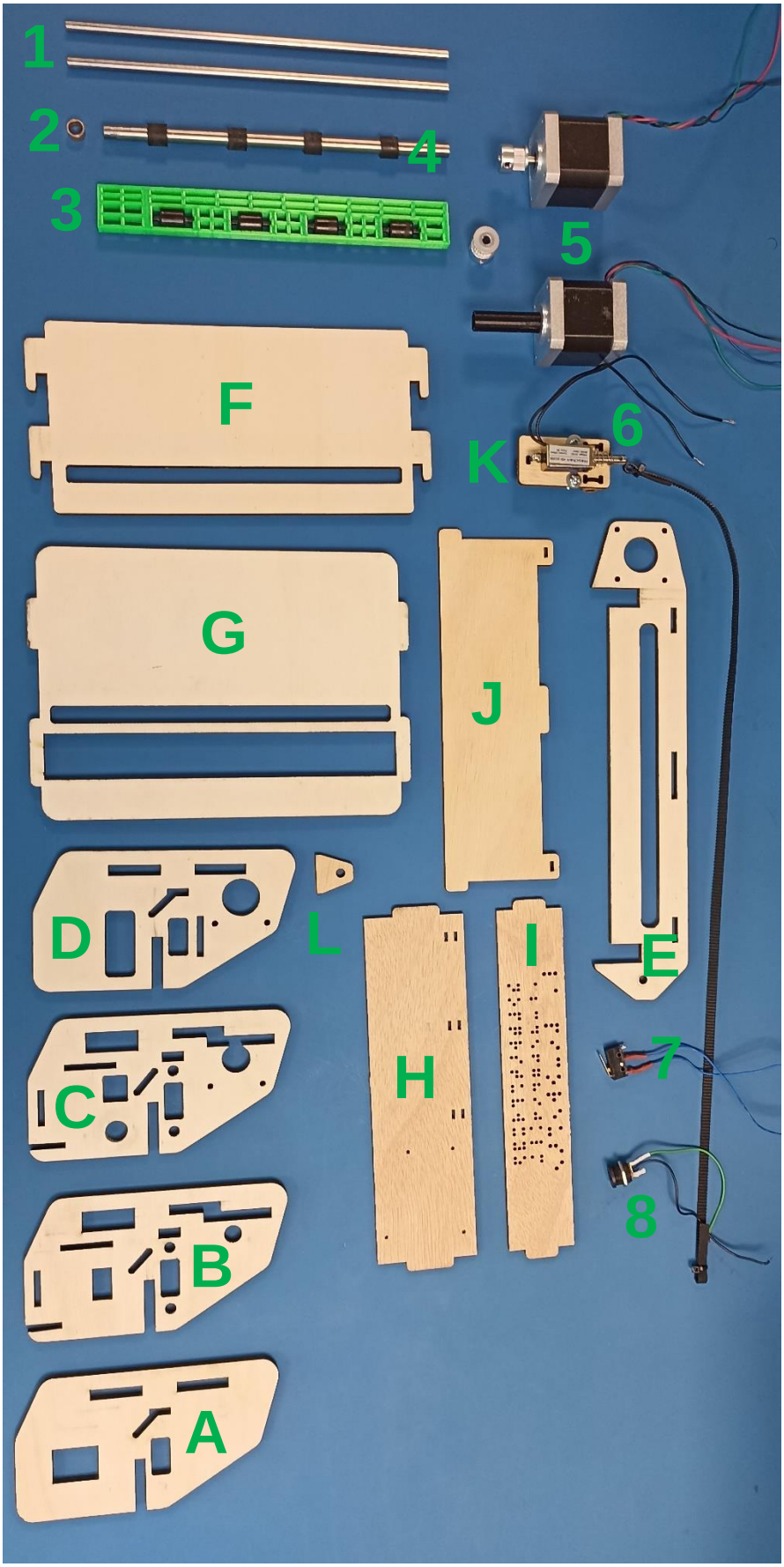
Instructions for assembling and using the braille printer „La Picoreuse“

