UNIVERSITY OF LIVERPOOL

SCHOOL OF ENGINEERING

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MNFG309: INDUSTRIAL ROBOTICS AND AUTOMATED ASSEMBLY

Group Project

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Table of Contents

1. Introduction

The ZIP file contains a total of 4 files: MainMoudle.mod, Crystal_Mech_9.pgf, new_jig_crystal_mech.prt.2, and jig_specification_file.pdf. All the code used to control the movement of the robotic arm can be found in 'MainMoudle.mod', which contains specific robot control instructions and necessary comments. ‘Crystal_Mech_9.pgf’ is an XML format file that references the ‘MainModule.mod’ file. The ‘new_jig_crystal_mech.prt.2‘ file shows the jig model modeled using Creo CAD software. Finally, there is this PDF file, which specifies the design and use of the jig.

2. Design

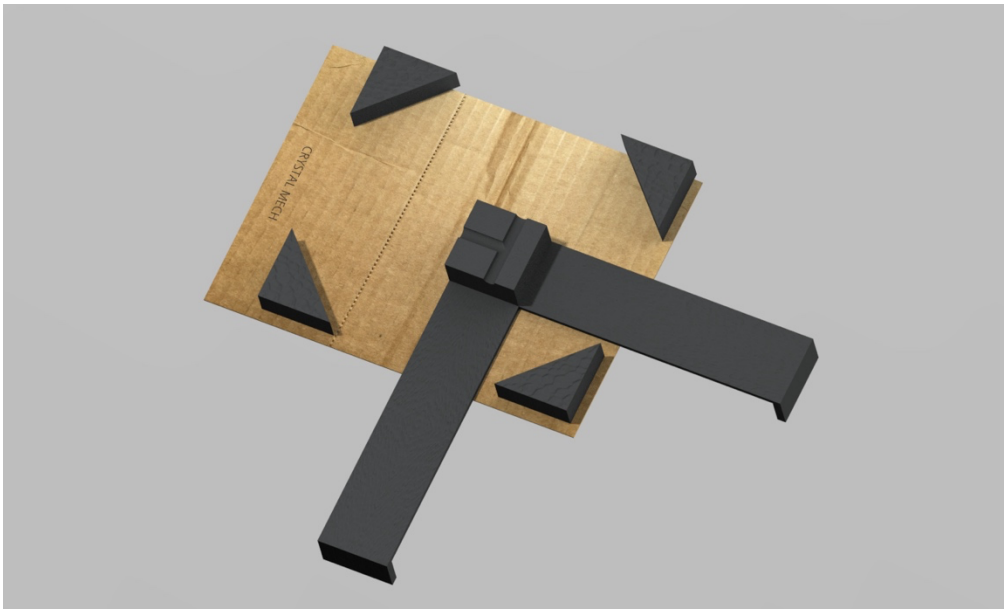

Figure 1: jig modelling.

