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Faculty of Engineering
Egyptian Russian University
Mechatronics And Robotics Department

Real-Time Object Detection Using MATLAB and IP Camera

Digital Signal Processing (ME)

Under Supervision of

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Submitted by

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Project Introduction

Objective &Key Technologies:

Objective:

To detect and highlight objects in real-time video streams using MATLAB and an IP camera.

Key Technologies:

- MATLAB
- Image Segmenter
- IP Camera Integration

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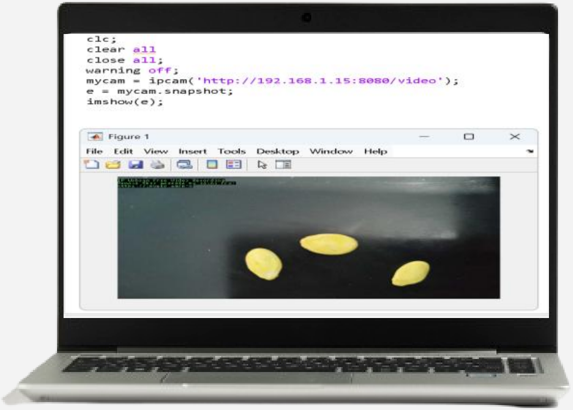
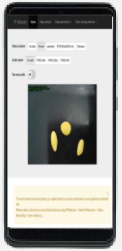


```
clc;
clear all
close all;
warning off;
mycam = ipcam('http://192.168.1.15:8080/video');
e = mycam.snapshot;
imshow(e);
```



System Overview

- Components:
    - IP Camera (network camera streaming video)
    - MATLAB (for processing and visualization)
- Workflow:
    - Capture video from IP camera
    - Process each frame
    - Detect objects
    - Display results in real-time

Capturing Video from IP Camera

MATLAB Code:

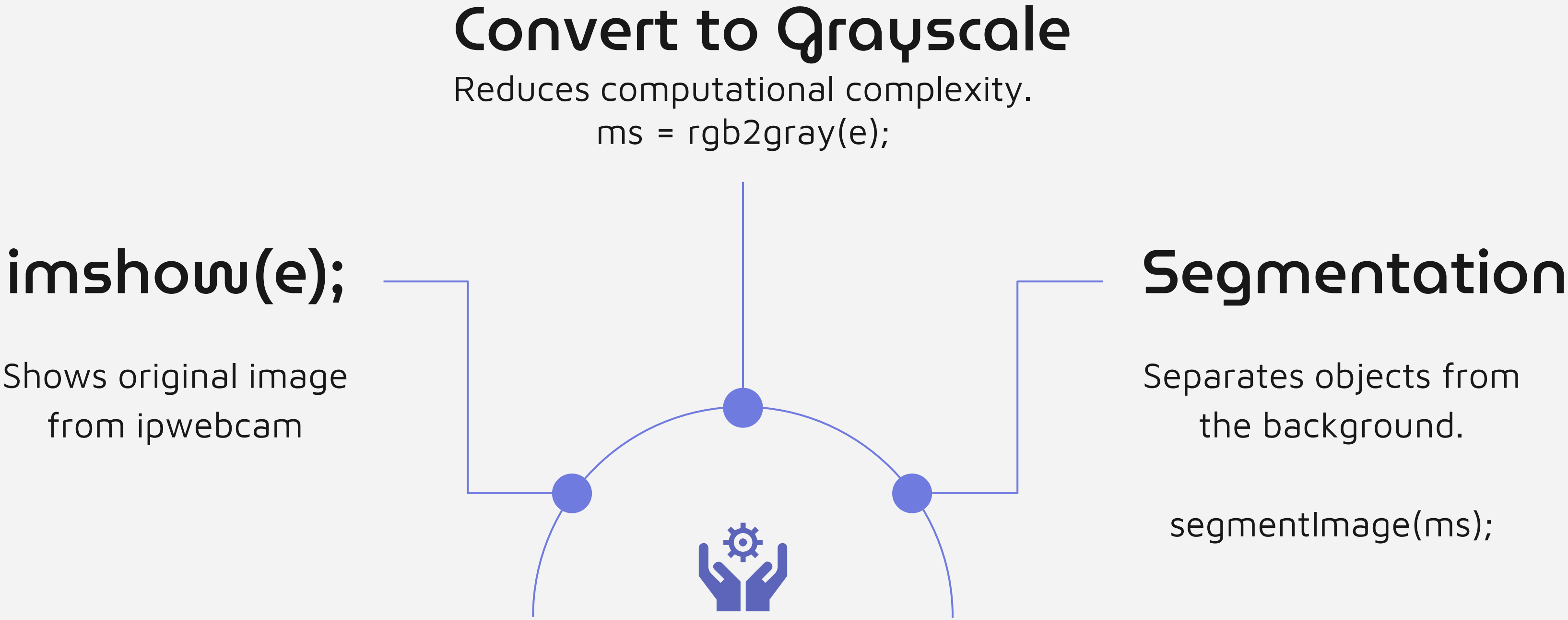
```
mycam = ipcam('http://192.168.1.101:8080/video');
```

