PRINCIPLES OF ARTIFICIAL INTELLIGENCE
LABORATORY PROGRAMS

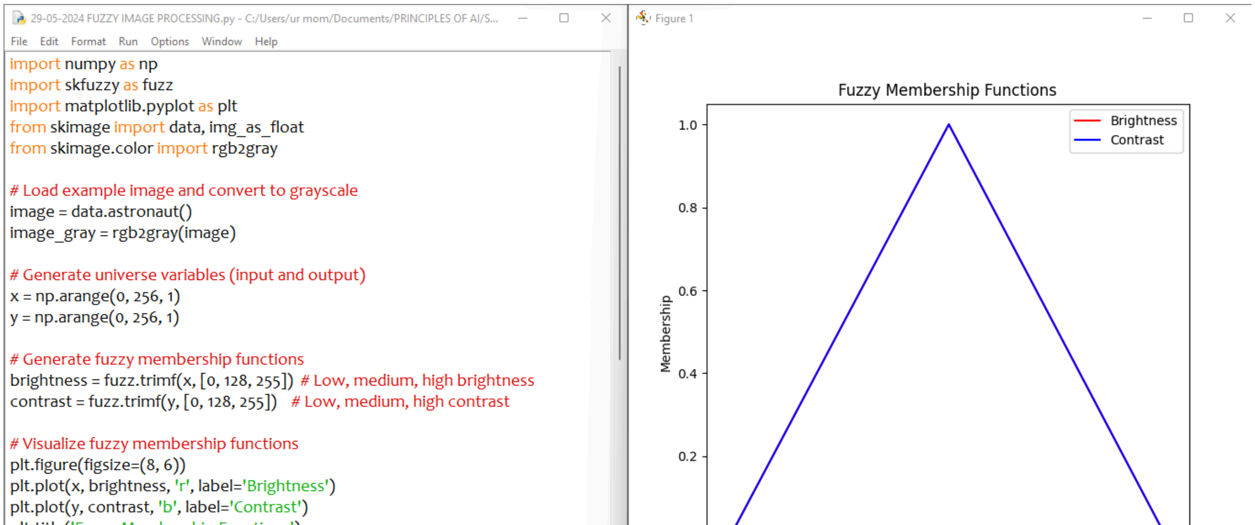
FUZZY-LOGIC IMAGE PROCESSING:

SOURCE CODE:

```
import numpy as np
import skfuzzy as fuzz
import matplotlib.pyplot as plt
from skimage import data, img_as_float
from skimage.color import rgb2gray

# Load example image and convert to grayscale
image = data.astronaut()
image_gray = rgb2gray(image)

# Generate universe variables (input and output)
x = np.arange(0, 256, 1)
y = np.arange(0, 256, 1)

# Generate fuzzy membership functions
brightness = fuzz.trimf(x, [0, 128, 255])  # Low, medium, high brightness
contrast = fuzz.trimf(y, [0, 128, 255])    # Low, medium, high contrast

# Visualize fuzzy membership functions
plt.figure(figsize=(8, 6))
plt.plot(x, brightness, 'r', label='Brightness')
plt.plot(y, contrast, 'b', label='Contrast')
plt.title('Fuzzy Membership Functions')
plt.xlabel('Pixel Intensity')
plt.ylabel('Membership')
plt.legend()
plt.show()
```

```
# Apply fuzzy logic to enhance contrast
brightness_level = 150  # Example brightness level
contrast_level = 200    # Example contrast level

brightness_membership = fuzz.interp_membership(x, brightness, brightness_level)
contrast_membership = fuzz.interp_membership(y, contrast, contrast_level)

# Use fuzzy rules to enhance image
enhanced_image = image_gray * (1 + (contrast_membership - 0.5)) *
brightness_membership

# Clip the values to be within the range [0, 1]
enhanced_image = np.clip(enhanced_image, 0, 1)

# Display original and enhanced images
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
plt.imshow(image_gray, cmap='gray')
plt.title('Original Image')
plt.axis('off')

plt.subplot(1, 2, 2)
plt.imshow(enhanced_image, cmap='gray')
plt.title('Enhanced Image')
plt.axis('off')

plt.show()
```

OUTPUT:


29-05-2024 FUZZY IMAGE PROCESSING.py - C:/Users/ur mom/Documents/PRINCIPLES OF AI/S...
File
Edit
Format
Run
Options
Window
Help
Figure 1
Fuzzy Membership Functions
Brightness
Contrast
Membership
1.0
0.8
0.6
0.4
0.2

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