Robotic Arm 6 DOF

Assembly Guide
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Overview:
6 DOF Robotic Arm from Robokits is a robotic arm with 4 degrees of freedom joints and a Gripper. Its actuated using 6 Standard size servos out of which 4 are normal Nylon gears standard and 2 are Metal Gear High Torque servo motors.

This robotic arm is controlled by USB (optional wireless Bluetooth) Servo Controller. It and be controlled by PC or other microcontrollers.

The power requirement for this robotic arm is 5 to 6V DC 10 Amp power supply. It could be either battery or a AC power supply rated at 5-6VDC. You can also use a modified computer SMPS supply, it is available for sale on Robokits website and you can also modify it yourself if you have one. There are many tutorials available for these modifications on internet.

Before starting the assembly we recommend to read the documentation of Servo Controller so that it will be easy to understand all electric connections and controls. If you have this document on CD then it should be in the same folder as this document otherwise you can download it from here: http://www.robokits.co.in/documentation/USB%2016%20Servo%20Controller.pdf

After assembling the robotic arm you will be able to control it from a Windows PC. However if you want to control it with a microcontroller you can directly generate C code for it from servo controller software. This generated code is directly programmable to our Rhino Robot Control Board or Arduino, if you want to use other microcontroller or compiler it could be translated easily if you are good at C language and embedded programming.

Let’s start with the basic assembly of robotic Arm. Some basic tools like screw drivers, pliers, small spanners, soldering iron, wire cutter, nipper, stripper are required to complete the assembly.

The notations used in this document for screws, nuts & bolts are like these.

1. 3x6 mm cap screw – 3mm small screw
2. 3x8 mm cap screw – 3 mm mid screw
3. 3x10 mm cap screw – 3 mm big screw
4. 3x8 mm CSK head screw – CSK screw
5. 3 mm Nylock Nut – Lock nut
6. 3 mm nut – nut
Fix four 10 mm studs to base with four csk screws. You may have to push hard the screw from bottom.
Fix six 50 mm spacers to the base with csk screws just as before.
This is how the base will look after fixing all the studs.
Now take a circle plate with holes for servo and castor wheels, 9 locknuts and 9 M3 long screws.
Fix three castors on the base as shown in above picture. Now take a servo, 4 M3 Long screws, and 4 lock nuts.
Fix the servo motor to the base as shown. The final assembly will look like the picture above.
Take assembled plate with servo and castors and six M3 small screws.
Fix the plate and servo controller pcb to the base as shown. The base assembly is now complete.
Optionally you can also mount castor plate inverted.
Fix the servo horns to the plates as shown in above picture. Take precaution while fixing them to the round plate. The round plate has 2 countersunk holes towards the edge. The horn should be fixed to the countersunk holes side only. You may receive servo horn screw in silver or black color.
When these parts are seen from top, they will look like the picture above.
Attach 2 L clamps on the round plate. Note that 2 M3 Long screws are inserted from top and locknut is fixed from bottom, for the holes on the edge side 2 csk screws are inserted from bottom and locknut is on top side. See next picture for bottom view.
Note that 2 CSK screws are inserted from bottom and nut is on top side. This is important otherwise the castor will touch the screw and restrict the movement of base rotation.
Now connect the base servo to servo controller as shown in picture. Power up servo controller with 5 to 6VDC power supply and connect to pc software with USB or Bluetooth connection. Neutralize the servo (Put the servo to centre position) using software. Mount the round plate with horn and clamps to the base as shown in picture. Tighten with the self tapping screw provided in servo accessory pack. Make sure that plate is not too loose or tight. Test with moving slider in software.

*Note : Please read manual of servo controller first before performing this step.*
Mount a metal gear servo with back attached to the clamp with M3 Long screws and locknuts as shown in picture.
Take out part with 2 servos and top mount for it. Also take 2 20mm studs and 4 M3 Small screws.
Fix two 20 mm studs in holes with 2 M3 small screws as shown. Also fix 4 rubber mounts available in metal gear servo accessory pack to metal gear servo as shown above. Take out eight M3 Long screws and locknuts for next assembly step.
Mount servos to the plate with 4 M3 Long screws and locknuts. Fix the top plate with bottom through 20 mm studs with 2 M3 Small screws.
Now connect all the motors to servo controller and neutralize them. Keep the servo controller powered on while assembly so all servos will be locked to centre position.
Fix plate with 2 servo horns to the 2 ready assemblies. Keep it perpendicular to each other.
Keeping the servos powered lock both servos with screws provided in servo accessory pack. Now you can power off the servo controller for next few steps.
Mount 2 50 mm studs with M3 small screws as shown in picture above.
On the back side, put the part with 4 holes and lock it with 2 M3 small screws and 2 Locknuts as shown in picture.
Take wrist rotate servo. Put 2 rubber mounts on mounting holes from servo accessory pack.
Fix the servo to mini servo mounting plate with 2 M3X10 CSK screws and M3 Nuts.
If not already prepared, prepare wrist mount part with a servo horn as shown in top inset images. Neutralize the wrist servo and mount it on servo shaft parallel to body.
Fix the wrist joint servo horn to servo with screw. Mount a 50 mm stud in centre hole with M3 small screw.
Take the back part of wrist joint, put wrist rotate servo mount between front and back part and fix the back part with a M3 small screw and a locknut as shown above.
Neutralize the wrist rotate servo and fix the gripper on it such that its almost parallel to the wrist rotate servo plate.
Lock the gripper to wrist rotate servo with a lock screw provided in accessory pack of mini servo. You will have to put screwdriver through gripper’s hole in centre between tow jaws.
Neutralize a standard servo, put the gripper jaws to approximate mid position and fix servo to gripper horn and secure it with a locking screw available in accessory pack from top. Mechanical assembly is now complete. Next step is connection and cabling.
Connect 3 servo extension cables to gripper jaw, gripper rotate and wrist servos as the cables will not be enough to reach servo controller.
Cabling is a very important part of assembly. Each joint should move freely after cabling. Start with gripper servo, examine each joint’s maximum movement in both direction and fix the cable with cable tie. You can mark the end connectors with servo name or number so that connection will be easy at the end.

Follow the pictures to see steps in cabling.
Assembly is now complete.
The final robot should look like shown above. Go through the servo controller document for programming and using the robotic arm.
Service and Support
Service and support for this product are available from Robokits India. The Robokits Web site (http://www.robokits.co.in) maintains current contact information for all Robokits products.

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