Explanation:

Connects MATLAB to the IP camera using its network address.

Continuously captures frames for processing.

Image Preprocessing



Convert to Grayscale

Reduces computational complexity.

ms = rgb2gray(e);

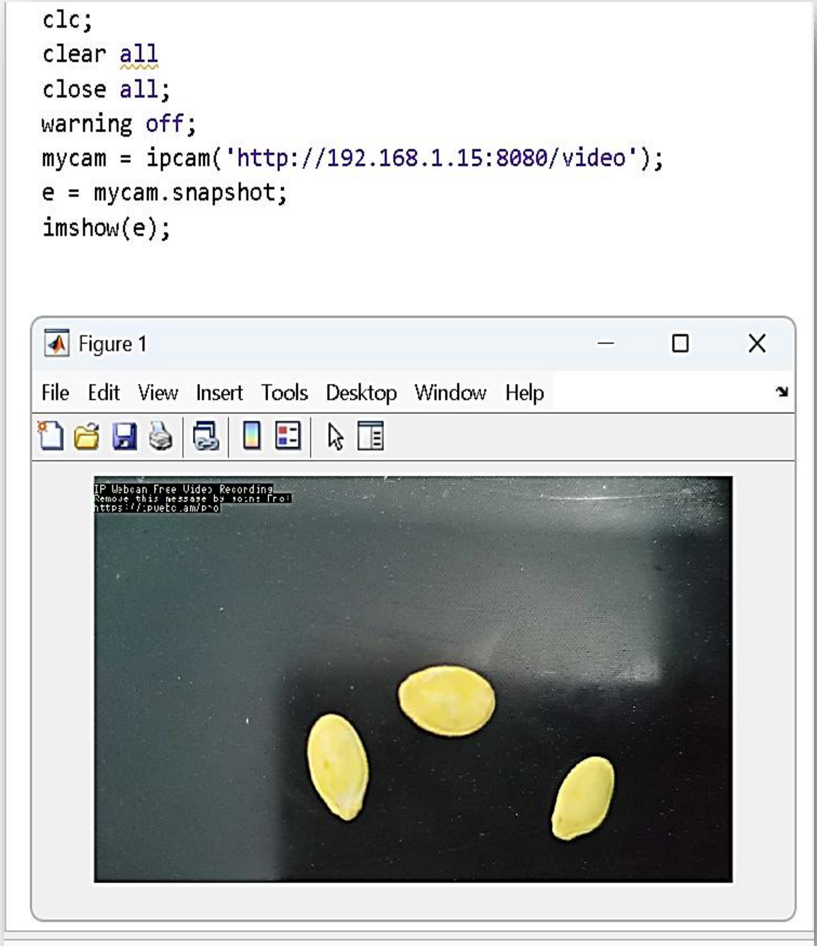
imshow(e);

Shows original image from ipwebcam

Segmentation

Separates objects from the background.

segmentImage(ms);



