3D printed ROBOT ARM first tests

Part list:

n° 20 3D printed parts

· n°1 EBA_01.00.001.STL

· n°1 EBA_01.00.002_vertical_drive_arm.STL

· n°3 EBA_01.00.003_link.STL

· n°1 EBA_01.00.004_forward_drive_arm.STL

· n°1 EBA_01.00.005_horizontal_arm.STL

· n°1 EBA_01.00.006_triangular_link.STL

· n°2 EBA_01.00.009_servo_plate.STL

· n°1 EBA_01.00.010_basement.STL

· n°1 EBA_01.00.011_round_plate.STL

· n°1 EBA_01.00.012_R01_claw_support.STL

· n°1 EBA_01.00.013_R01_right_finger.STL

· n°1 EBA_01.00.014_R01_left_finger.STL

· n°1 EBA_01.00.015_drive_gear.STL

· n°1 EBA_01.00.016_R01_driven_gear.STL

· n°1 EBA_01.00.017_R01_ramp.STL (optional)

· n°1 EBA_01.00.018_maestro_holder.STL (optional)

· n°1 EBA_01.00.019_ball.STL (optional)

n* 3 Tower Pro MG90S servos

n* 1 SG90 servo (gripper) + 1 optional for the loop ramp

n° 7 M4 self locking nuts

n° 15 M4 washers

n° 7 M3 nuts

n° 1 M3 x 30 screw

n° 2 M3 washers

n° 4 M3 x 12 hex screw

n° 2 M3 x 12 TCEI screw

n° 2 M3 x 20 TCEI screw

n° 5 M4 x 20 round hed hex recess screw

n° 1 brass pipe 4 x 3 x 22 + n°1 4 x 3 x 26

ELECTRONICS

The Arm can be driven in several different ways : sketches, potentiometers, joystick, WII nunchuck …. after several trials I found very "easy" to use a controller from Pololu: Mini Maestro USB Servo Controller. You can attach up to 6 – 12 – 24 servos depend of the controller type. It is provided with a free configuration and control program for Windows and Linux that give you the power to drive the servo in manual moving slides; in the mean time you are able to set the values of speed and acceleration for any singular item. You can also build sequences of servo movements and run scripts stored in the internal script memory that can be automatically played back without any computer or external microcontroller connected.
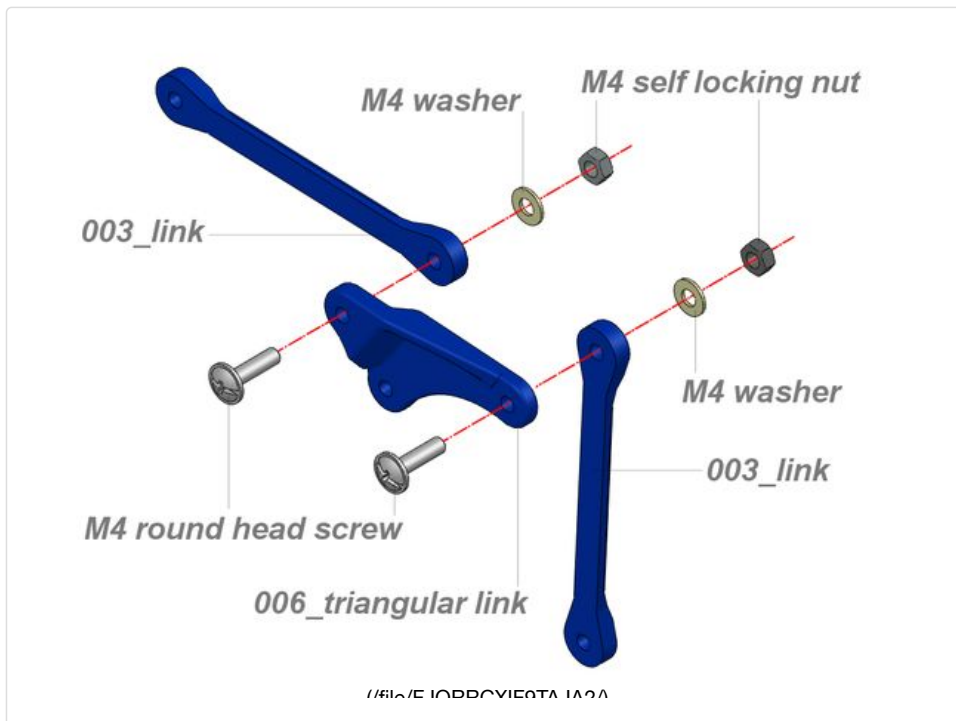
here the link of the Pololu servo controller:
https://www.pololu.com/product/1352 (https://www.pololu.com/product/1352)

------- UPDATE ------

add an instructables to drive it with Arduino, bluetooth module and Android APP made wit MIT app inventor

http://www.instructables.com/id/Android-APP-to-Con...
(http://www.instructables.com/id/Android-APP-to-Control-a-3DPrinted-Robot/)