1. **Overview of the components:**



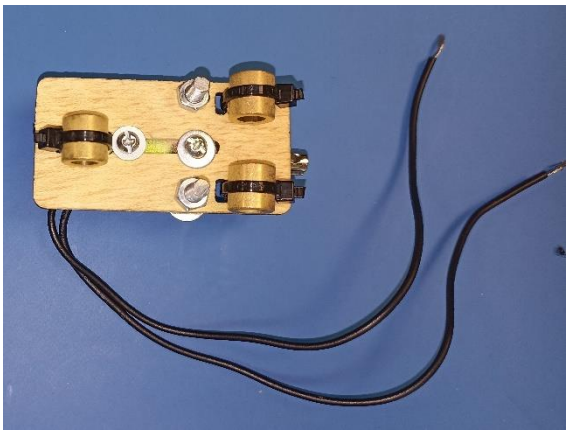
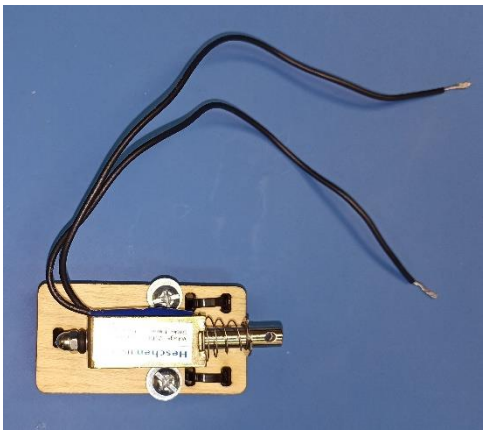
1) Metal rods (6mm)
2) Bronze ring (BNZ8-10-6)
3) Leaf drive system with rollers
4) Metal rod (8mm)
5) Stepper motors with pulleys and 5 to 8 mm shaft connector
6) Solenoid (mounted on part K)
7) End-of-travel switch
8) 12V connector

2. Tools:

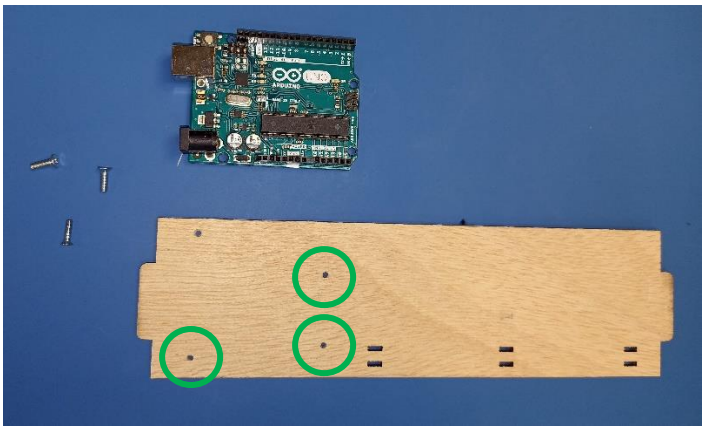
- fine sandpaper
- screw driver (slot and Phillips screw driver)
- laser cutter (min 60W)
- side cutting pliers
- scissors or cutter knife

