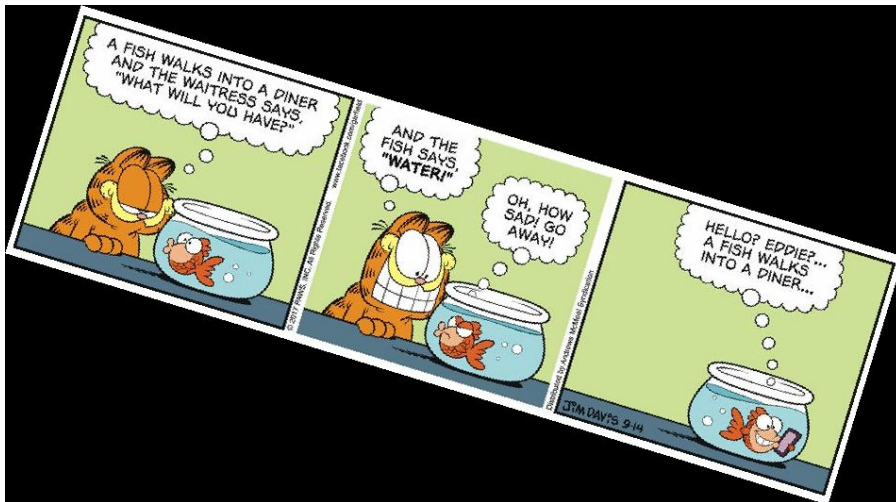
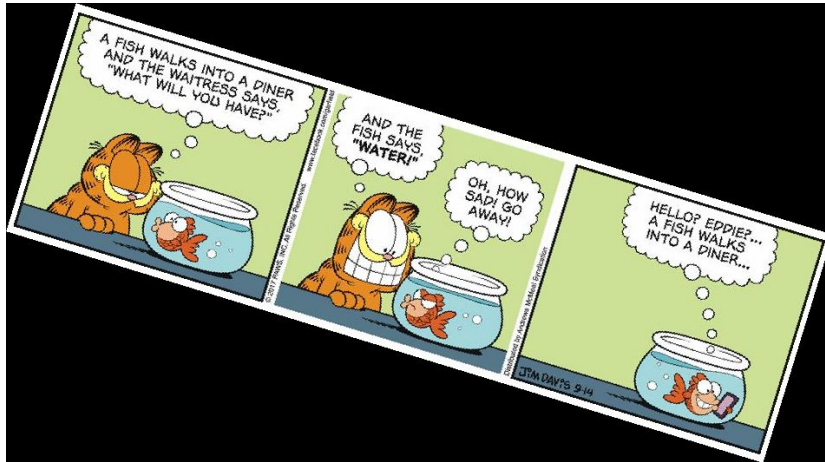


# Problem and Goal

Re-orientate comic and blacken the background in all instances where Garfield is present while retaining foreground elements such that the comic remains readable.