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imshow(e);
```

Figure 1
File Edit View Insert Tools Desktop Window Help
IP Webcam Free Video Recording
Remove this message by going Pro!
https://ipwebc.am/pro

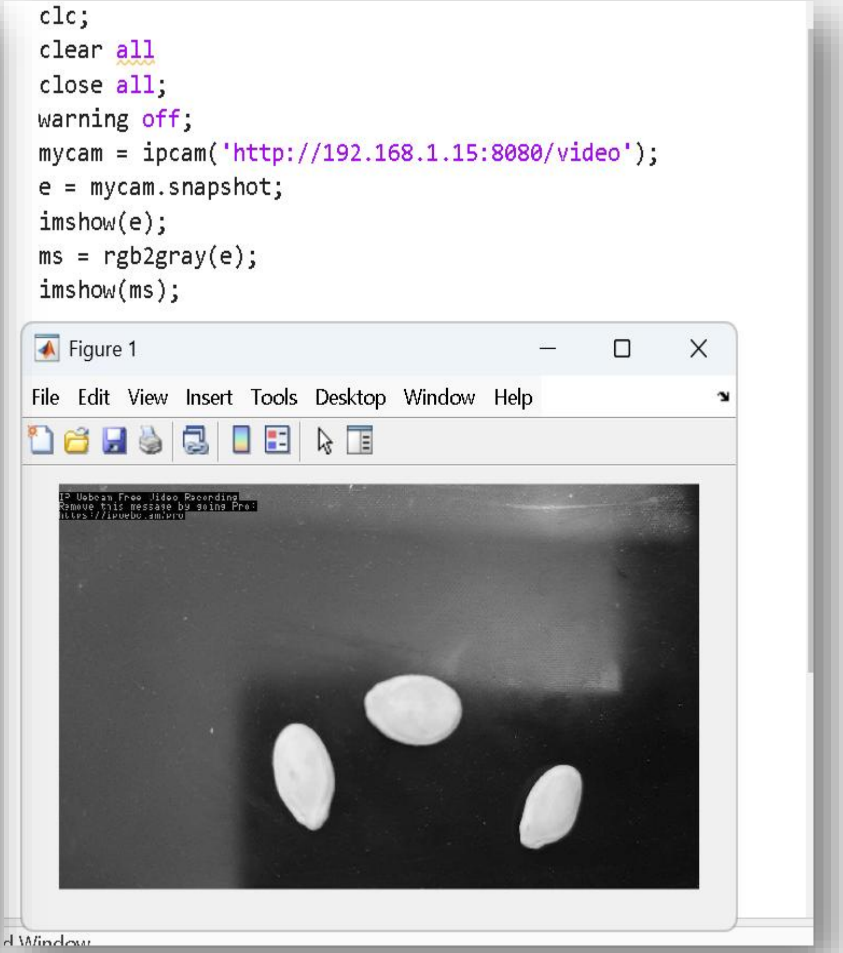

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Figure 1
File Edit View Insert Tools Desktop Window Help