3. Assembly:

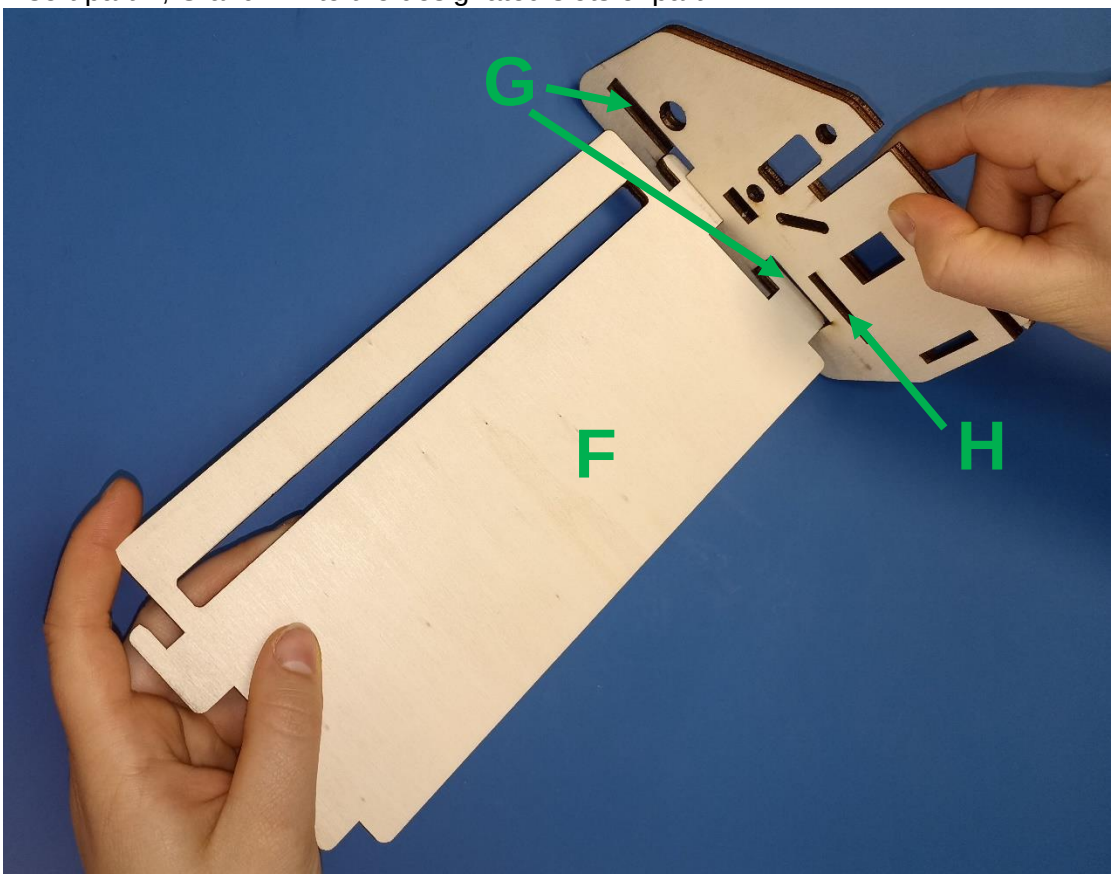
1. 3D print the leaf drive system and the 5 to 8 mm shaft connector according to the stl files provided.
2. Based on the two drawings provided (*printerBrailleV4_3mm.dxf* and *printerBrailleV4_6mm.dxf*), cut out the parts A to L from the two MDF boards using a laser cutter. Pay attention to the different material thicknesses and be sure to use a laser cutter of at least 60W.
3. With the help of sandpaper, smoothen the surface and edges of parts G and E. This facilitates the sliding of the paper over part G and the solenoid wires over part E.
4. For the solenoid support, attach an M3x5mm screw with a screw nut to each of the two round holes in part K. Attach the three smaller bronze rings to the side where the screw nuts are using cable ties. Make sure the heads of the cable ties are as close to the surface of part K as possible. Attach the solenoid to part K using 2 screws (M3x5mm). The solenoid should be on the side opposite of the bronze rings.