Step 1:

(/file/FJOBBCXIF9TA.IA2A)

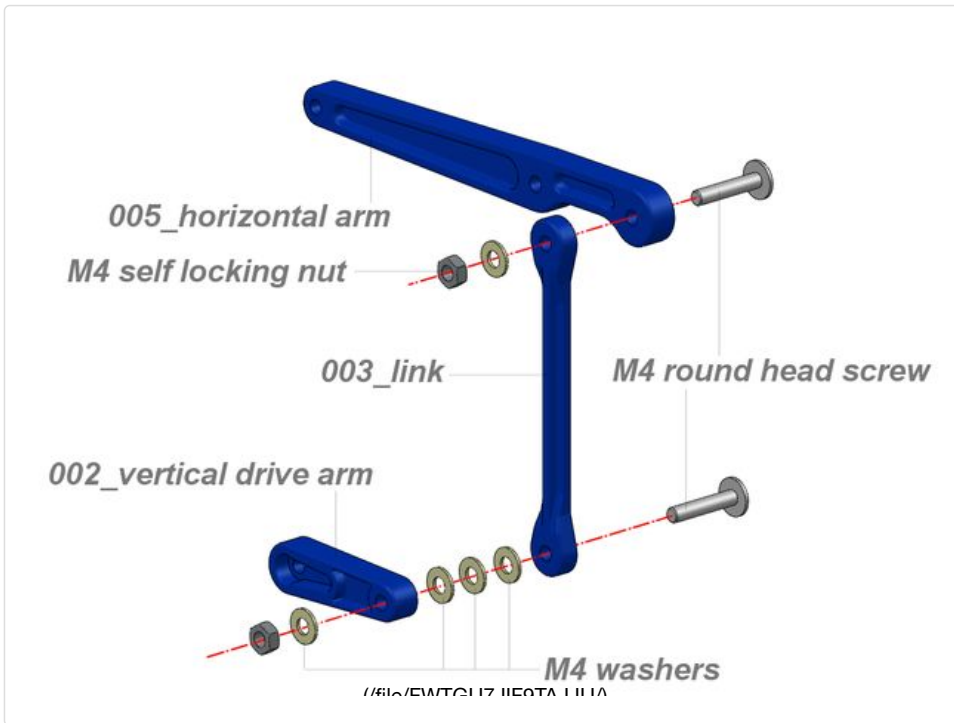Connect two link arms (003) to the Triangular link (006).

Keep the M4 round heads screws to the inner side like shown on image and selflocking nuts to the outer side.

IMPORTANT

I design all the holes of joints quite exact to allow to make them more precise using a drill bit

The nuts are to be tightened till the locking of the joint, then consequently you must loose them until you obtain a smooth movement with the lower clearance between components. This rule is valid and is to be applied also for the following joint that involve use of self locking nuts.

Step 2:

005_horizontal arm

M4 self locking nut

003_link

M4 round head screw

002_vertical drive arm

M4 washers

(/file/EWTGUZ IIF9TA I ILIA

Connect link (003) to the rear joint of the horizontal arm (005).

The lower part of the link (003) is to be connected with the vertical drive arm (002) as shown.

Between the two links interpose three M4 washer, this to better align them with the vertical arm

Keep the M4 round heads screws to the inner side and self locking nuts outside

Step 3:

M3 selflocking nut

M3 washer

M3 x 30 screw

Ø4 x Ø3 x 26mm brass pipe

(/file/ECDLLIZIE9TAKI4A

Connect now the two preassembled links to the forward drive arm (004).

Punt in position horizontal arm (005) and triangular link (006) aligned with the upper connection of the forward drive arm (004). Insert the Ø4 mm brass pipe crossing all the parts and fix it with the M3x30 screw, locked by the nut on the other side.

Verify the freedom of movement and If everything is ok, proceed to the next step.

Step 4: Base assembly

M3 x 15

EBA_01.00.001_base.STL

EBA_01.00.011_round plate.STL

servo horn screw

servo horn (double)

n° M3 nuts

MG90S servo

EBA_01.00.010_basement.STL

(/file/EU17DLVIE9TAKL3A

Part list:

· n° 1 EBA_01.00.001_base.stl

· n° 1 EBA_01.00.011_round plate.stl

· n° 1 EBA_01.00.010_basement.stl

· n° 1 TowerPro metal gear MG90S servo with double arm horn

· n° 1 servo horn fixing screw

· n° 2 M3 x 15 screw (VTCEI)

· n° 3 M3 nuts

Step 5:


