INCOBOTICS 5.0 – Ready for Industry 5.0

Project number: 2019-1-ES01-KA201-064454

CHALLENGE

PALLETIZATION & AV SORTING

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Author:

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Date	Version	Author	Changes
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Contents

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1. THE CHALLENGE

A conveyor belt feeds product from three different machines. The products have the same dimensions but different colours and have to be organized on three different pallets using the colour as sorting criteria.

The idea is to use the collaborative robot for pick pieces from the conveyor belt, recognizing their colour and divide them on three different pallets.

The robot has also to communicate to the production machines his availability to receive products.

2. LEARNING OUTCOMES - EVALUATION CRITERIA

LO	EXPLANATION	VALUE
LO-1	Comprehend the CO-BOTS major brands available on the market	
LO-2	Configures Cobot systems, selecting and connecting the component elements.	**5**
LO-3	Programs Cobot systems, using programming and data processing techniques.	**15**
LO-4	Checks the operation of Cobot systems, adjusting the control devices and applying safety regulations.	**5**
LO-5	Configures Artificial Vision systems, selecting and connecting the component elements.	**5**
LO-6	Programs Artificial Vision systems to use with Cobot systems, using programming and data processing techniques.	**5**

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3. REQUIREMENTS (SPECIFICATIONS)

1.	**GENERAL TECHNICAL CONDITIONS OF THE CHALLENGE**
1	Carry out the process using a collaborative robot
2	Use of the palletizing function or compose a palletizing cycle if function is not available on the robot
3	Use of an artificial vision system to detect the colour of the pieces
4	Interface the robot with a external system (conveyor belt, production lines)
2.	**CONDITIONS OF THE DOSSIER FORMAT**
1	It will be delivered in digital format.
2	The document must include the requirements of each module and will have the following structure: Cover, Index, Memory, and Bibliography.
3	Cover identifying Challenge, Photo, Members, Group No., Modules, and Year.
4	Index and numbered pages.
5	Normal spacing and line spacing and Calibri font size 12.
6	Well numbered and organized titles
7	Well defined bibliography.
3.	**CONDITIONS OF THE PRESENTATION**
1	The presentation is aimed at exposing, explaining and justifying the challenge as best as possible.
2	Each team will have a maximum of 10 minutes for the presentation.
3	The teaching staff will not say the order of intervention of the teams in advance.
4	The order of intervention of each member will be carried out by the teaching staff "in situ and live"
5	Team members must be able to explain the challenge in its entirety.
6	The use of correct and adequate technical expressions will be valued.
7	The use of good tone and fluency and the non-use of fillers will be valued
8	Not reading the contents, being well organized and making personal contributions will be valued.
9	If challenge questions are asked, all members should be able to answer.
10	Format for presentation is not specified. Being able to use at the choice of the working group.
11	It is suggested to reduce the use of text as much as possible
12	It is suggested to use visual resources; images, graphics, animations, etc.

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4. BASIC CONTENTS

CONCEPTUAL AND PROCEDURAL

LO-2	Configures Cobot systems, selecting and connecting the component elements.
Knowledge	TCP configuration
Knowledge	Characteristics of the input and output systems
Skills	Tool assembly and connection
Skills	Software installation
LO-3	Programs Cobot systems, using programming and data processing techniques.
Knowledge	Different types of movements
Skills	Program GRAFCET
Skills	Use logic instructions
Skills	Use of variables
Skills	Use of palletizing functions
LO-4	Checks the operation of Cobot systems, adjusting the control devices and applying safety regulations.
Skills	Execution time reduction
Skills	Follow safety rules
Skills	Locate and recognize potential installation errors
LO-5	Configures Artificial Vision systems, selecting and connecting the component elements.
Knowledge	General characteristics of artificial vision systems
Knowledge	Environmental conditions in AV systems
Skills	AV system connection
Skills	AV system calibration
LO-6	Programs Artificial Vision systems to use with Cobot systems, using programming and data processing techniques.
Skills	Teach objects
Skills	Behavior of the program in each case
Skills	Use AV system for colour recognition

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In addition, the challenge will work on crosscutting aspects that teachers evaluate according to the corresponding rubric:

- ✓ Personal (Planning, Involvement.)
- ✓ Teamwork.
- ✓ Communication (written and oral).

In addition, the challenge will work on Soft Skills aspects that the students evaluate:

- ✓ Co-evaluation of teamwork (which includes valuing teammates at work).
- ✓ Self-evaluation of teamwork (which includes valuing oneself in the team).

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5. GET THE INFORMATION (and seminars)

Resources

We have the following resources:

- Computers with Drive for shared work and completion of dossiers and presentations.
- Robotics laboratory.
- Robot manuals.
- Information from www.incobotics.eu
- Bibliography

Seminars

SEMINAR	Basic configuration & movements
HOURS / SESSIONS	4 h
TEACHER / SPECIALIST	Stefano Antona
CONTENT	• Start up • TCP configuration • MoveJ, MoveL & MoveP

SEMINAR	Logic functions
HOURS / SESSIONS	6 h
TEACHER / SPECIALIST	Stefano Antona
CONTENT	• IF-ELSE • Wait • Variables • Palletizing function

SEMINAR	AV systems
HOURS / SESSIONS	5 h
TEACHER / SPECIALIST	Stefano Antona
CONTENT	• Installation • Calibration • Teaching object • Color sorting

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6. EVALUATION OF RESULTS

HOMOGENIZATION				TRANSVERSAL							TECNICAS						
				SOFT SKILLS							SKILLS			KNOWLEDGE		MINIMUM	
SOFT SKILLS	SKILLS	KNOWLEDGE	TOTAL	AUTONOMY	PLANNING	TEAMWORK	WRITTEN COMMUNICATION	ORAL COMMUNICATION	SELF-EVALUATION	CO-EVALUATION	DOSSIER	ACTIVITIES	FINAL PRODUCT	DEFENDING	EXAM	MINIMUM DOSSIER	MINIMUM EXAM
25	40	35	100	5	0	5	5	5	2	3	15	15	10	10	25	**5**	**5**

7. TIMING

Duration: **50 sessions**			
1	sessions	1	Present the challenge to the student body
20	sessions	21	Obtaining the information includes visits to the facilities, giving seminars and training activities.
10	sessions	31	Offline programming, testing and assembly
10	sessions	41	Preparation of documentation until the completion of planned tasks. Completion of the "Dossier". During the execution, Feedback with the teams.
4	sessions	45	Knowledge sharing and preparation of the defense.
2	sessions	47	Presentation / defense and the co-evaluations & self-evaluation will be carried out.
2	sessions	49	Exam
1	sessions	50	Final Feedback

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CONCLUSION

Complete once the whole challenge is finished

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