

	TANTA UNIVERSITY FACULTY OF COMPUTERS AND INFORMATICS		
	EXAMINATION FOR (LEVEL 4)		
	COURSE TITLE: ROBOTICS	COURSE CODE: IT416	
DATE: 29/5/2024	TOTAL ASSESSMENT MARKS: 60	PAGES : 2	TIME ALLOWED: 2 HOUR

Model 2

Choose true or false (20 marks):

1. Image enhancement involves retrieving the image from a source, usually a hardware-based source. False
2. The label is usually a number, but it could not be anything: a letter, or color. False
3. Camera often emits an electromagnetic force or a beam of electromagnetic radiation and looks for changes in the field by reading the return signal. false
4. Designers of artificial hands consider the human hand to have 6 degrees of freedom. False
5. Power supply is working on the moon or in space since we need renewable energy for example sun light. False
6. The global threshold is to statistically examine the intensity values of the local neighborhood of each pixel. false
7. Segmentation deals with the image's characteristics and regional properties. True
8. Representation deals with extracting quantitative information that helps differentiate one class of objects from the other. True
9. For diagonal edge detection we use 2D mask of Robert. True
10. Chow and Kaneko divide an image into an array of overlapping sub-images and then find the optimum threshold for each sub-image by investigating its histogram. True
11. Adaptive thresholding algorithm is not appropriate for real-time applications. True
12. Low level control algorithms are increasingly being incorporated into robot controllers, enabling them to learn, make decisions, and autonomously perform tasks. False
13. Washing machines is considered as programed automation design. false
14. It is difficult to use the edges to measure the size of the objects in an image. False
15. User interfaces allow humans to interact with the robot, setting tasks, monitoring performance, and adjusting parameters. True
16. Delta robots have three robotic arms in the shape of parallelograms. True
17. Edges are significant local changes of intensity in an image. True
18. Template matching is a technique in computer vision used for finding a sub-image of a target image which matches a template image. True
19. SIFT, or Scale Invariant Feature Transform, is a feature detection algorithm in Computer Vision. true
20. Human beings are the highest level of autonomous systems because they think and they can change plan at any moment due to their high intelligence. True

Complete the following (20 marks):

1. **Sensors** are the eyes and ears of a robot, providing it with information about its environment.
2. Robot **control systems** are the brains behind robots, allowing them to perceive, plan, and execute actions in the real world.
3. **Segmentation** is accomplished by scanning the image pixel by pixel and labeling each pixel as object or background, depending on threshold.
4. **User interface** allow humans to interact with the robot, setting tasks, monitoring performance, and adjusting parameters.
5. **Sensor, actuator, controller, software** are considered the main component of robot system.
6. **Gyroscopes** sensor work with the Coriolis Effect to detect the angular velocity, i.e, how fast the body is turning.
7. **Proximity sensors** are able to detect or recognize the presence of close objects without any physical contact with them.

8. **Gripping End effectors** can be attached to the end of the robot's arm to hold an object.
9. The flexibility of robot motion is described by **Degrees of Freedom**.
10. **Cameras** sensors provide visual and tactile information, allowing the robot to perceive objects, shapes, and textures.
11. **Actuators** are the muscles of a robot responsible for its movement, for example **joint movements, Locomotion, and Gripping**.
12. **Stationary** robots are robotic arms designed for tasks like picking and placing, sorting, assembling, welding, and finishing.
13. **RTOS** software provides efficient scheduling and resource management for real-time control tasks, ensuring timely responses to sensor inputs and actuator commands.
14. A **Cartesian** robot can only move linearly in three directions.
15. **Microcontrollers** are very small computer devices used for robot control, it contains processor core, memory, and programmable input/output peripherals
16. **Robotic process automation (RPA)** uses automation technologies to mimic back-office tasks of human workers,
17. **Power supply** is a device for increasing or decreasing the electrical power voltage and ampere.
18. **SIFT** algorithm helps locate the local features in an image, commonly known as the 'scale & rotation invariants keypoints' of the image.
19. **Sobel** edge detection technique is emphasizing (strengthening) edges and eliminates the noise.
20. **Dithering** is used to calculate patterns of dots such that values from 0 to 255 correspond to patterns that are more and more filled at darker pixel values, for printing on a 1-bit printer.

Answer the following (20 marks):

- 1- Discuss the main 4 steps of SIFT algorithm?
- 2- Apply **Roberts** edge detection technique on image 1 to detect the edges?
- 3- Assume you have the following **background model** and one of the **video frames**,
Detect the motion in the given frame. Consider the **threshold to be 10**.

10	9	9	4
0	6	6	2
5	9	8	4
7	5	5	4

Figure 1

30	50	20
20	50	100
80	90	70

Background model

35	150	160
50	45	95
100	92	100

Video frame

- 4- Apply **orderd dithering** on image 2 using the mask showing in figure 3

10	100	40	30
30	60	20	100
120	150	100	20
80	90	170	25

Figure 2

60	40
35	150
30	45
20	92

Figure 3

With my best wishes

Dr. Marian Wagdy