MESISI474624: Cobotics
Project work: Industrie et Robotique
Proposal of a robot catalog for simplified 3D printing

S.Venkateswaran
Assistant Professor: Mechatronics, ESILV/DVRC
swaminath.venkateswaran@devinci.fr

A cobot for a customer

3D printing is a well-known process used to perform rapid prototyping of a product within a short interval of time. Usually, parallel robots are deployed to perform this task. The user designs a 3D model in CAD modeling software and an STL file of the 3D model is typically imported into the machine to execute the printing. Once the printing starts, the robot continues to print the object, and any changes, if required, cannot be implemented during the process.

De Vinci Research Center (DVRC), a laboratory affiliated with ESILV, is currently working on deploying cobots to perform 3D printing operations for simple objects. The idea of deploying cobots allows the user to define custom waypoints, based on which the cobot will initiate the printing process. By doing so, it is possible to achieve a Human-Robot Interaction (HRI) scenario in 3D printing.

While 6-axis cobots are a common solution, their size can be a limitation in practical deployment. To simplify the process, a more compact 3-DOF configuration, such as RRR, RRP, or RPR, could be employed. DVRC is actively seeking a cobotic startup with expertise in this domain and has approached your firm. Using the architecture selected by you in DVL, the goal is to successfully perform 3D printing of a simple object.

As a startup specializing in cobotics, your company is well-positioned to present its catalog to DVRC. The catalog, provided in PDF format, should feature the product name and your company logo on the first page. Including a company or product logo is optional but encouraged. For reference, an example of a comprehensive catalog is the Universal Robots brochure, available here:
`https://www.universal-robots.com/media/1802432/e-series-brochure.pdf`

The catalog must address all questions outlined in Part 1 of the project work and be organized into clear sections. While the arrangement of sections is flexible, it is mandatory that all requested details are included.

Regarding the MATLAB codes, it is recommended to provide them as script files alongside the catalog. Alternatively, you can upload the script files to GitHub and include the corresponding links at the end of the catalog. Video files can also be provided to prioritize the consideration of your proposal.

The trajectory of the object to be printed is provided as a MATLAB function, **printing.m**, which can be used to solve the inverse kinematics and perform the simulation.

During the TD session on 10/12/2024, there will be a discussion about this project. Feel free to ask as many questions as needed to better understand the requirements from the customer.

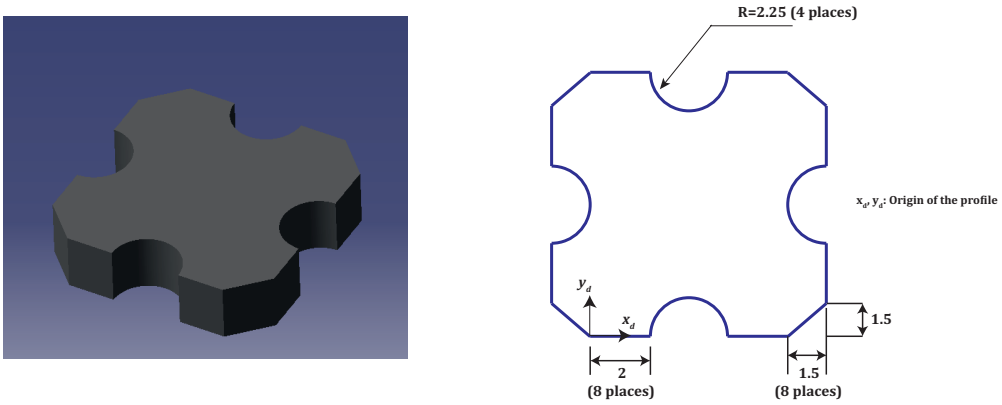

Figure 1: (a) Overview of the 3D printed part (3D model), (b) simplified profile of part to be printed for the project

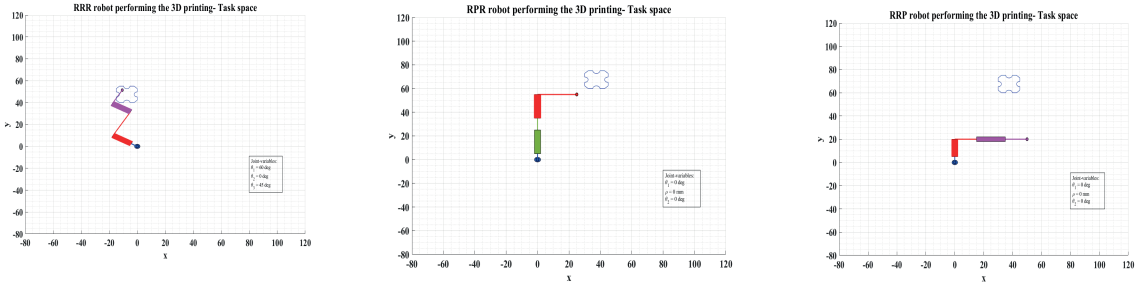

Figure 2: Overview of the placement of the profile to be printed in the robot environment: (a) RRR, (b) RPR, (c) RRP

Information & Dates

1. The project will be an individual submission (no team work)
2. Ensure that the catalog you submit is unique and corresponds to the group choice made in DVL.
3. The deadline for the project is 10/01/2025 (before 23h59) and you can find the submission link in DVL
4. Submissions by email are not acceptable and will be graded ZERO
5. The catalog must be submitted as a PDF file. For the MATLAB codes, they can be provided in a single zip file along with the PDF or uploaded on GitHub (include GitHub links in the catalog).
6. For the trajectory planning related to the proposed problem statement, use the frequency and trajectory profiles suggested in Part-1.
7. Include position and velocity profiles for the trajectory planning.