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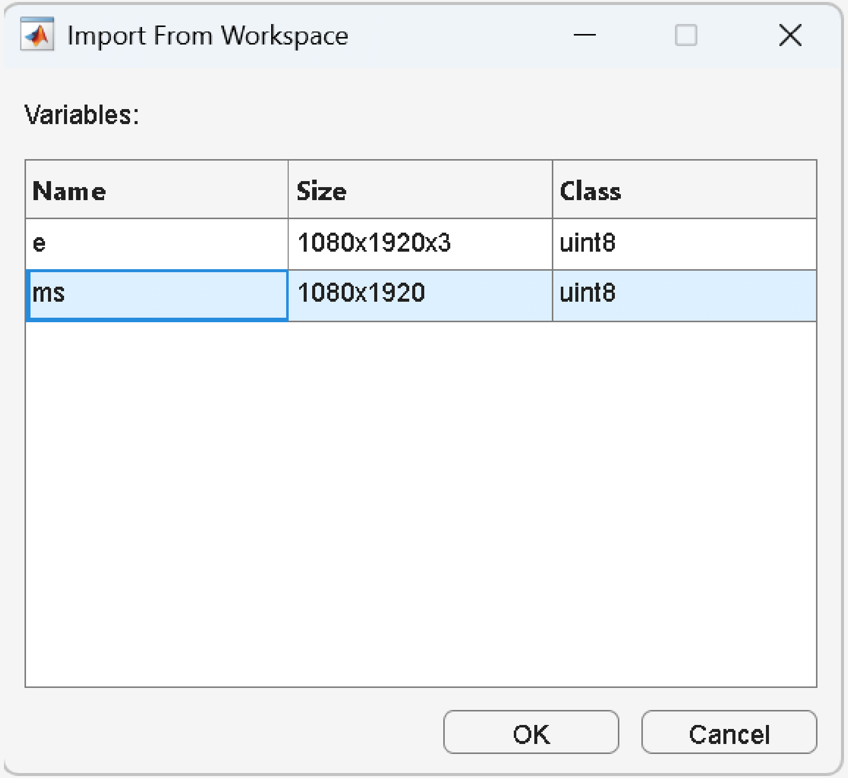
Remove this message by going Pro!
https://ipwebc.am/pro
d Window

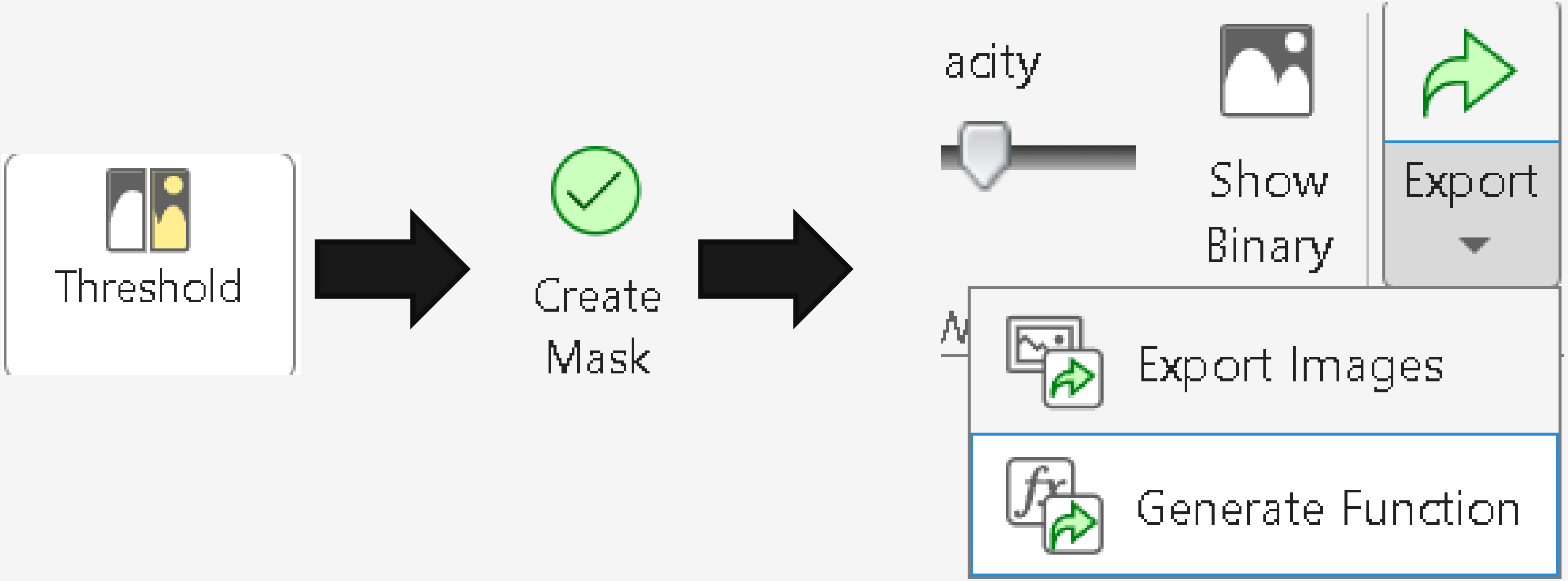
Load Image ▾

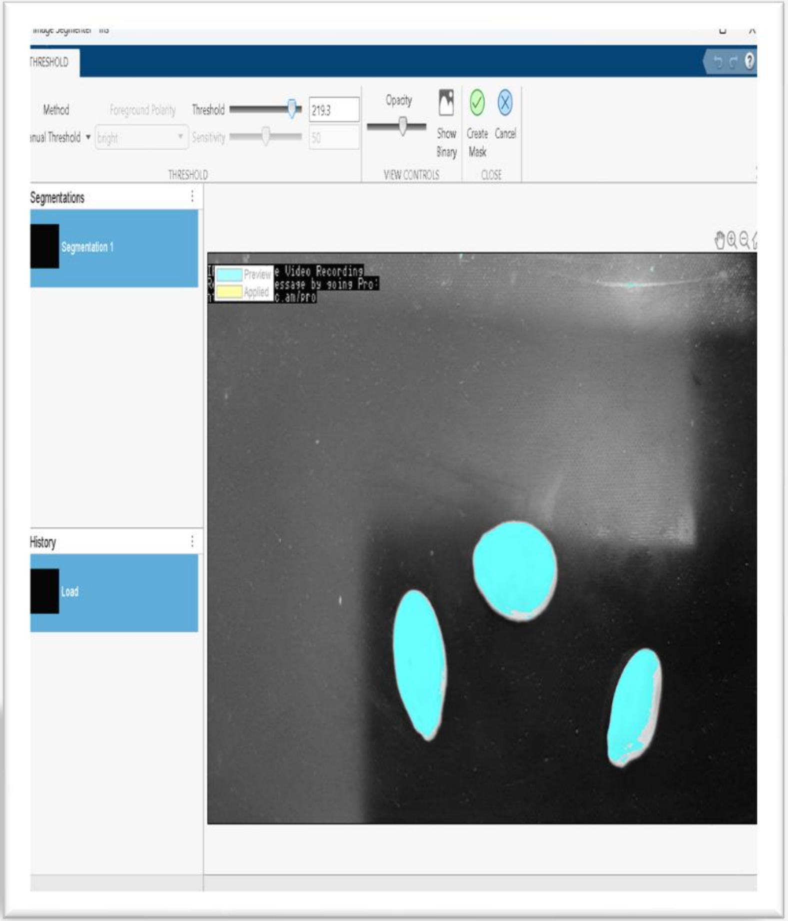


Import From Workspace

Variables:

Name	Size	Class
e	1080x1920x3	uint8
ms	1080x1920	uint8


Threshold
