**Programme: Higher Diploma in Artificial Intelligence and Robotics**

**Programme code: EG114728**

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| **Official Use** | | |
|  | Full Mark | Mark |
| **Total** | 100% |  |

**Module: AI and Programming**

**Module Code: MBS 3523**

**Assessment: Assignment 1**

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**Submission deadline: 13 March 2023, 9pm**

**Assignment 1**

**Question 1** (5%)

Type your GitHub account link.

Example Ans: <https://github.com/wysh2503/MBS3523-AI-and-Programming>

Answer: <https://github.com/noddycheung>

**Question 2** (10%)

Screen capture your PyCharm IDE with Webcam open, showing TWO windows, one with your face in **colour**, the other one with your face in **black and white**.

*# Requirement:*

*# Save the file on your Github as* ***MBS3523\_Asn1Q2.py*** *and attach the link in the submission*

*# Print the code and attach to this paper*

*# One screen capture with your face shown*

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| Your code here:  <https://github.com/noddycheung/cv2/blob/269286102b5dd616e4ad09721b9f274c96c6e2ae/MBS3523_Asn1Q2.py>  import cv2 print(cv2.\_\_version\_\_)  cam= cv2.VideoCapture(0) while True:  success,frame=cam.read()  grayImage = cv2.cvtColor(frame, cv2.COLOR\_BGR2GRAY)   (thresh, blackAndWhiteImage) = cv2.threshold(grayImage, 127, 255, cv2.THRESH\_BINARY)   cv2.imshow('Black white image', blackAndWhiteImage)  cv2.imshow('Original image', frame)   if cv2.waitKey(2)&0xff==27:  break cam.release() cv2.destroyAllWindows()  Screen Capture here: | |
| **Question 3 (20%)** |
| Write a python code to draw a bouncing ***box*** (80 x 80 px) on your webcam screen (showing your face) moving in two dimensions and when it reaches any boundary, it bounces back within the frame, i.e. the box will not go outside the frame.  The ***box*** can be started in any position on your frame.  Choose a starting angle, ɵ, between 15° to 75°.  Put the following text (font: FONT\_HERSHEY\_SIMPLEX, any color, any thickness) on top middle of your frame:  **“MBS3523 Assignment 1 – Q3 Name: Chan Tai Man”**  *# Requirement:*  *# Save the file on your Github as* ***MBS3523\_Asn1Q3.py*** *and attach the link in the submission*  *# Print the code and attach to this paper*  *# One screen capture with your face shown*  *# The box can be of any color and thickness you like*  *# Upload the result (the code and a screen capture similar to the one shown below) to Moodle* |

Sample output screen capture:

A picture containing text, person, indoor, wall

Description automatically generated



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| Your code here:  <https://github.com/noddycheung/cv2/blob/37f6846707a8fc9c4324751ac0684025836ffc0b/MBS3523_Asn1Q3.py>  import cv2 print(cv2.\_\_version\_\_) dispW = 640 dispH = 480 flip = 2 cam= cv2.VideoCapture(0) dispW=int(cam.get(cv2.CAP\_PROP\_FRAME\_WIDTH)) dispH=int(cam.get(cv2.CAP\_PROP\_FRAME\_HEIGHT)) BW=80 BH=80 posX=10 posY=270 dx=2 dy=2  text = "MBS3523 Assignment 1 Q3 Name: Cheung Tsz Chun" width = int(cam.get(cv2.CAP\_PROP\_FRAME\_WIDTH))  font = cv2.FONT\_HERSHEY\_SIMPLEX   while True:  ret, frame = cam.read()  cv2.putText(frame, text, (int(width / 2 - 200), 20), font, 0.5, (255,0,0), 2)  frame=cv2.rectangle(frame,(posX,posY),(posX+BW,posY+BH),(0,0,255),2)  posX=posX+dx  posY=posY-dy  if posX<=0 or posX+BW>=dispW:  dx=dx\*(-1)  if posY<=0 or posY+BH>=dispH:  dy=dy\*(-1)  cv2.imshow('nanoCam', frame)  if cv2.waitKey(1)==27:  break cam.release() cv2.destroyAllWindows()  Screen Capture here: |