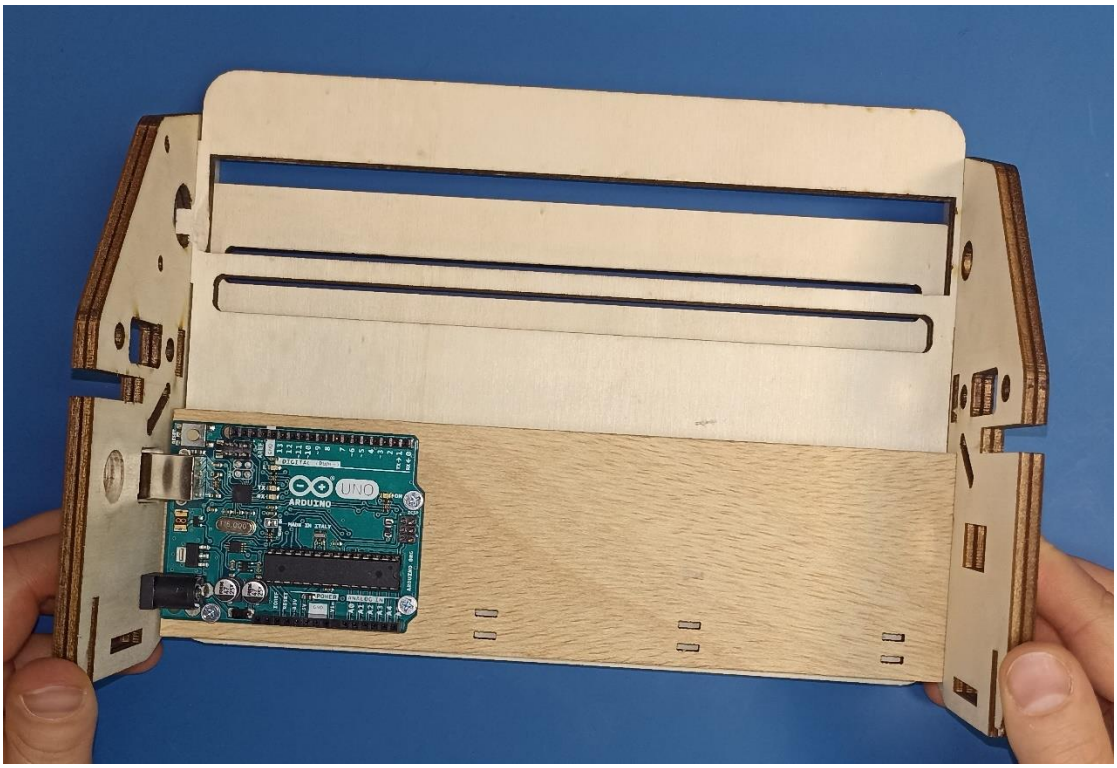
5. To assemble the main frame, screw the Arduino board to part H (3 x M3x8mm).



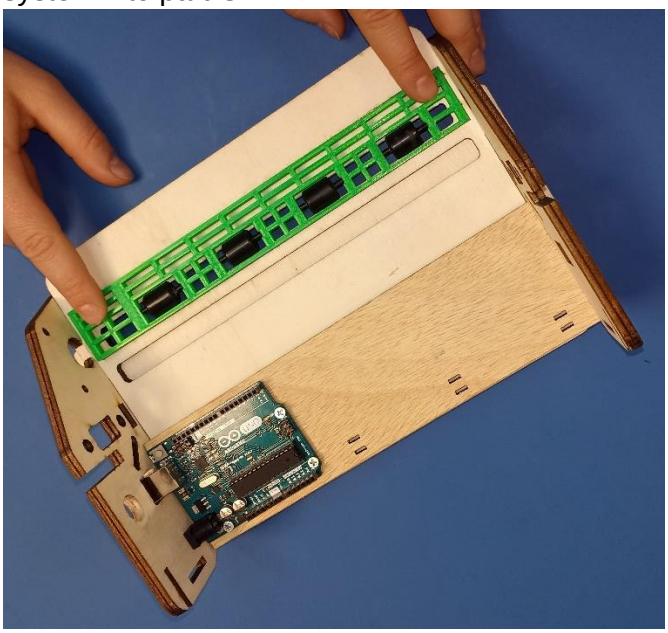
6. Insert part F, G and H into the designated slots of part B.