Create Mask
acity
Show Binary
Export
Export Images
Generate Function



Method: nual Threshold

Foreground Polarity: bright

Threshold: 219.3

Sensitivity: 50

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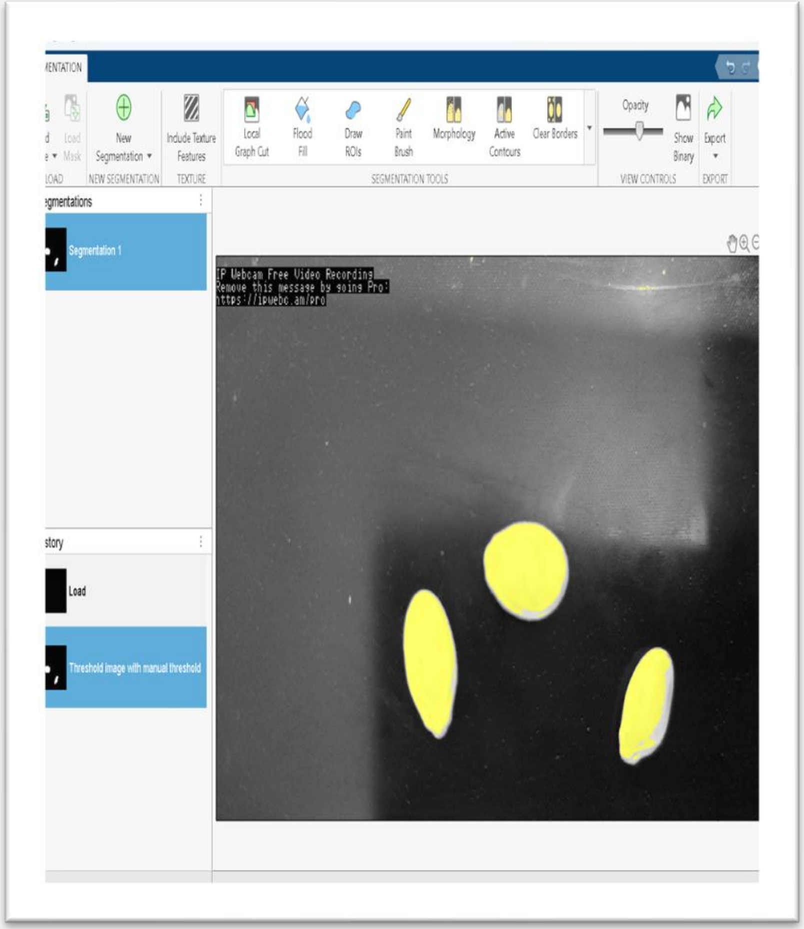
c.am/pro



Threshold image with manual threshold

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https://ipwebc.am/pro