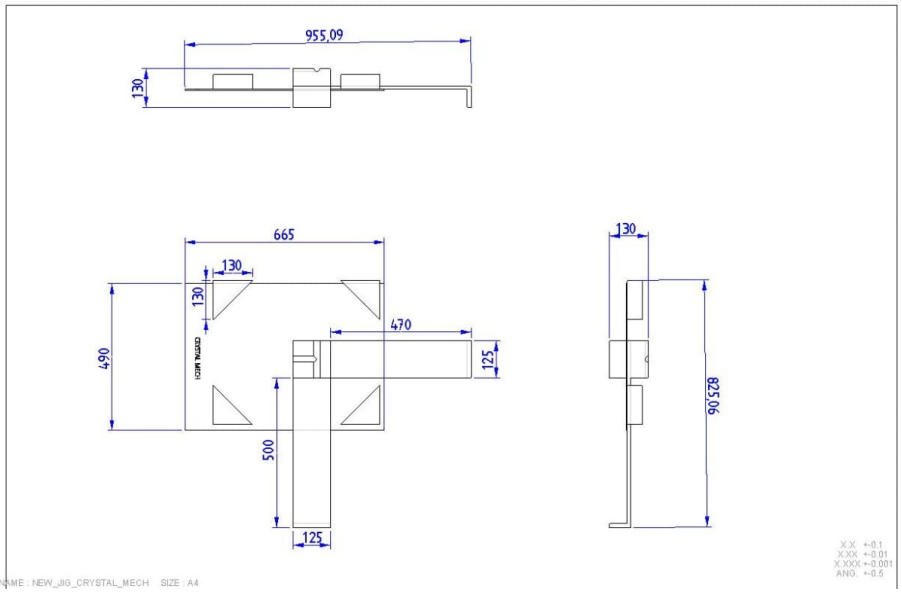

Figure 2: Specifications.

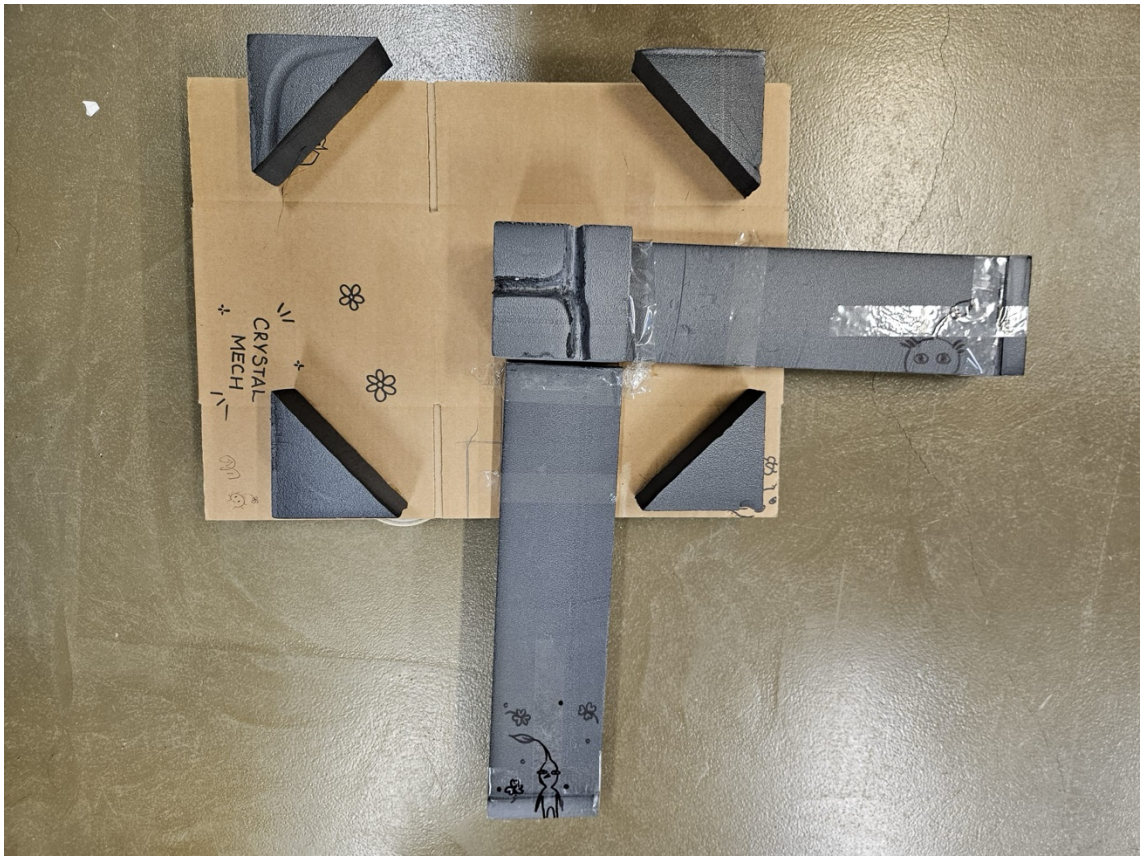

Figure 3:Jig on the ground.

