

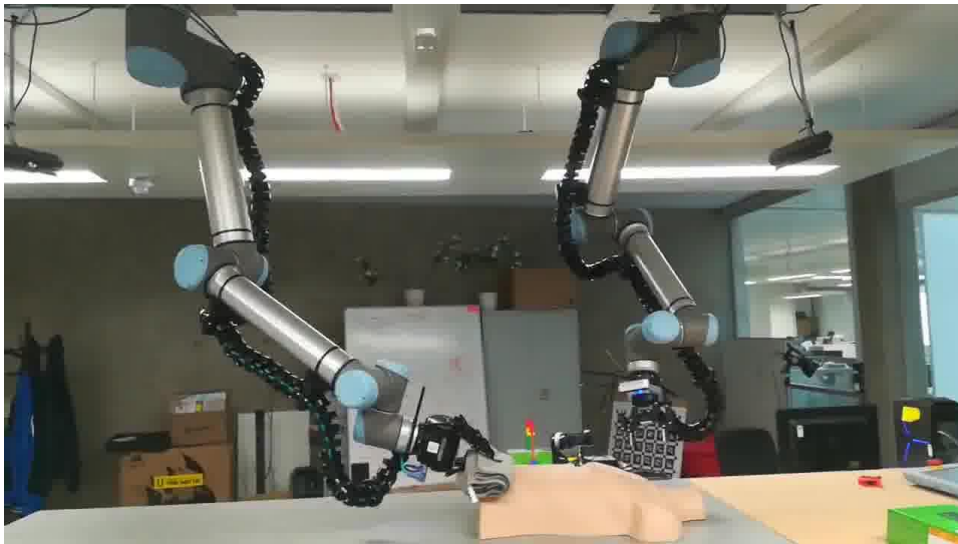


UR10 Multi-arm Risk Assessment Form

School Assessment No:	INFRA 58
Title of Activity:	Working with the UR10 multi-arm system
Location(s) of Work:	Assisted Living Lab; Bayes 1.25

Brief Description of Work:

Working with the UR10 multi-arm system



Hazard Identification:

Hazard(s)	Present Risk Estimate L/M/H	Control Measures (i.e., alternative work methods / mechanical aids / engineering controls, etc.)	Risk Evaluation after control L/M/H
Impact between robotic arm and people or objects in its path (e.g., being struck by the robotic arm)	L	<p>The UR10 robot is designed to allow some human-robot interaction (momentum, force and power limiting), but only authorised and trained operators may work within the working envelope.</p> <p>The emergency STOP buttons must be always within easy reach of the operator.</p> <p>The operators should be familiar with safe code of working practice for working with the robot.</p> <p>No unauthorised person should enter the robot's working envelope (demarcated using an aluminium cage) when robot operation is underway, unless an authorised and trained operator is present attending control of the robot.</p> <p>Unauthorised person must not operate the robot.</p>	L
Crushing and trapping (e.g., part of the body being trapped between the robotic arm joints)	L	<p>Those working in close proximity to the robot should be aware of areas of possible injury, such as the small gaps in rotational joints.</p> <p>The emergency STOP buttons must be always within easy reach of the operator.</p>	L
Collision with ceiling items and wrist mounted sensors and	L	<p>Those working in close proximity with the robot should avoid standing beneath robots and sensors mounted directly overhead.</p>	L

<p>impact from falling debris.</p>		<p>Only experienced operators should attempt low level robot control with collision checking disabled.</p> <p>Care should be taken to avoid robot orientations where sensors may collide with the manipulators.</p>	
<p>Ejection of the workpiece from the grippers due to mechanical failure, malfunction or overloading.</p>	<p>L</p>	<p>The emergency STOP buttons must be always within easy reach of the operator.</p>	<p>L</p>
<p>Slipping/tripping</p>	<p>L</p>	<p>Working areas should be kept clear of obstructions.</p> <p>Any spillages should be cleaned up immediately.</p> <p>Any hazards such as trailing cables, defects to floors coverings, faulty lighting etc. should be reported immediately to the Admin Office / Local Safety Adviser or another senior member of staff.</p>	<p>L</p>
<p>Electrical equipment (electrocution)</p>	<p>M</p>	<p>All portable electrical equipment must be safety tested at correct intervals and labelled with the date of test.</p> <p>Electrical cables, plugs should be regularly visually inspected by the user for damage.</p> <p>Any defective equipment should be reported immediately to the Admin Office / Local Safety Adviser or another member of senior staff, then suitably labelled and taken out of use until the repair has been effected.</p> <p>Any computer hardware faults should be reported to members of computing staff.</p>	<p>L</p>

Fire	L	Lab users must be acquainted with the Fire Routine Procedure for the area.	L
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Engineering Controls:

Guarding	X	Extraction (LEV)		Interlocks		Enclosure	
Other relevant information (incl. testing frequency if appropriate):							
An aluminium boundary rail is used to keep untrained personnel away from the system during demonstrations.							

Personal Protective Equipment (PPE):

Eye / Face		Hand /Arm		Feet / Legs		Respiratory	
Body (clothing)		Hearing		Other (Specify)			
Specify the grade(s) of PPE to be worn:							
Specify when during the activity the item(s) of PPE must be worn:							

Non-disposable items of PPE must be inspected regularly, and records retained for inspection

Persons at Risk:

Academic staff	X	Technical staff	X	P'Grad students	X	U'Grad students	X
Maintenance staff	X	Office staff		Cleaning staff		Emergency personnel	
Contractors		Visitors	X	Others			

Additional Information:

Everyone working in a lab should be familiar with the lab regulations .

Assessment carried out by:

Name:	Vladimir Ivan	Date:	25/08/2021
Signature:		Review Date:	25/08/2022



Safe system of work – Form SSW

Working with the UR10 multi-arm system – INFRA 58

INFRA 12 must be read, understood, and signed off along with this SSW, before use of the robot.

The multi-arm system is designed to allow some levels of human-robot interaction, however it should only be used in this manner by authorised experienced users.

Inexperienced and unauthorised users should only enter the working envelope under the direction of an experienced authorised user who is present at the time. Operators and attendees should avoid standing directly beneath ceiling mounted equipment.

Only experienced users should attempt to operate the dual arm system using low level control without collision constraints. All other users should operate the system using the designated operator console and software libraries.

No unauthorised use is allowed.

Before use the area should be checked and cleared of unnecessary items and the aluminium guards positioned appropriately. Cables should be neatly routed, and the emergency stop buttons available for use. Two persons should be always on hand during operation, each manning one of the two emergency buttons on the system. Free-drive pendant control should be used to re-position manipulators if they lie in close proximity.

If any injury occurs, the unit should be stopped, disabled and medical assistance sought.

Once finished. Shut down unit and any associated equipment. Ensure computer is logged out, to prevent unauthorised use.

The emergency phone number is 2222

The nearest First Aid box is in the floor kitchen

Informatics First Aider list can be found on the web at;

<http://www.inf.ed.ac.uk/safety/first-aiders.html>