Object Detection & Noise Removal

Thresholding:

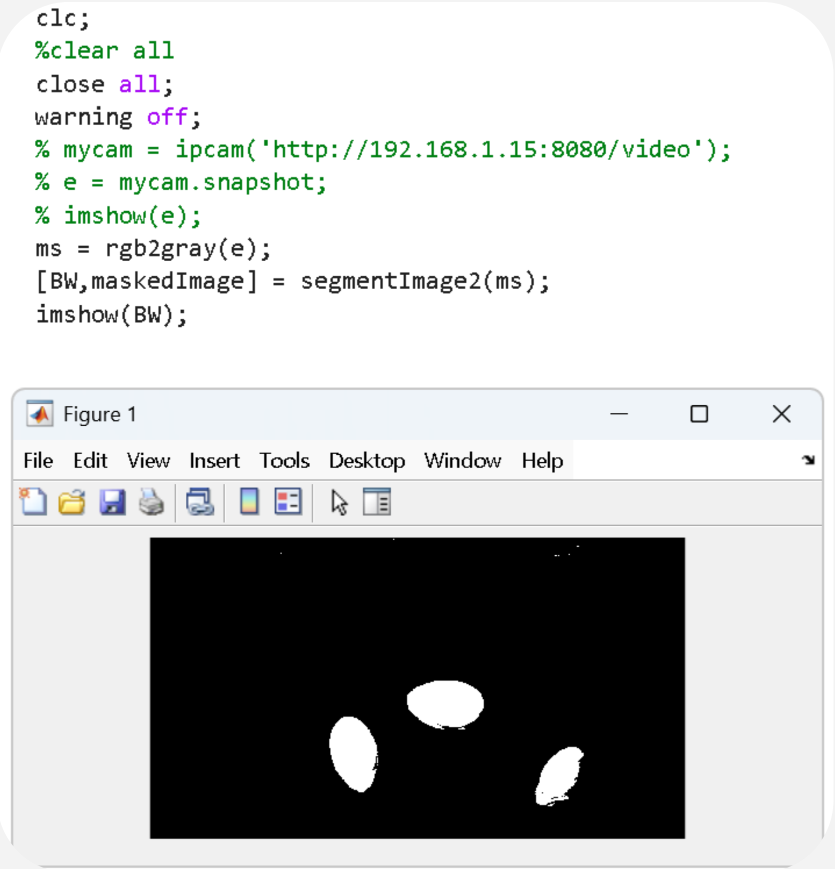
Converts grayscale to binary image for easier object detection.

Noise Removal:

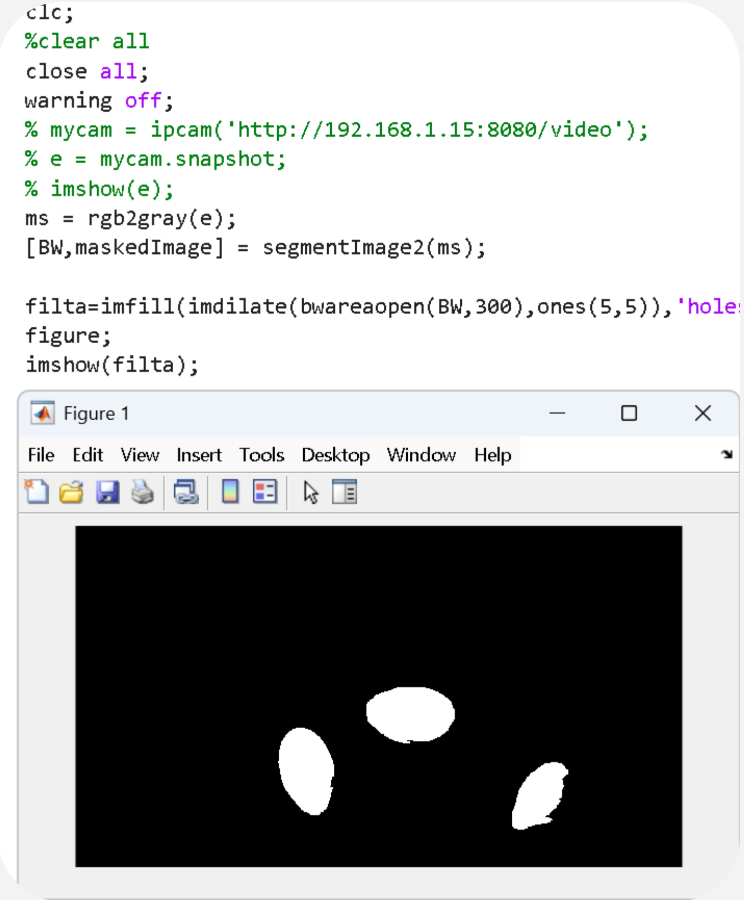
Removes small objects/noise using morphological operations:

Labeling Objects:

bwlabel identifies connected components
.