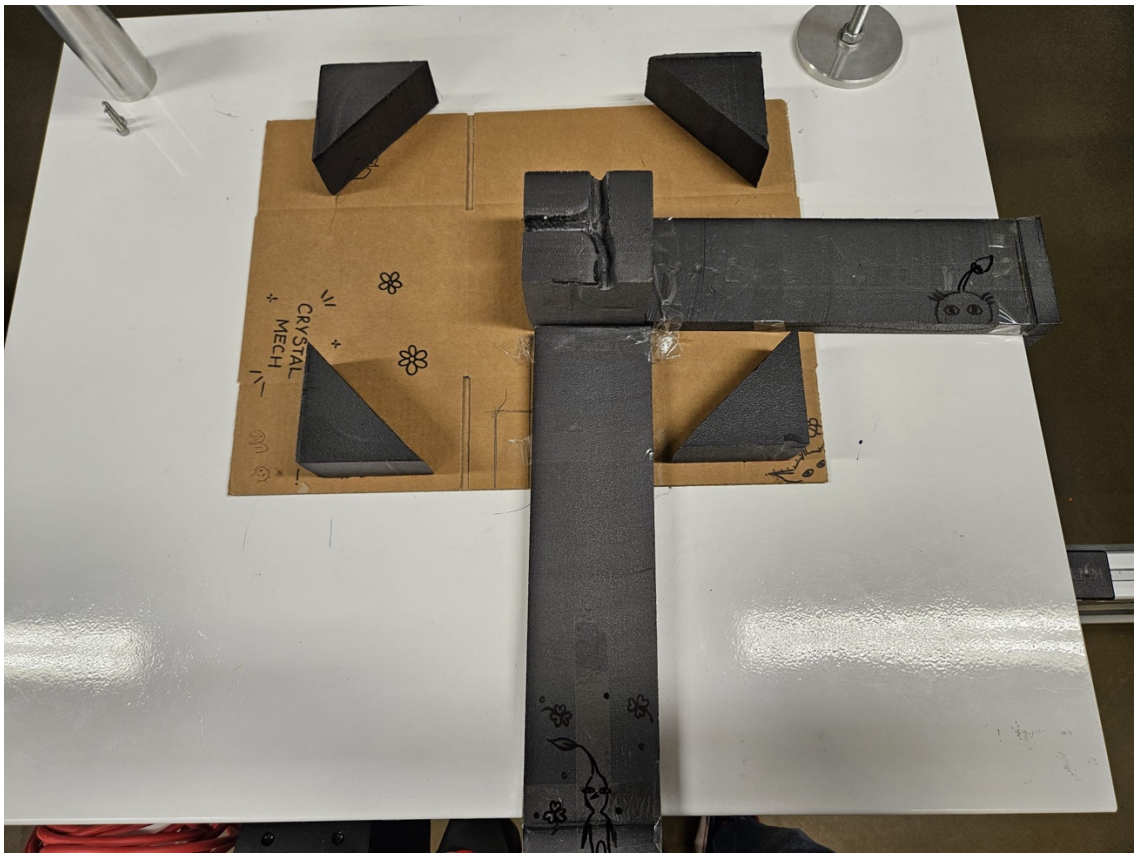

Figure 4: Jig on the workbench.

Figure 1 shows the jig modeling completed in Creo CAD software, and Figure 2 contains its specific specifications and dimensions. This jig is used to fix the position of the workpiece so that it remains stable during robot operation. Figure 3 and Figure 4 show the final jig fabrication.

Before designing the jig, test the maximum working range of the robotic arm to ensure that the jig is set so that the workpiece is within the working range of the robotic arm and can meet the requirement of an angle of approximately 60 degrees with the working base surface.