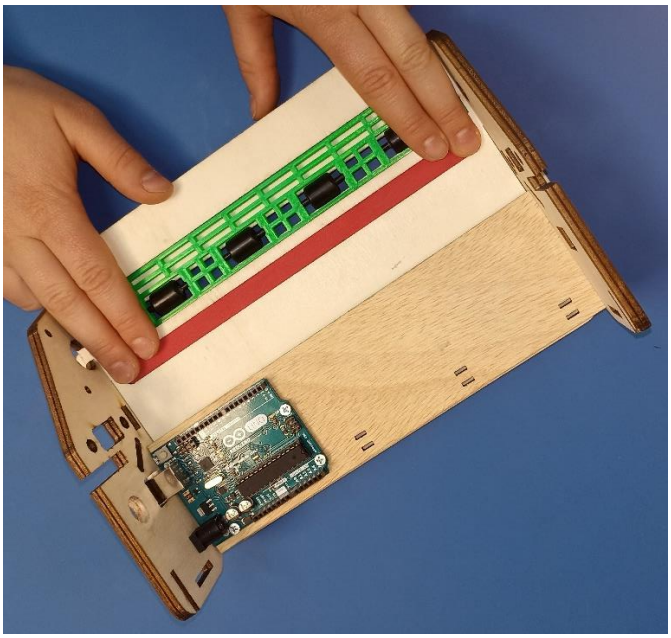
7. Attach board C opposite of part B to part F, G and H. Pull part F forward so that its hole overlaps with the one in part G and it locks parts B and C to keep them in place.



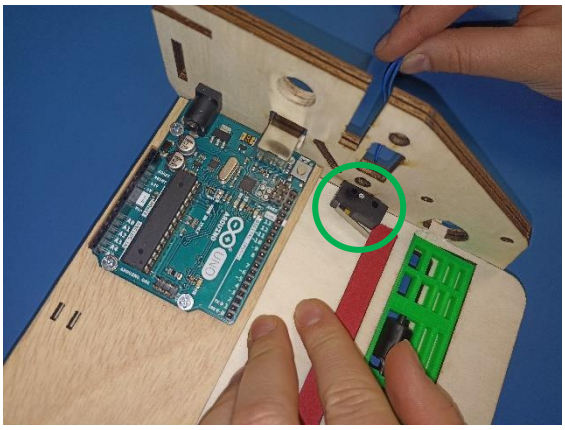
8. Attach the printer rollers to the 3D printed leaf drive system. Then, insert the leaf drive system into part G.

