

Lever-Based, One Degree of Freedom Robotic Arm

Materials	Quantity
1/4" Plywood	228 in ²
1"x4" Plywood	66.5 in ²
#18 Twisted Nylon String	3 yds
#8-32 1 1/4" Machine Screws	4
#8-32 Machine Screw Nuts	8
1/4"-20 Threaded Rod	5 in
#6 x 1" Wood Screws	4
Wood Glue	negligible

Power Tools
Drill Press
Table Saw
Drill

Safety

ASMSA is not responsible for any accidents occurred during the production of this arm. To help ensure an accident-free workshop please use all necessary safety precautions when building this robot.

Several important guidelines to follow are:

- Never horseplay in the workshop
- Always ask your supervisor for help before using any equipment
- Always listen to the instructions given by your supervisor before working in the workshop

Engineering

This arm works by using a lever to raise the arm. This lever is attached to the arm through two loose joints, this allows fluid motion. The arm is anchored with two strings wrapped around two tight joints; this makes the arm remain level.

Advantages and Drawbacks

This robotic arm allows vertical motion while remaining level with the floor. This motion allows easy pickup jobs without complex arms, picking things up would consist of ramming it with the scoop on the ground and then lifting the scoop up

Because this arm only has one degree of freedom, the arm can only move up or down. This lack of mobility can be bad depending on the situation. The nuts can come loose after using, so I recommend adding another nut to each bolt and tightening between each round.

Assembly



Figure 1

To make the vertical support, cut the 1"x4" into a rectangle with the dimensions of 1"x12". Drill a $\varnothing \frac{17}{64}$ " hole, 1" from the top and 1" from the side. Drill a $\varnothing \frac{1}{4}$ " hole, 3.5" from the top and 1" from the side. Drill a $\varnothing \frac{17}{64}$ " hole, 6" from the top and 1" from the side, as shown in figure 1 . Next, glue two 3.5" squares to the vertical support, as shown in figure 2.



Figure 2

To make the arm, cut it out of the plywood. Drill holes of the same dimension as the vertical support.

Cut two members out of plywood and drill two holes. In this example, the members were cut 1"x24" and a hole was drilled $\frac{1}{2}$ " from the top and the side. Then another hole was drilled 6" directly below that

In order to assemble the arm, put one washer and nut on to each of the M8 bolts and place them in the $\varnothing \frac{17}{64}$ " holes. Then, place one more nut on the ends to secure them to the vertical support

and arm.

Next, attach the two members to the vertical support by threading the threaded rods through the middle holes and securing with nuts.



Use 1.5 yds of nylon string to wrap around the bolts tightly,
do this for both sets of M8 bolts

Potential Improvements

In order to prevent the loosening of nuts, you could countersink each one.

In order to generate less friction, add washers between the members and the wood