# Key Stages



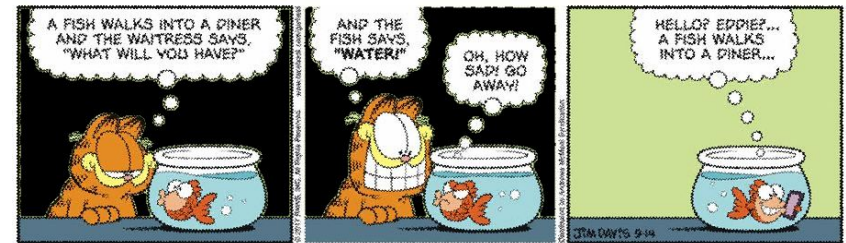
Re-Orientate Comic



Find Frames



Detect Garfield



Blacken Background

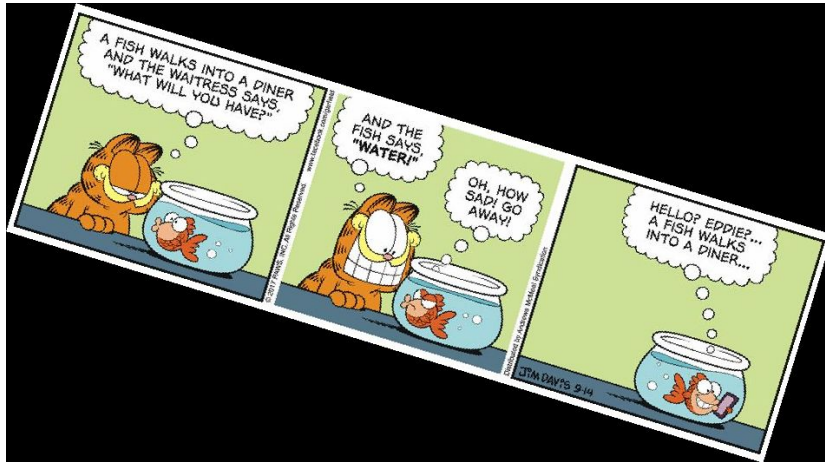


e

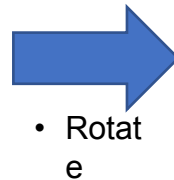
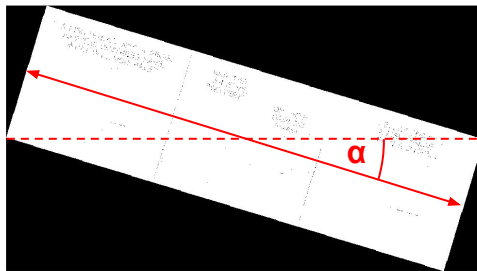
e

e

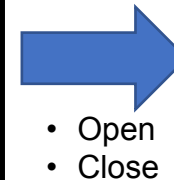
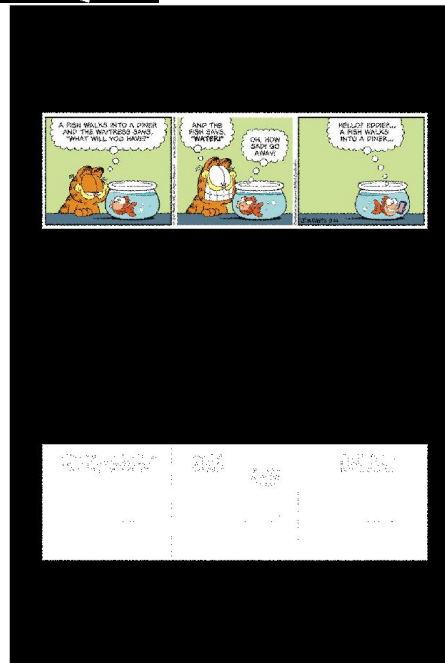
# Re-Orientate Comic