```
clc;
%clear all
close all;
warning off;
% mycam = ipcam('http://192.168.1.15:8080/video');
% e = mycam.snapshot;
% imshow(e);
ms = rgb2gray(e);
[BW,maskedImage] = segmentImage2(ms);
imshow(BW);
```



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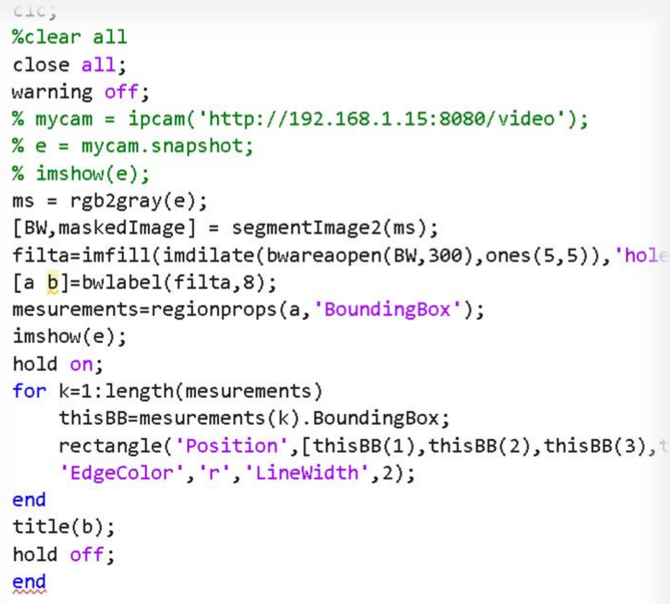
% e = mycam.snapshot;
% imshow(e);
ms = rgb2gray(e);
[BW,maskedImage] = segmentImage2(ms);

filta=imfill(imdilate(bwareaopen(BW,300),ones(5,5)),'hole
figure;
imshow(filta);
```