//file/E6ZQN51JF9TAKSDA
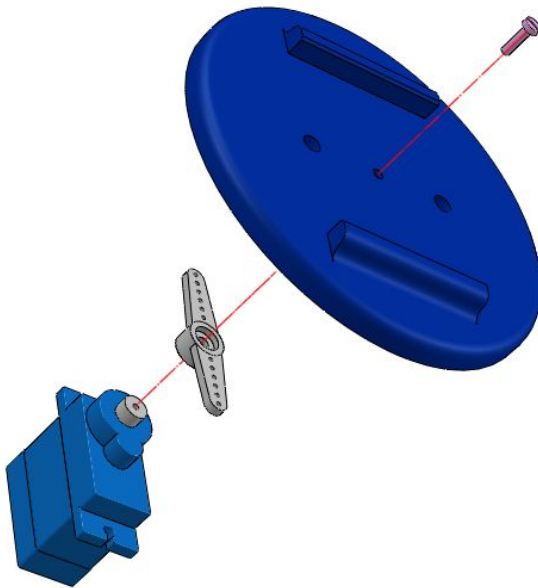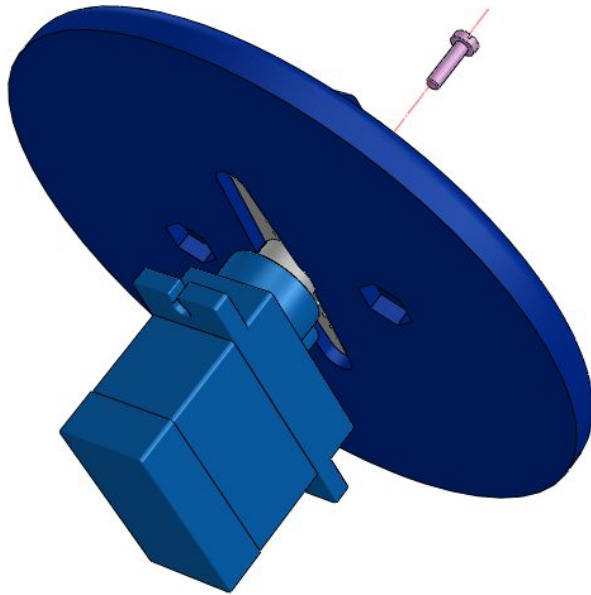
(/file/F5H6REXIF9TAKSEA

Be sure that the servo is in the neutral position than install the double arm horn on the splined shaft keeping the arms parallel to the servo body

Insert the horn inside the housing below the round plate and fix the servo to the plate using one of the two long screw supplied with the servo (the small one in too short due to the thickness of round plate)
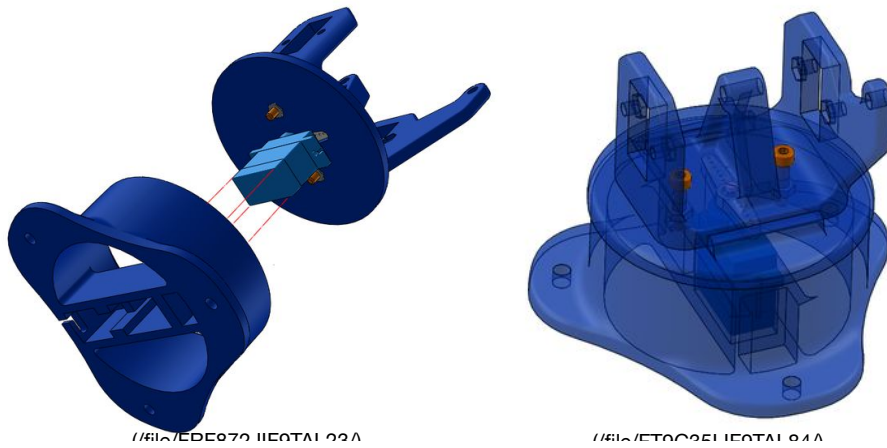
Step 6:

(/file/FF3VAWTWIF9TAKWHA

(/file/FTQWJHEIF9TAKWM)
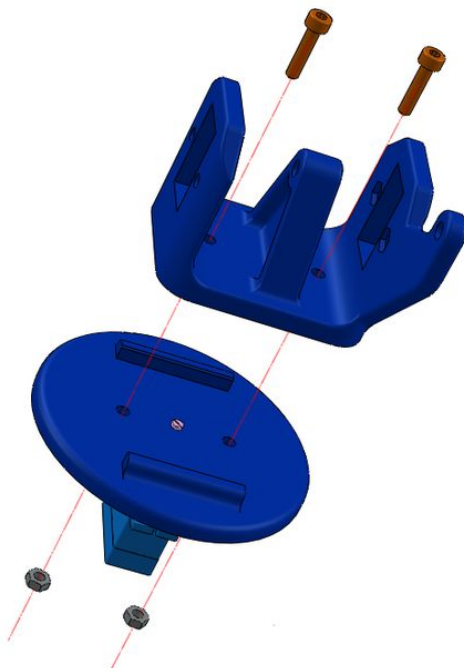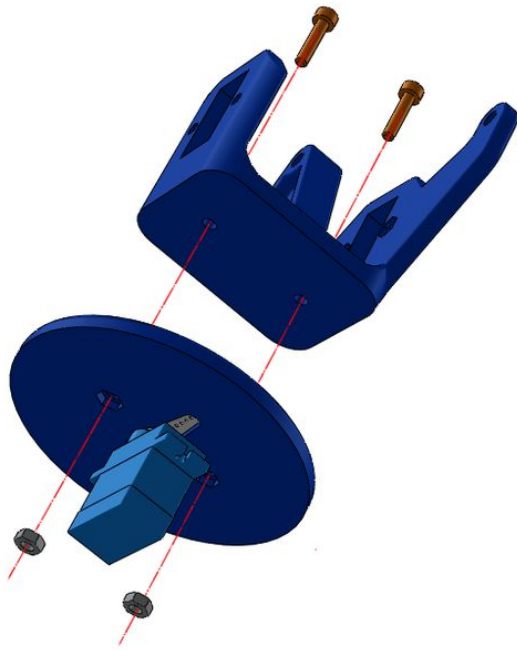
Put in position the base between the two shoulder on the plate and attach together using the two M3 screws and nuts. There two hexagonal housing below, so nuts will be kept in position during tightening

Step 7:

(/file/FGH53VSIF9TAL28)
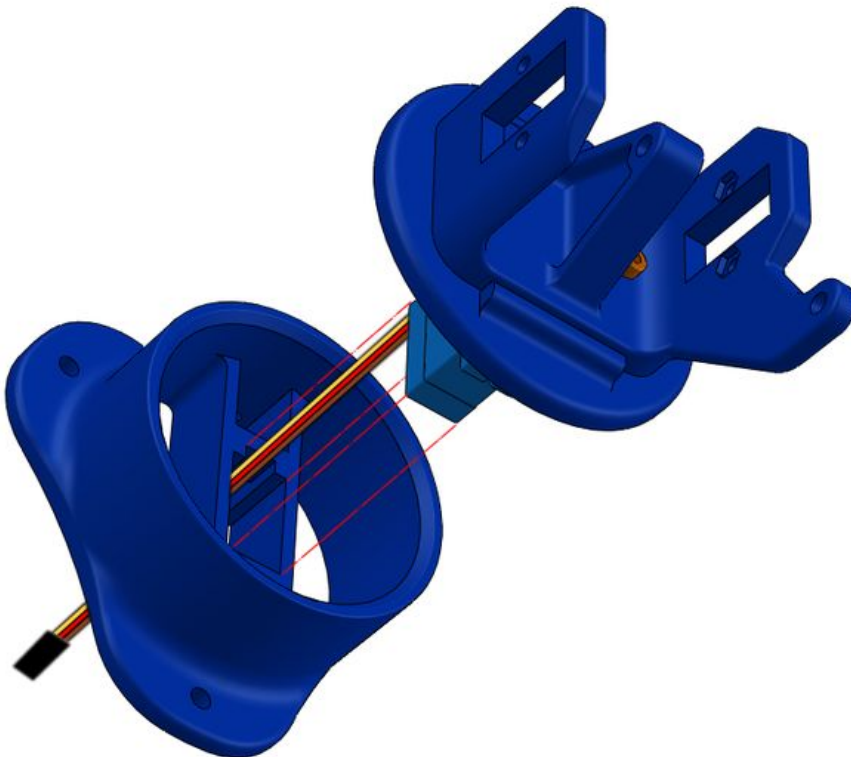
(file/EBE872...IE9TAL23A)   (file/ET9C35IIE9TAL84A)

Align the servo and introduce the wiring in the central part of the basement. Gently pull the wire to make it straight while continue to push in it housing the servo

The wire is then kept in position making it pass through a frontal hole

Step 8: Gripper assembly

fixing screw

MG90S servo

EBA_01.00.012

horn

fixing screw

EBA_01.00.016

EBA_01.00.015

EBA_01.00.014

M3 washers

EBA_01.00.013

M3 screw TCEI

(file/FF5K2ZAIE9UARSKA)

Part list:

· n° 1 TowerPro metal gear MG90S servo with single arm horn

· n° 1 servo horn fixing screw

· n° 1 EBA_01.00.012_claw support.stl

· n° 1 EBA_01.00.015_drive gear.stl

· n° 1 EBA_01.00.014_left finger.stl

· n° 1 EBA_01.00.016_driven gear.stl

· n° 1 EBA_01.00.013_right finger.stl

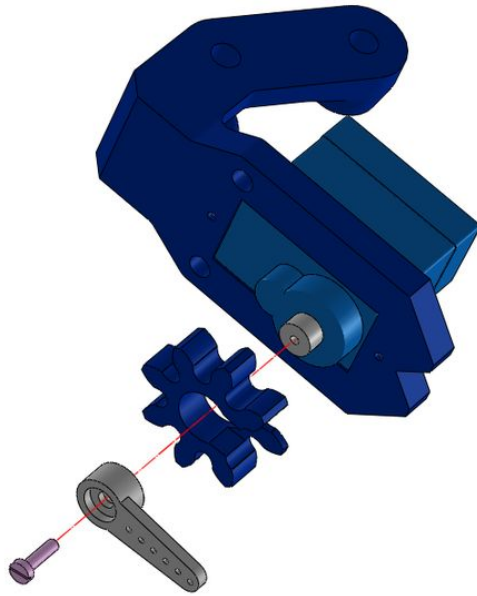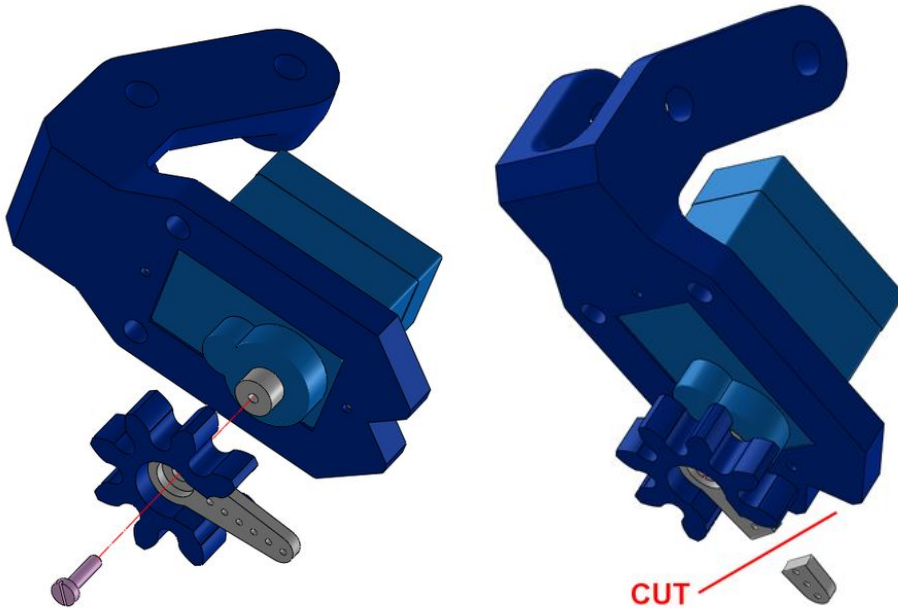· n° 2 M3 x 20 screw (TCEI)

· n° 3 M3 selflocking nuts

Step 9:

(/file/EQM8P6MIF9UABWBA
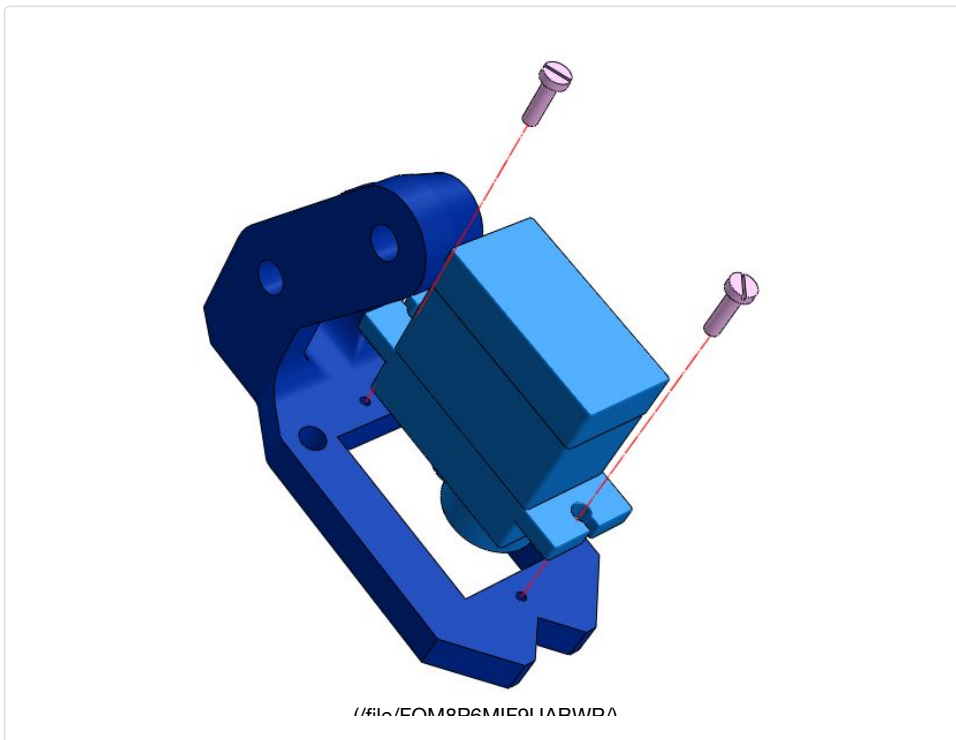
Attach the servo to the claw support using the two fixing screws supplied with the servo