The four triangular blocks around the model are used to support the entire workpiece to avoid shaking, the triangles were chosen to reduce the use of materials. The square with a "T" groove in the middle is used to embed the protrusion inside the workpiece, ensuring that the workpiece does not move during the sealant application process, thus ensuring accuracy and efficiency. It is also worth noting that there are two long strips on both sides of the model. This is to ensure that the jig is placed in the same position on the workbench every time it is run, thereby reducing the calibration time required each time the experiment is started, ensuring the robot can precisely apply sealant to the work piece. Finally, all the parts are fixed on the cardboard with glue, using cardboard as the basic material, which is convenient, lightweight and low-cost.

3. Instructions

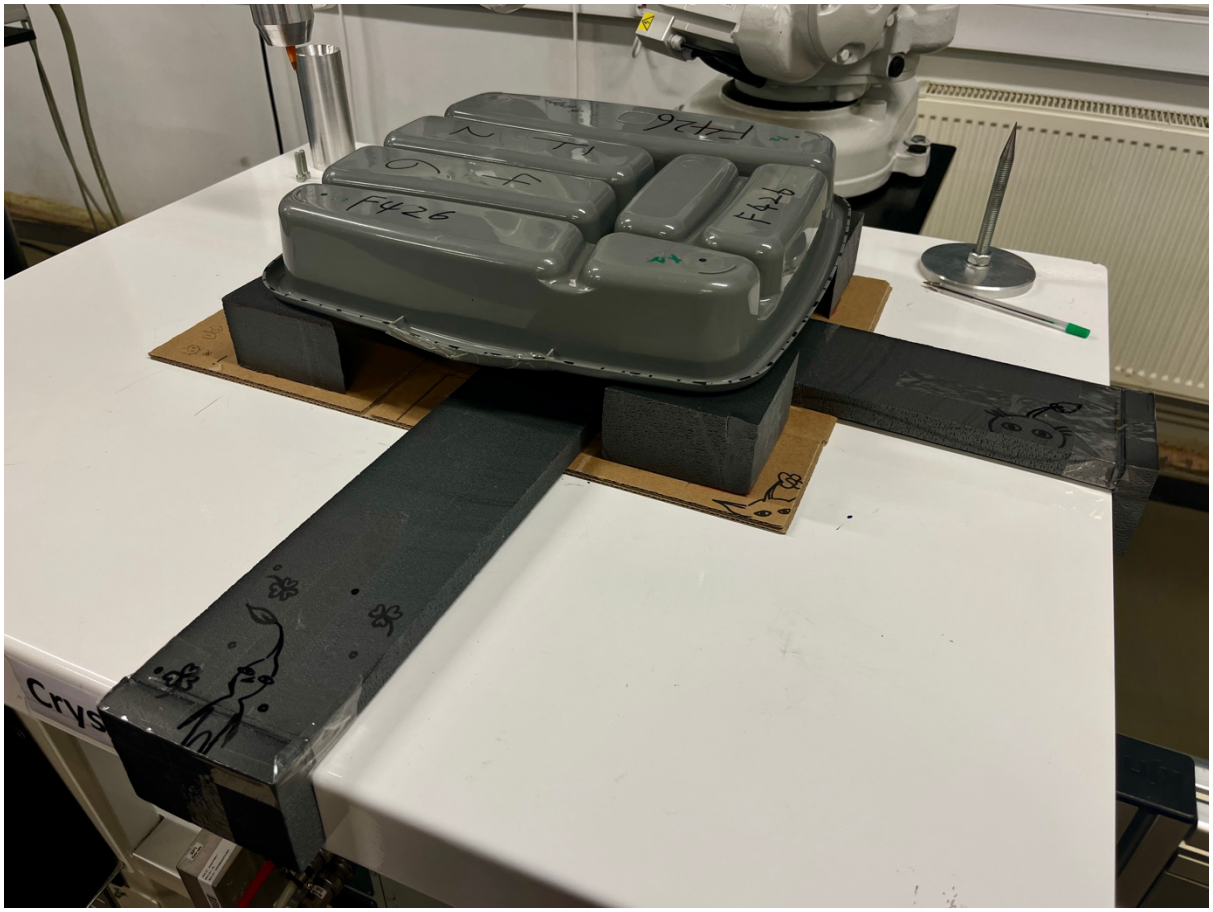

Figure 5: Overall view.