- Threshold
- Label Region
- Major Axis
- Angle



- Rotate



- Open
- Close



- BoundingBox
- Crop

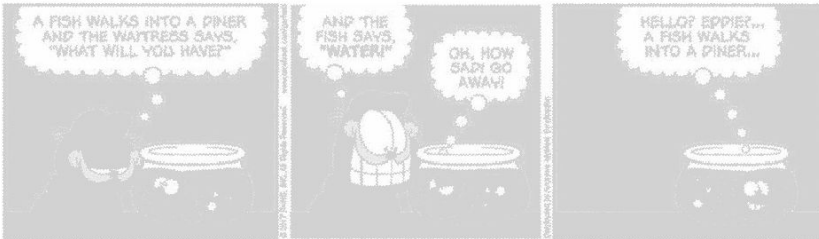




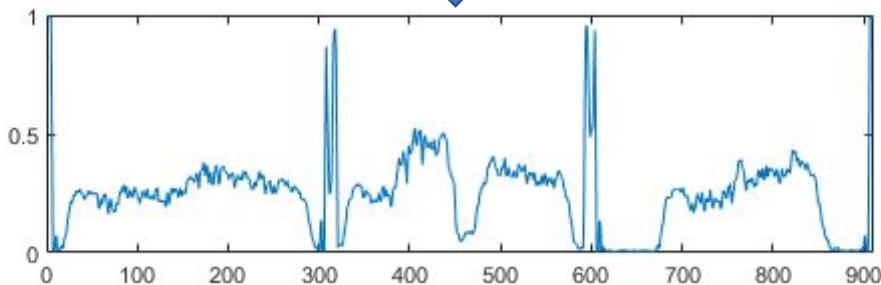
# Find Frames



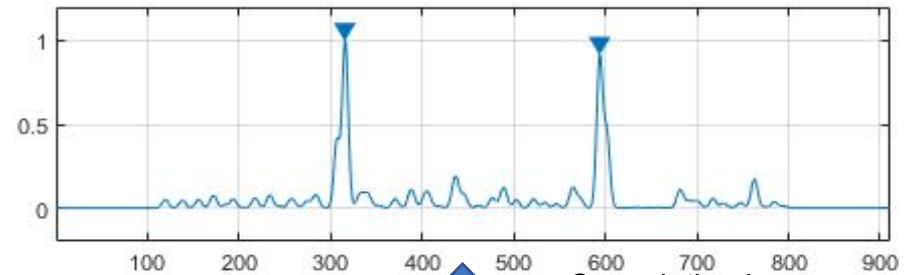
- Threshold



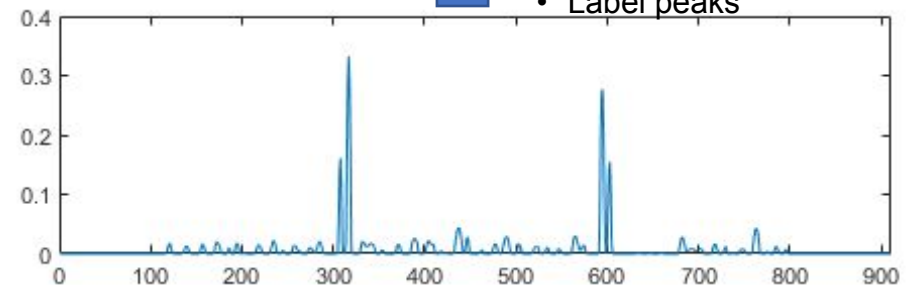
- Column-wise mean



- Define frame edges



- Convolution by Gaussian
- Label peaks

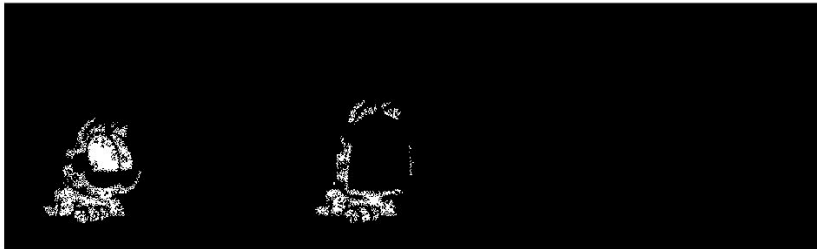


- Convolution by Laplacian of Gaussian
- Invert
- Truncate

# Detect Garfield



- Detect Garfield Orange



- Detect pixel

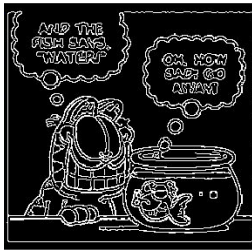


- Close
  - Erode
- (remove spurious false positives)

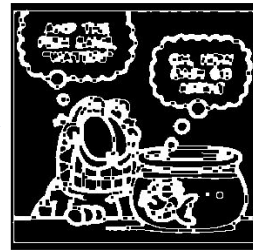
# Blacken Background - I



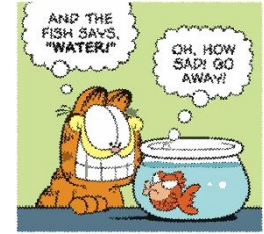
- Canny edge detection



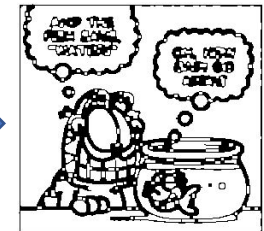
- Draw border
- Close (fill breaks in edges)



