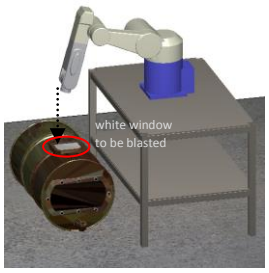
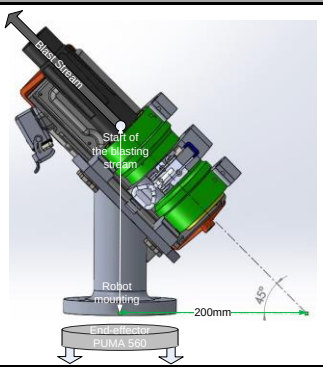
Robotics 41013: Assessment Task #4 – Final Report

Total Subject Weight: 15%. Marked out of 100, with breakdown of task marks, **(x)** specified in descriptions.
Final Submission Due: 20:59pm Thursday 5th November.

Notes:

- Marks are given for **justifying design choices and explaining how and why** each task item was done, and why it was (un)successful for each scenario. Images / graphs / figures and snippets of relevant inline code, may **help** prove success.
- **DON'T** include collision checking/avoidance or extra safety features, or plotting functionality.

Task	Task mark	Description
1. Manipulate the world	**35**	Perform the Dynamic Torque calculations for grit blasting a drum, *Drum.ply* (shown in the figure) but using a **Puma560** from the Robotics Toolbox. • Show calculations to determine the tool offset as a homogeneous transform matrix to attach the blasting nozzle (shown in the figure) to the robot **(4)** • Place the robot base according to your student number. For an 8 digit student number: xxxxyyyy, the base must be [x.xxx,y.yyy,1]meters. So, for student number: 10052821, *p560.base = transl([1.005, 2.821, 1]);* Choose a location for the drum based upon your personalised robot location. In your report, show (a) the robot base transform, (b) the drum transform and (c) the transform between the robot base and the drum **(4)**. ***All these transforms must be unique to you.*** • Show how you used an inverse kinematic solver to find a starting pose that points the nozzle at one corner of the white window on the drum **(2).** Remember you can use "Tools->Data Tips" in the Matlab figure window to find the [x,y,z] of the corners of the white window.  ***Possible blasting setup with a different robot***  ***The blasting tool (weight 2.09kg)*** Code and explain the following two scenarios to move the arm with the 2.09kg tool (i.e. payload) in a single straight line (blast stream pointing straight downwards) with a blasting reaction force (straight upwards) equivalent to 209N, between any two corners using a **reasonable** timespan (note the max. angular velocity of the p560 is given here[1]) 1. slow enough to perform a successful blasting motion **(10)** 2. ***just*** fast enough to overload the arm so it **cannot** achieve the task, identifying where/ when the point of failure occurs **(15)** For full marks you must: allow all 6DOF to move whilst ensuring you obey joint limits; and include a separate plot of the angles / velocities / accelerations / torques on each joint in each scenario.
2. Robots affecting our world	**8**	Participate in the Week 11 in-class discussion by Zoom-presenting 1 slide that you prepared **during** class.
	8	Post a recent (from 2020) / relevant link to a video **(2)** and scholarly article **(2)** on to the Teams discussion board along with a brief comment on interesting facts that you discovered because of reading/viewing them. **(4)**
	4	Post a critical and considered comment responding to at least one other student's discussion post.
	20	*"In what ways do you imagine that robots be more integrated in your life in within the next 5 years in a post COVID-19 world"*. Discussion with reliable literary evidence (at least 5 sources) the impact that robots will have on you, and your family into the future (roughly 500 words).
	20	Discuss your professional opinion (backed up by evidence from at least another 5 sources, and informed by your experience in 41013 Robotics, about the technical challenges that would need to be overcome before technology presented in the film Robot and Frank (2012) could become possible. (roughly 500 words).
3. Self-Assess	**1**	Self-assessment and comments (mark your report out of 95) and include mark breakdown in report
	4	Difference between your self-assessment mark and marks given by an assessor. If off by <10 marks **(4)**, or if off by <20 marks **(3)**, or if off by <30 marks **(1)**, if off by more than 30 marks **(0)**. e.g. If you gave yourself: 60/95 and an assessor gave 55/95 you get 4/4; or you gave you 80/95 and the assessor gave 55/95 you get 1/4; or 90/95 and the assessor gave 55/95 you get 0/4

[1] Puma560 parameters:

Joint N°	1	2	3	4	5	6
$\dot{q}_{max}$ (rad/s)	8	10	10	5	5	5
$\ddot{q}_{max}$ (rad/s^2)	10	12	12	8	8	8
τ_{max} (N m)	97.6	186.4	89.4	24.2	20.1	21.3