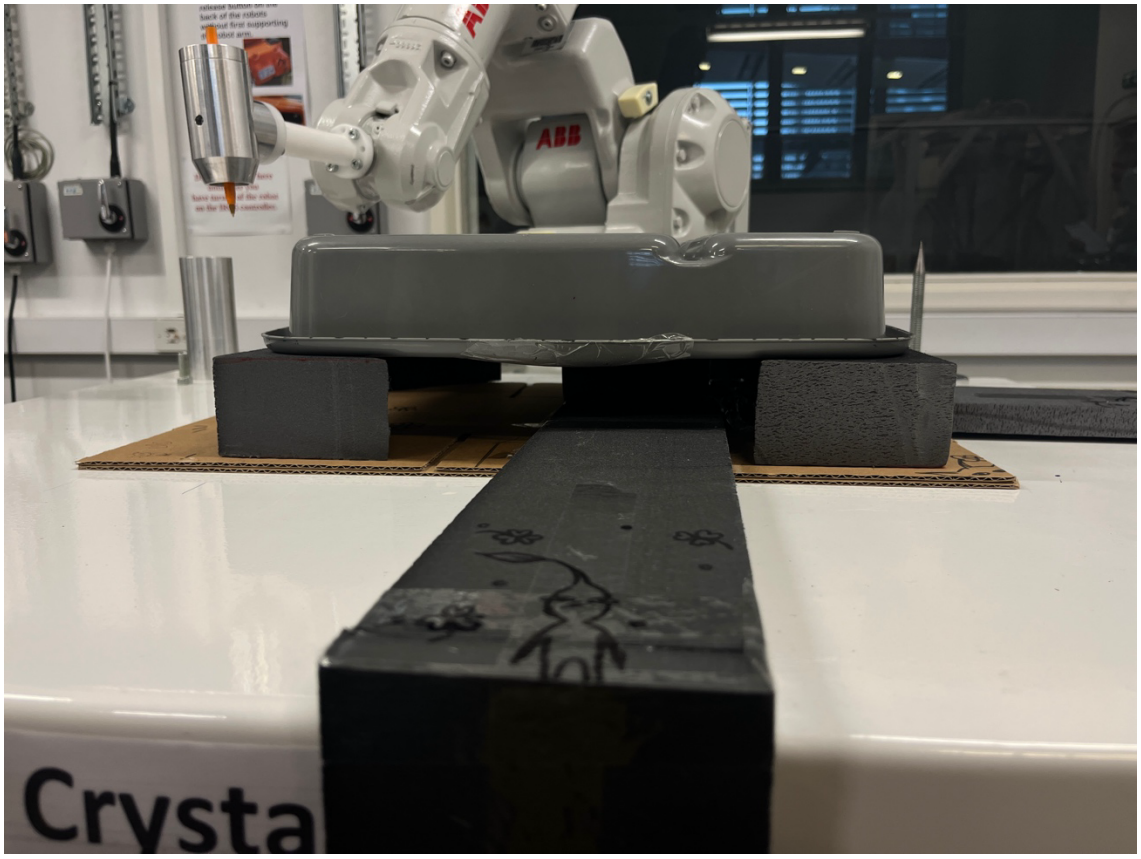

Figure 6: Front view.