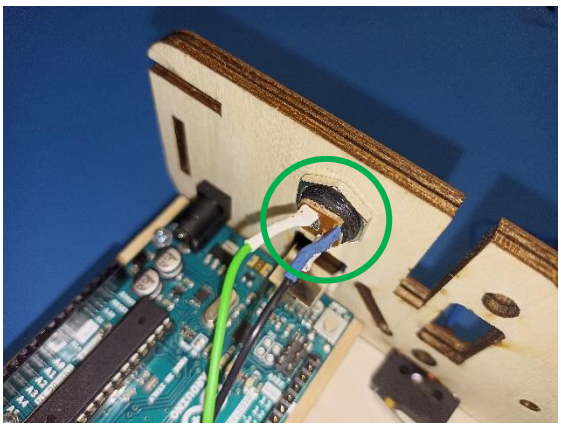


9. Cut three layers of foam rubber to fit into the long hole in part G.

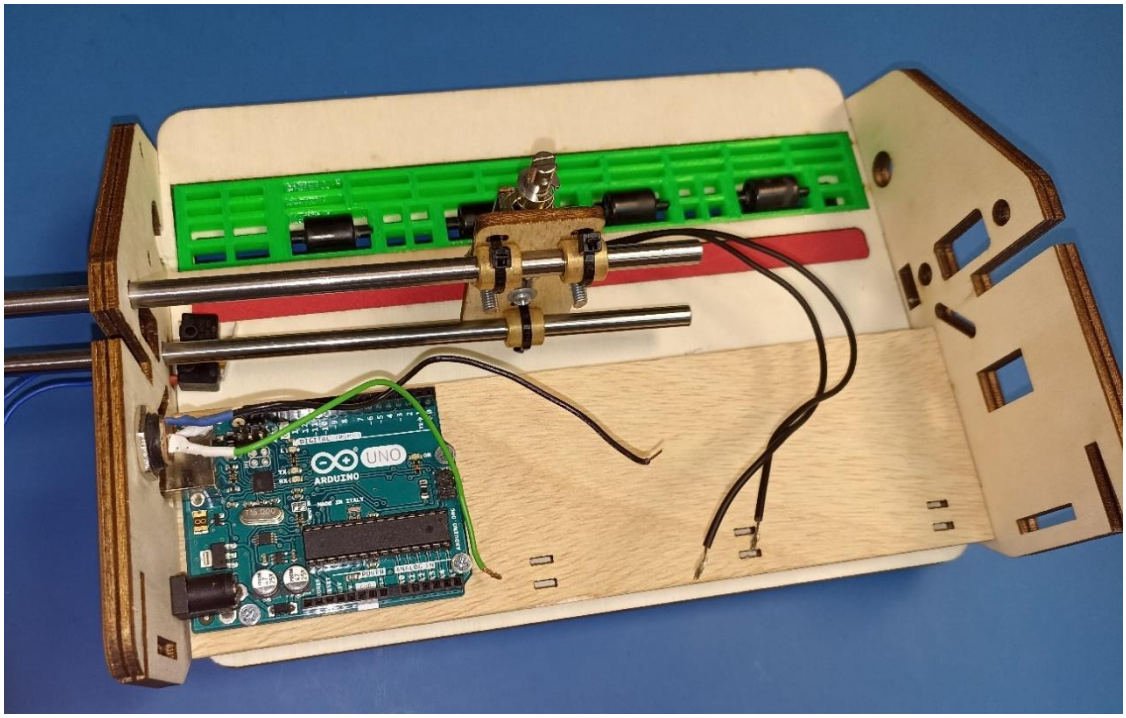


10. Insert the 12V connector into the designated slot of part C such that the cables are on the inside of the printer. Next, add the end-of-travel-switch to part C.

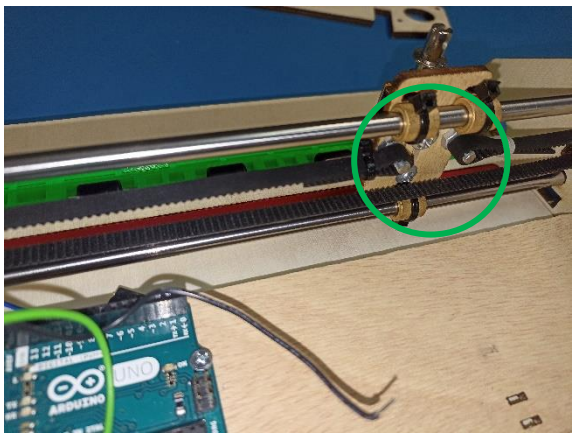


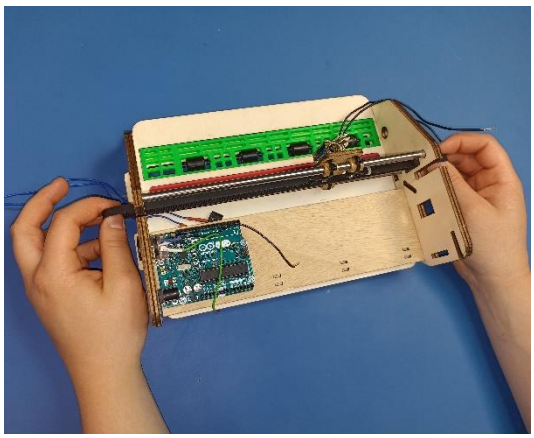


11. To build the x axis of the printer, attach part D next to part C on the outside. Next, starting with the bottom one, slide the 6mm metal bars through the two round holes in part B and then through the bronze rings.