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| **Question 4 (20%)** |
| Write a python code to track your face using Haar Cascade method. When your face is tracked, a rectangle is bounding your face. Only the area within the rectangle will be displayed in original color, area outside the rectangle is in grayscale.  Put the following text (font: FONT\_HERSHEY\_SIMPLEX, any color, any thickness) on top middle of your frame:  **“MBS3523 Assignment 1 – Q4 Name: Chan Tai Man”**  *# Requirement:*  *# Save the file on your Github as* ***MBS3523\_Asn1Q4.py*** *and attach the link in the submission*  *# Print the code and attach to this paper*  *# One screen capture with your face shown*  *# The bounding rectangle can be of any color and thickness you like*  *# Upload the result (the code and a screen capture similar to the one shown below) to Moodle* |

Sample output screen capture:

A person with a toothbrush in his mouth

Description automatically generated with low confidence

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| Your code here:  <https://github.com/noddycheung/cv2/blob/17d656b765e186bebeb144bdeb0c30ab2e899de0/MBS3523_Asn1Q4.py>  import cv2  # Initialize webcam cap = cv2.VideoCapture(0)  # Set text text = "MBS3523 Assignment 1 Q4 Name: Cheung Tsz Chun"  # Set font font = cv2.FONT\_HERSHEY\_SIMPLEX  # Set color and thickness color = (255, 0, 0) thickness = 2  # Get frame width and height width = int(cap.get(cv2.CAP\_PROP\_FRAME\_WIDTH)) height = int(cap.get(cv2.CAP\_PROP\_FRAME\_HEIGHT))  # Load Face Detector Classifier face\_detector = cv2.CascadeClassifier('Resources/haarcascade\_frontalface\_default.xml')  while True:  # Read frame  \_, frame = cap.read()   # Convert to grayscale  gray = cv2.cvtColor(frame, cv2.COLOR\_BGR2GRAY)  gray = cv2.cvtColor(gray, cv2.COLOR\_GRAY2BGR)   # Detect faces  faces = face\_detector.detectMultiScale(gray, 1.3, 5)   # Draw rectangle around detected faces  for (x,y,w,h) in faces:   # Extract face from frame  face = frame[y:y+h, x:x+w]   # Replace face in gray frame  gray[y:y+h, x:x+w] = face  cv2.rectangle(gray, (x, y), (x + w, y + h), color, thickness)   # Draw text  cv2.putText(gray, text, (int(width / 2 - 200), 20), font, 0.5, color, thickness)   # Show gray frame  cv2.imshow("Gray frame", gray)   # Stop when q is pressed  key = cv2.waitKey(1)  if key == ord("q"):  break  # Release webcam cap.release() cv2.destroyAllWindows()  Screen Capture here: |

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| **Question 5 (20%)** |
| Write a python code with one trackbar to adjust the position of the vertical line from the leftmost to the rightmost of your window (e.g. 640x480) when the trackbars are adjusted.  Put the following text (font: FONT\_HERSHEY\_SIMPLEX, any color, any thickness) on top middle of your frame:  **“MBS3523 Assignment 1 – Q5 Name: Chan Tai Man”**  *# Requirement:*  *# Save the file on your Github as* ***MBS3523\_Asn1Q5.py*** *and attach the link in the submission*  *# Attach a screen shot to this paper*  *# Upload the result (the code and a screen shot) to Moodle*  NOTE: The required result should be similar to below: |