- Complement
- Label 4-connected components



- Set each region to median colour



Variable colours in background



Frames with and without borders



Colour artefacts due to poor image quality

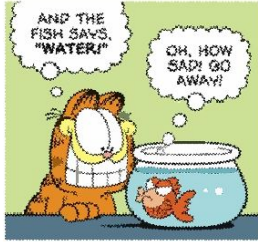
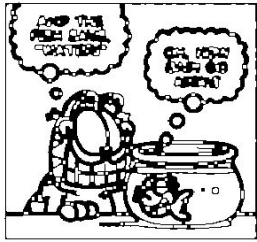


Clutter

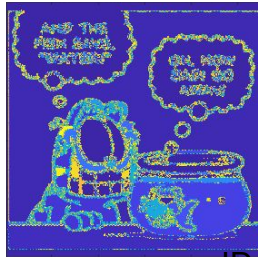


Foreground similar colour as background

# Blacken Background - II



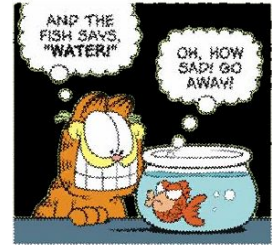
- K-Means Clustering on colour
- Label colour segments



- ID largest colour segment or largest region (not white)
- Set as background
- Aggregate regions of similar colour



- Label 4-connected components
- Remove spurious elements



- Apply to colour image



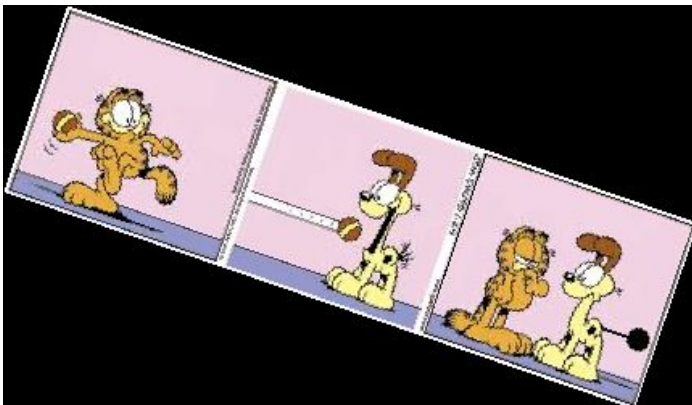
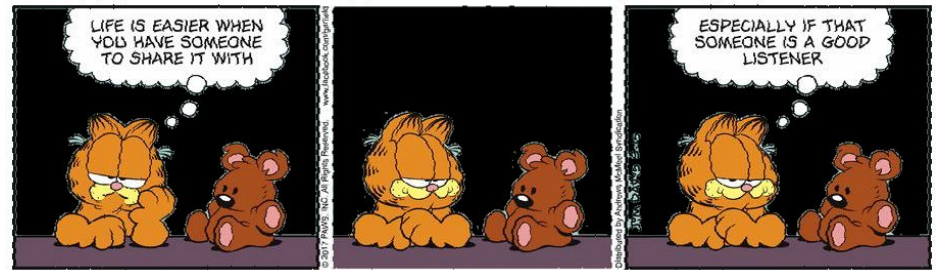
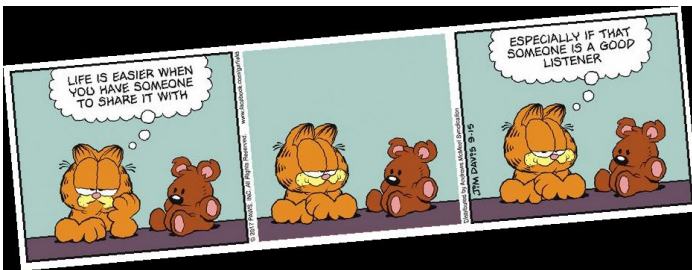
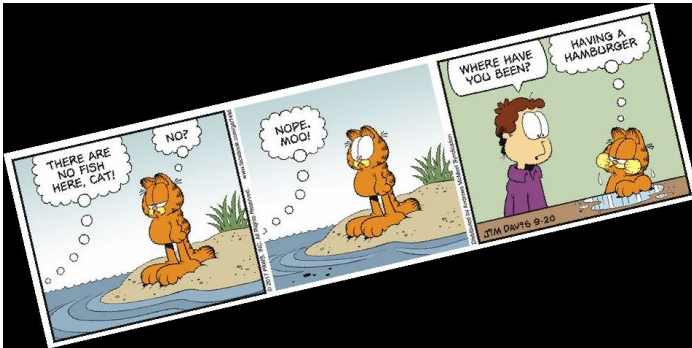
- Complement
- Erode (for soft boundary)