Keep the output shaft forward

Step 10:

(/file/FNWZGAXIF9UAC00A

(/file/FKUO99CIF9UAC01A

(/file/FZIZZA3IF9UAC16A

CUT

Insert the horn in the driven gear then attach the horn at the servo shaft using the supplied screw

The horn has to be aligned forward with the servo in neutral position. Cut the exceeding part of the horn from gear using a cutter
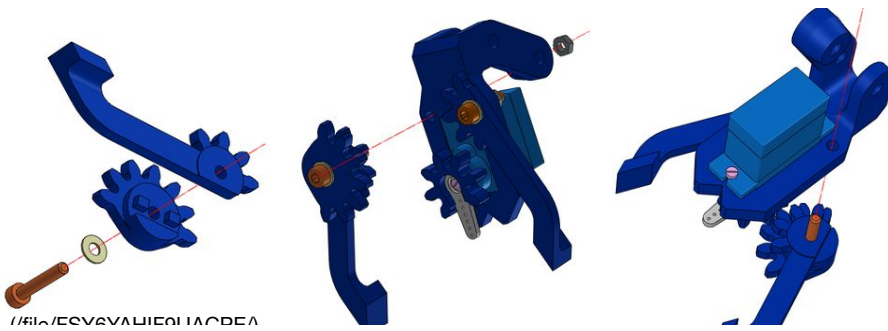
Step 11:

(/file/FRGA3XFIF9UACC0A
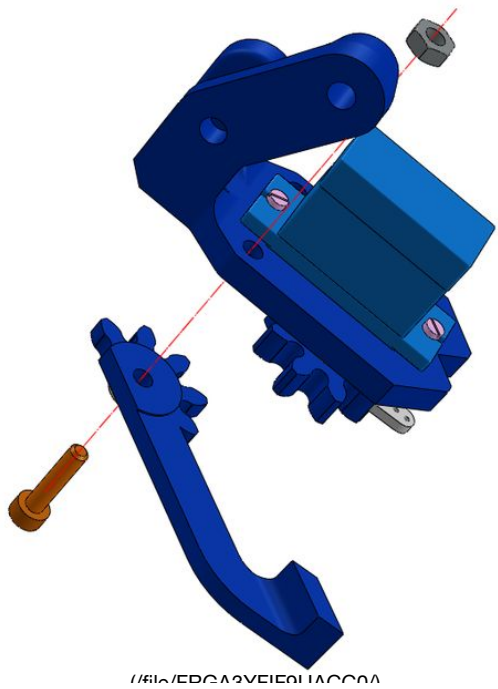
Insert an M3 screw in the central hole connect it to the claw support then tight the self locking nut checking the freedom of movement

Step 12:

(/file/F892FM5IF9UACN6A

(//file/FSX6YAHIF9UACREA
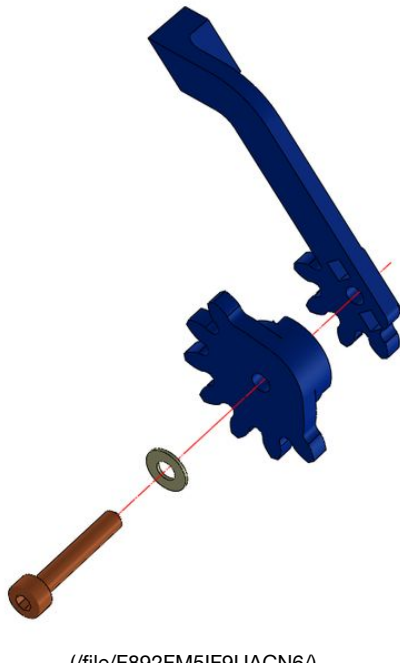
Insert the two pin of the driven gear into the dedicated holes on the left finger
The driven gear has also a shoulder that has to be aligned with the lateral side of the finger. If you find difficulties coupling them, reduce interference using a file.

Once coupled insert an M3 screw in the central hole and attach the finger to the claw support