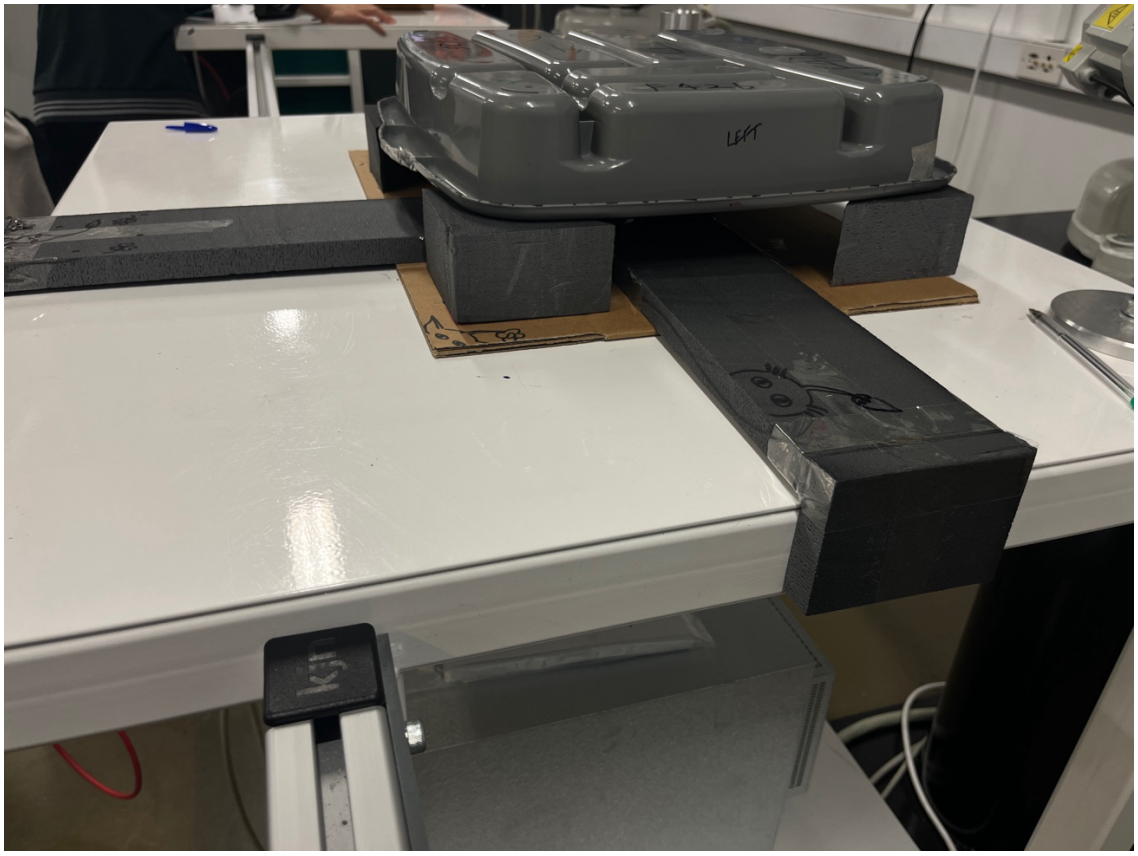

Figure 7: Side view.

Place the jig on the workbench, making sure that the long strips on both sides are against the edge of the workbench. Then carefully place the workpiece on the jig, ensuring that the protrusions of the model are embedded in the corresponding grooves. When the model has been stably fixed on the workbench, the experiment can be officially started. If the clamp is accidentally moved during the test, it can be quickly repositioned to its original position using the two long strips. These pictures show the workpiece being fixed to the jig from different directions.

4. Summarize

By using this jig, the workpiece can be well fixed to complete the robot simulation application of sealant. The overall design has significant advantages in material saving, accuracy assurance and improved work efficiency, but there are some shortcomings in structural strength, durability and flexibility. While well suited to current mission requirements, if long-term use or adaptation to different workpieces is considered, the selection of materials and methods of securing components may need to be improved to improve overall quality and reliability.