# Results

- Training Set: 15 / 15
- Test Set: 10 / 10
- Validation Set: 12 / 15



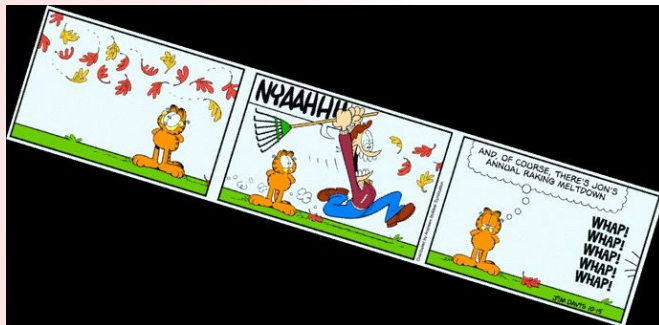
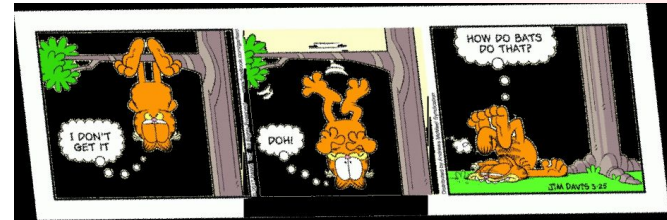
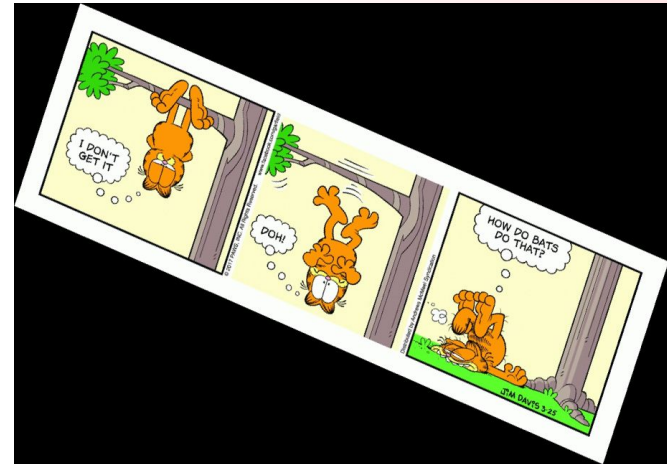
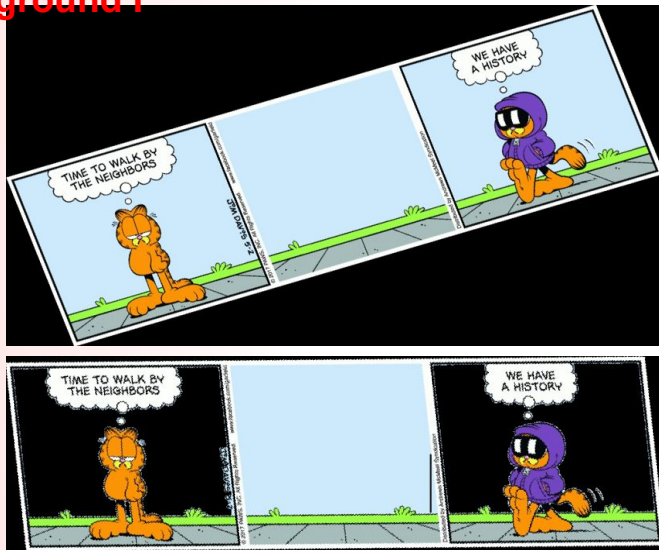


# Results

- Training Set: 15 / 15
- Test Set: 10 / 10
- Validation Set: 12 / 15

**Original comic is skewed (unanticipated feature)**

**Affects Re-orientation and Blacken Background I**



**Background and foreground same colour – almost white**

**Affects Blacken Background II**



