in accuracies based on the various methodologies added.

The below showcases various inputs (frames taken from the video stream) and the stalk recognized produced on that frame is shown as the output.

**Automated and Manually Coded Modules**

There are a few modules that require certain parameters to be calibrated and readjusted. This can be entered on UI and include distance, focal-length, ratio of dilate and erode cycles for morphology HSV threshold values, real-life width of the fruit to track and the input live video stream.

The modules which use these attributes as input shall be our manually coded modules:

1. Main method
2. get\_color\_mask(image):
3. apply\_morphology(mask):
4. get\_width():
5. get\_distance\_to\_camera(knownWidth, perWidth):

The modules which uses these parameters to derive internal values can be classified as automated modules. These are:

1. get\_contours(image):
2. get\_window(contour\_val):
3. camshift(fruit\_image,fruit\_window,cap):
4. track\_fruit(fruit\_contour,fruit\_window,cap,pd):.
5. get\_distance(p1,p2):
6. get\_direction(window,distance,pivot):
7. move\_drone(img,direction,msg):
8. find\_stalk(tracked\_contour,tracked\_contour\_image):

**Conclusions**