Machine Vision assessment paper

Name and surname: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Ʃ 100 points** |  |

 Points:

**Written test**

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| **Ʃ 10 points** |  |

**Learning outcome 1 (execusion): Explain the relationship and impact of parameters on the digital image (10 points)**

1. Camera has lens Focal length 8 mm and observing part of the object is 12 mm x 12 mm. At which the working distance we have to mounting the camera?

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| 1 point |  |



Source: Cognex installation manual

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| 1 point |  |

1. Distance between the camera and subject is 220 mm, lens Focal length is 6 mm. Specify the horizontal Field of View (mm).
2. Camera has resolution 800 x 600 mm and working distance 400 mm. Observing object has hole with diameter 4 mm. How many pixels are on the length of diameter?

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| 1 point |  |

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| 1 point |  |

1. What is the minimum number of frame rate if the maximum time of image processing is 50 ms?
2. Name at least two software tools for the part location?

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| 1 point |  |

1. Name at least two software tools for the geometry recognition?

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| 1 point |  |

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| 1 point |  |

1. Name at least two software tools for the Feature comparison.

**Oral test**

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| 1 point |  |

1. Explain your choice of software tools for coins value recognition.

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| 1 point |  |

1. Explain your choice of software tools for damage coins recognition.

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| 1 point |  |

1. Explain the system settings you choice to identify unsuitable currency (kuna).

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**Practical exercise**

Using Machine Vision as a tool for identifying coins. The machine vision system will identify coins on the basis of their characteristics such as diameter, edge width, currency (€, kuna) … Each candidate will have to define the basic feature of the object, camera settings, lens and recognition of a foreign object (unsuitable coin, token).

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| **Ʃ20 points** |  |

**Learning outcome 2 (execusion): Prepare imaging environment and set lighting**

1. The candidate suggested or chose the appropriate lens.

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| 2 points |  |

1. The candidate set the camera properly according to the camera-to-object distance.

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| 2 points |  |

1. The candidate set suitable lighting settings according to the measured object.

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1. The candidate selected a suitable feature of the object for ligthing the object.

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1. The system recognizes the value of the coin according to the currency.

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| 2 points |  |

1. The candidate selected a suitable feature of the object to recognize the value of the coin.

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1. The system recognizes a foreign object (foreign currency, token ... ).

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1. The candidate selected a suitable feature of the object for recognizing a foreign object.

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| 2 points |  |

1. The system recognizes a damaged coin edge.

1. The candidate selected a suitable feature of the object for recognizing a damaged coin edge.

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**Learning outcome 3 (planning): Choose an optimum camera and lens**

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| 5 points |  |

The candidate explains the choice of lens and camera.

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**Learning outcome 4 (execusion): Connect camera with PLC and create inspection program**

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| **Ʃ20 points** |  |

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| 10 points |  |

1. The connection between PLC and camera is working.

 The pre-prepared programme on the PLS responds appropriately.

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**Learning outcome 4 (documentation): Connect camera with PLC and create inspection program**

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| 5 points |  |

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| **Picture of suitable object** | **Picture of unsuitable object** |
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Based on taken photos, the candidate explains why the system recognized a particular object as suitable/unsuitable.

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**Learning outcome 5 (execusion and documentation): Measure and take a test on the operation of the machine**

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| 20 points |  |

 Test system operation on a sample of 50 objects/coins. Explain the results.

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**Learning outcome 4 (planning): Connect camera with PLC and create inspection program**

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| 5 points |  |

The candidate planned the software on the camera properly.

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**Learning outcome 5 (presentation): Measure and take a test on the operation of the machine**

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| 15 points |  |

 The candidate demonstrates and discusses the operation of the system.