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| Your code here:  <https://github.com/noddycheung/cv2/blob/f16e21d083a3cedfffce22e00cd82d422bcb7170/MBS3523_Asn1Q5.py>  import cv2 print (cv2.\_\_version\_\_)  dispW = 640 dispH = 480  text = "MBS3523 Assignment 1 Q5 Name: Cheung Tsz Chun"  # Set font font = cv2.FONT\_HERSHEY\_SIMPLEX   cam= cv2.VideoCapture(0)  def nil(x):  pass  cv2.namedWindow('frame') cv2.createTrackbar('x','frame',100,dispW,nil) cv2.createTrackbar('y','frame',100,dispH,nil)  while True:  success, frame = cam.read()  x=cv2.getTrackbarPos('x','frame')  y=cv2.getTrackbarPos('y','frame')  cv2.line(frame,(x,0),(x,dispH),(255,0,0),2)  cv2.line(frame, (0, y), (dispW, y), (255, 0, 0), 2)  cv2.putText(frame, text, (int(dispW / 2 - 200), 20), font, 0.5, (0,255,0), 2)  cv2.imshow('frame',frame)  if cv2.waitKey(1) & 0xff == 27:  break cam.release() cv2.destroyAllWindows()  Screen Capture here: |

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| **Question 6 (25%)** |
| Write a python code to interact with the mouse click event. By selecting a “Region of Interest” (ROI), a new window is being popped up.   * When the mouse left button is down, it captures the upper left corner position. Keeping pressing the left button down and drag your mouse to a lower right position and then release the left mouse button, a rectangle is drawn on the original window and another ROI window is popped to show only the ROI that the rectangle is bounded. * Click and release the mouse right button (i.e. when the right mouse button is up), the rectangle in the original window disappears and the ROI window is killed. * The above can be repeated without the need to re-run the code.   Put the following text (font: FONT\_HERSHEY\_SIMPLEX, any color, any thickness) on top middle of your frame:  **“MBS3523 Assignment 1 – Q6 Name: Chan Tai Man”**  *# Requirement:*  *# Save the file on your Github as* ***MBS3523\_Asn1Q6.py*** *and attach the link in the submission*  *# Print the code and attach to this paper*  *# One screen capture with your face shown*  *# The rectangle can be of any color and thickness you like*  *# Upload the result (the code and a screen capture similar to the one shown below) to Moodle*  Sample output screen capture:    Left mouse button is up |

Left mouse button is down

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| Your code here:  <https://github.com/noddycheung/cv2/blob/b07e6fd642de691b0899bfdd1ba428ca4e87e9c5/MBS3523_Asn1Q6.py>  import cv2 EVT = 0  def drawShape(event,x,y,flags,params):  global EVT  global PNT1  global PNT2  if event == cv2.EVENT\_LBUTTONDOWN:  PNT1 = (x,y)  EVT = event  elif event == cv2.EVENT\_LBUTTONUP:  PNT2 = (x,y)  EVT = event   elif event == cv2.EVENT\_RBUTTONUP:  EVT = event cv2.namedWindow('image') cv2.setMouseCallback('image',drawShape)   cam = cv2.VideoCapture(0,cv2.CAP\_DSHOW)  while True:  ret,image = cam.read()  cv2.putText(image, 'MBS3523 Assignment 1 Q6 Name: Cheung Tsz Chun',  (10, 30), cv2.FONT\_HERSHEY\_SIMPLEX, 0.7, (0, 0, 255), 2)  if EVT == 4:  cv2.rectangle(image,PNT1,PNT2,(255,0,0),2)  ROI = image[PNT1[1]:PNT2[1],PNT1[0]:PNT2[0]] # python format [0],[1] (x,y,z...) ; row and column  cv2.imshow('ROI',ROI)  if EVT == 5:  image[:,:] = image  try:  cv2.destroyWindow('ROI')  except:  ENT=0  cv2.imshow('image',image)   if cv2.waitKey(1) & 0xff == 27:  break cam.release() cv2.destroyAllWindows()  Screen Capture here: |