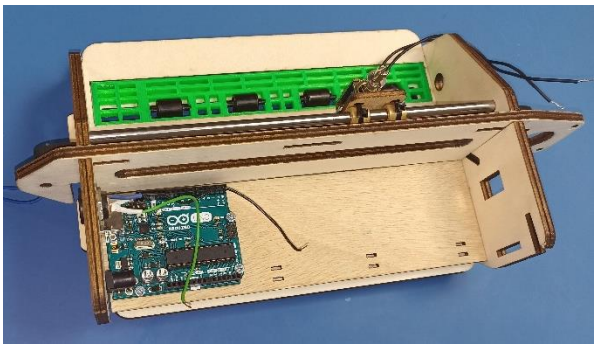
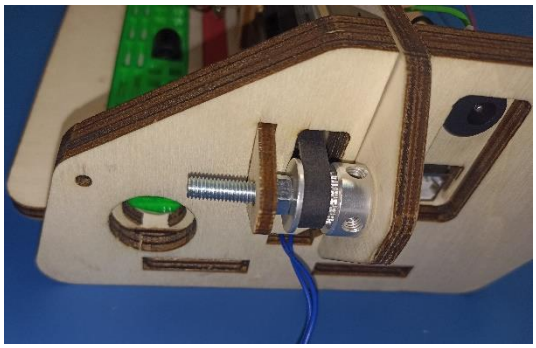


12. Attach the ends of the belt to the screws on the solenoid support below the bronze rings. Make the belt protrude from the rectangular hole between the metal bars in boards B and C+D.