Drawing Bounding Boxes

- **Bounding Box Extraction:**
  - regionprops ot desu rof sexob gnidnuob teg tcejbo detceted hcae
  - **Visualization**: Draws red rectangles around detected objects in each frame.



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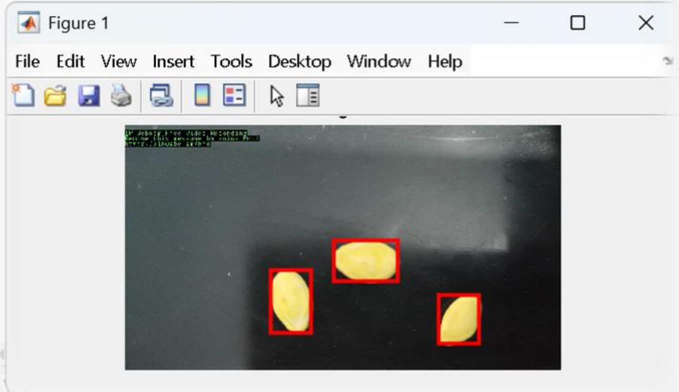
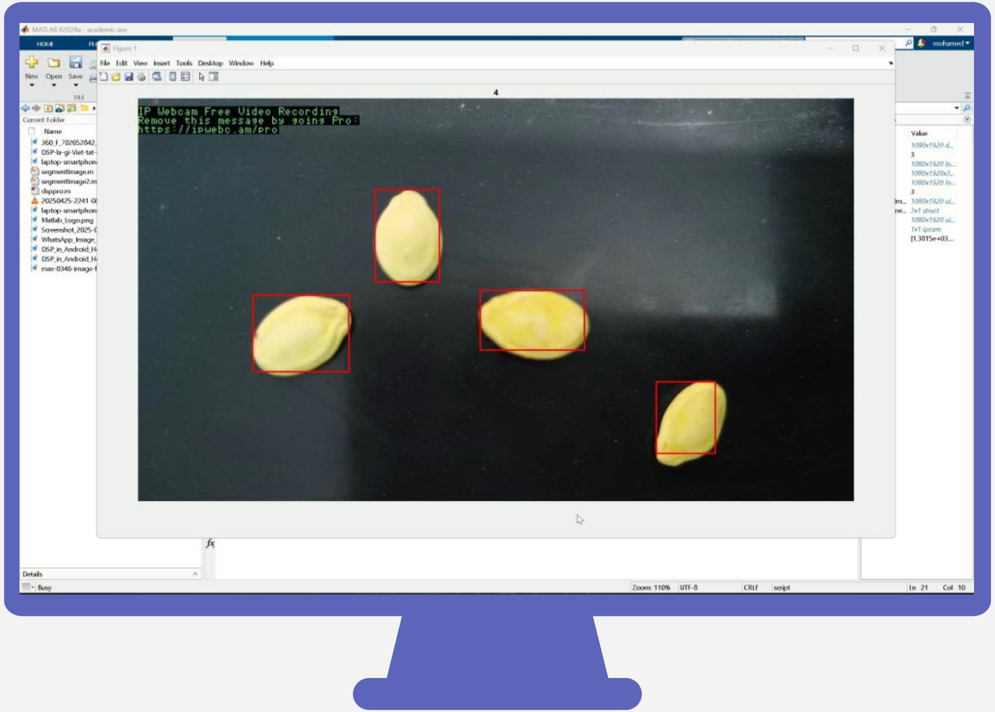
% imshow(e);
ms = rgb2gray(e);
[BW,maskedImage] = segmentImage2(ms);
filta=imfill(imdilate(bwareaopen(BW,300),ones(5,5)),'hole
[a b]=bwlabel(filta,8);
mesurements=regionprops(a,'BoundingBox');
imshow(e);
hold on;
for k=1:length(mesurements)
    thisBB=mesurements(k).BoundingBox;
    rectangle('Position',[thisBB(1),thisBB(2),thisBB(3),t
    'EdgeColor','r','LineWidth',2);
end
title(b);
hold off;
end
```



Real-Time Display

- The process runs in a loop for real-time detection and display.
- User Interface:
- Shows original video with detected objects highlighted.



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Applications

-Security and surveillance
-Industrial automation
-Smart home monitoring
-Research and education

Conclusion

Summary:

-Demonstrated real-time object detection using MATLAB and an IP camera.

-Showed key steps: capturing, preprocessing, detection, and visualization.

Future Improvements:

-Enhanced object classification

-Integration with machine learning models