Now the gripper is ready to be installed on the horizontal arm of the EEzybot

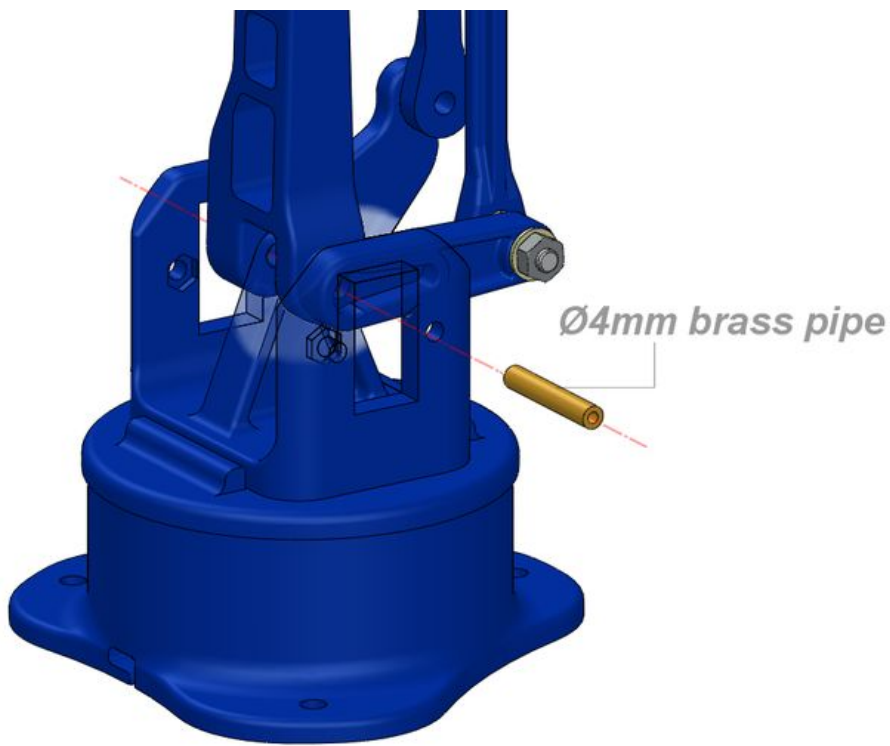Verify freedom of movement of the gripper manually or using a servo tester

Step 13: Final assembly

GRIPPER assy

MAIN ARM assy

BASE assy

(//file/EAS4SF5IFCDDYO4A

Now we have the three main sub assembly ready to be connected each other.

Next step we will join the base with the main arms

Step 14:

Ø4mm brass pipe

(/file/54BI0ZGIECDDZ53A

(/file/EN3LJHWIECDDZ54A
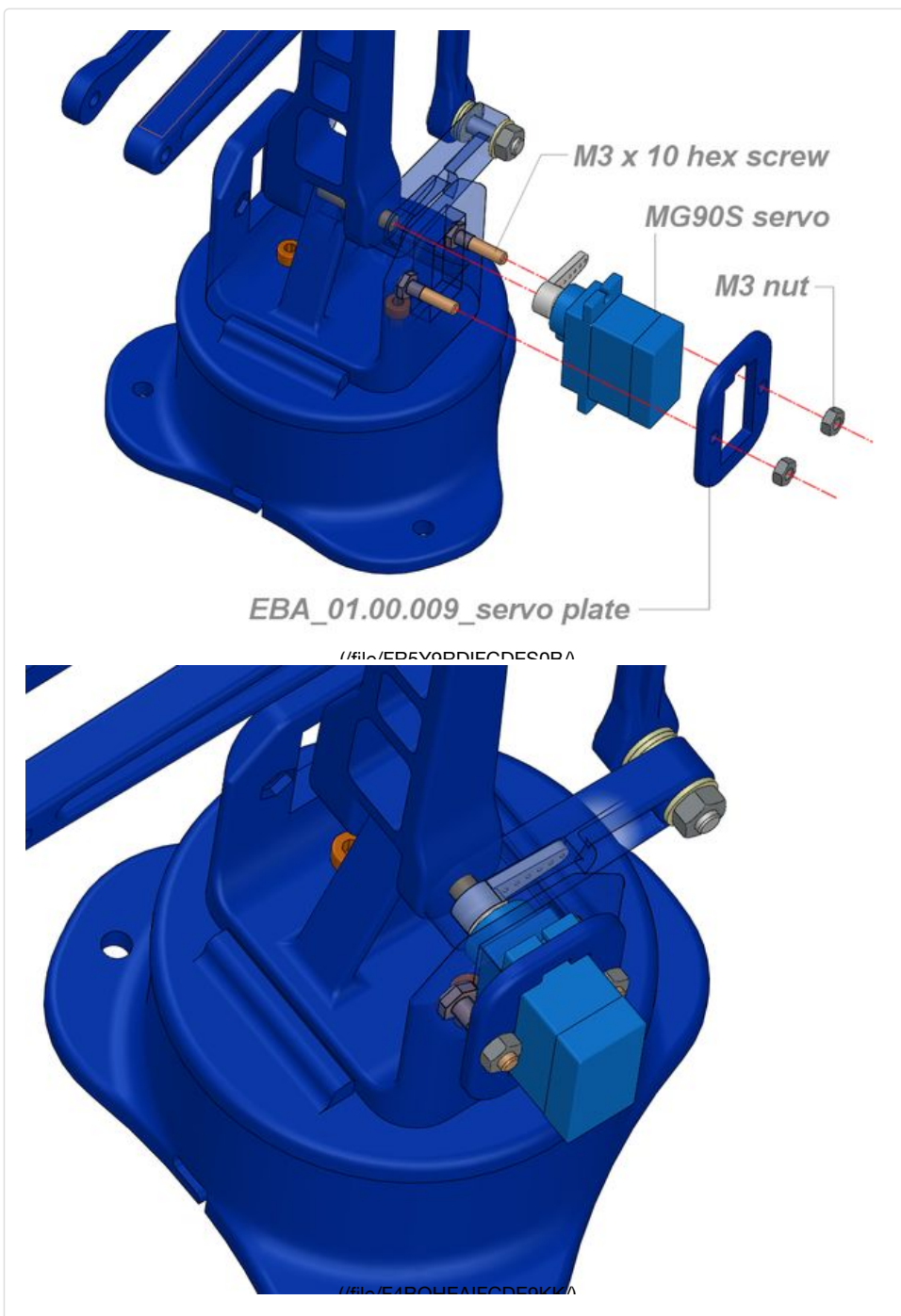
To join the base with the main arms align the axis of the parts and insert from one side the brass pipe 24mm long.