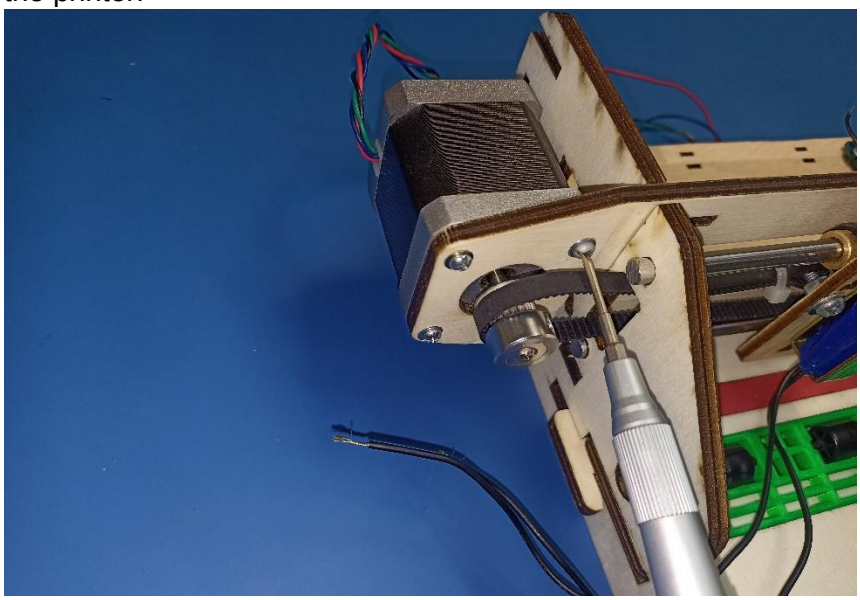




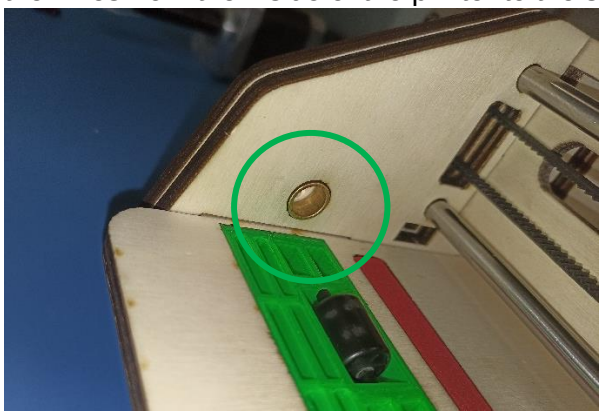
13. Assemble the electronics as shown in the circuit diagram and place all components inside the printer next to the Arduino board. Make the wires of the Y stepper motor protrude through a hole in parts C+D.
14. To finish the assembly of the frame, add part E to the frame thanks to the large slots in pieces E and B and C respectively. Connect the pulley to the screw on part E then wrap the belt around it.

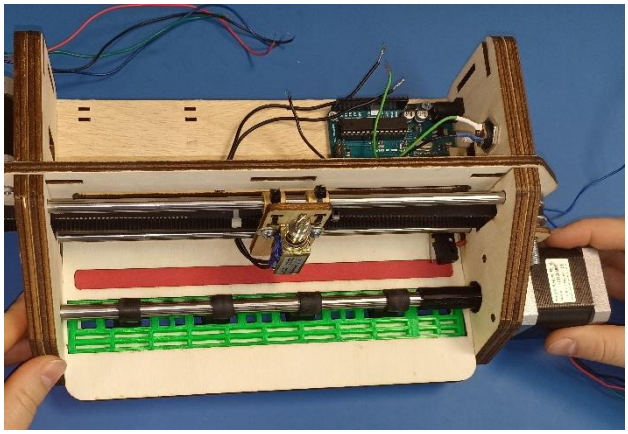
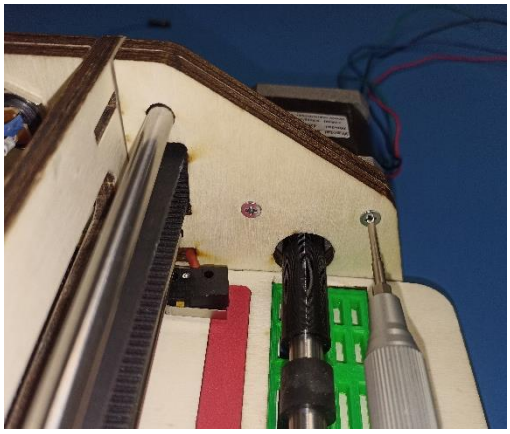



15. Next, add part I to the back of the printer. The more widely spaced holes should be at the top. Then, attach part A to part B on the left side similar to part D.
16. Attach the X stepper motor on the left side of the printer. Slide the shaft of the stepper motor through the large round hole in part E such that it is pointing to the front of the printer and the belt is wrapped around the pulley. If necessary, adjust the length of the belt so that it is tight. Then use 4 M3 x10 mm screws to keep the stepper motor in place. Connect the wires from the stepper motor through parts A+B to the inside of the printer.



17. Insert the large bronze ring into the round hole of part B. Attach the 5-to-8mm connector to one end of the 8mm metal bar and insert its other end into the bronze ring. Attach the Y stepper motor to part D so that its shaft fits into the 3D printed connector. Use two M3x10 mm screws to keep the stepper motor in place. Connect the wires from the inside of the printer to the stepper motor.



18. Slide part J in between parts B and C to cover the wires.

4. Using the printer:

1. Open the ino-file and plug the Arduino board to the Computer using a USB cable. Disconnect the HC-05 module from the circuit board to avoid an error message. Next, load the Arduino sketch.
2. Reconnect the HC-05 module. Its LED should be flashing red to indicate the module is ready to connect to a smartphone.
3. On the smartphone, switch Bluetooth on and open the AMR Voice app. Click on “connect robot” and select the HC-05 module. Once the connection is successful, the printer is ready to turn your speech into braille.