Also the short arm of the servo that drive the vertical movement has to be supported by the brass pipe as shown on the pictures.

Check the freedom of movement

Step 15:

M3 x 10 hex screw

MG90S servo

M3 nut

EBA_01.00.009_servo plate

Is time now to install the servo that drive the vertical movement of the arm. Put in the dedicate receptacles two M3x10 hex screw. The servo has to be in the neutral position with the horn at 90 degrees on the right side with the press plate (009) installed (Make the wiring pass through the dedicated enlargment).

Introduce the servo angled in the square seat on the base plate and slide the horn in the shaped housing of the arm that drives the vertical movement. Fixt the press plate against the servo using two M3 nuts

Step 16: Fwd/bckw drive servo

M3 x 10 hex screw

MG90S servo

M3 nut

EBA_01.00.009_servo plate

(/file/FXC7BHFIFCDFS.I5A)
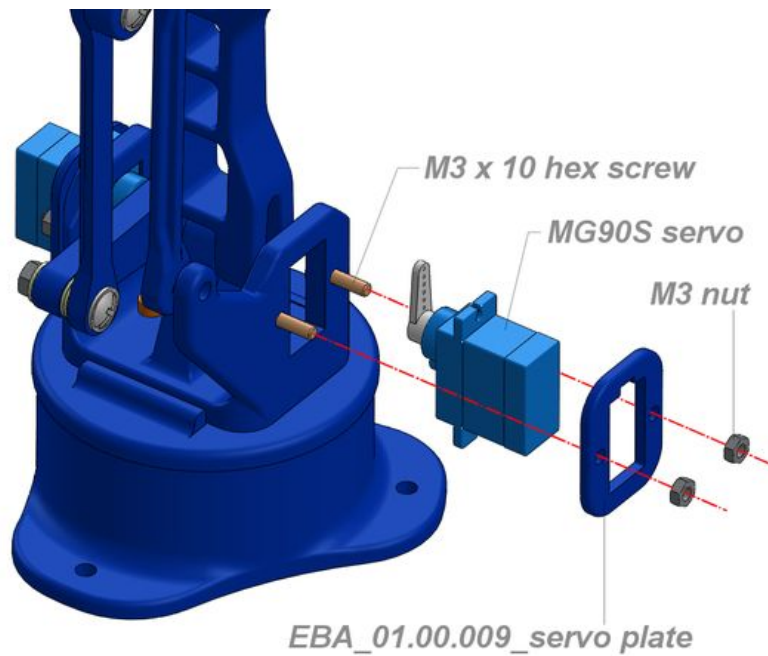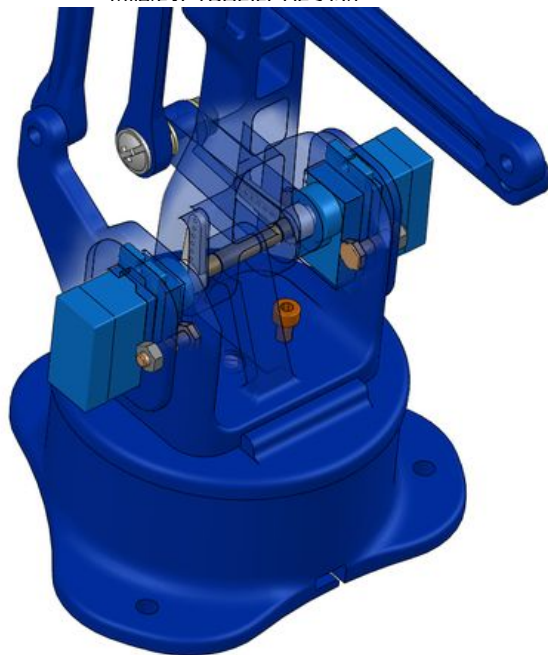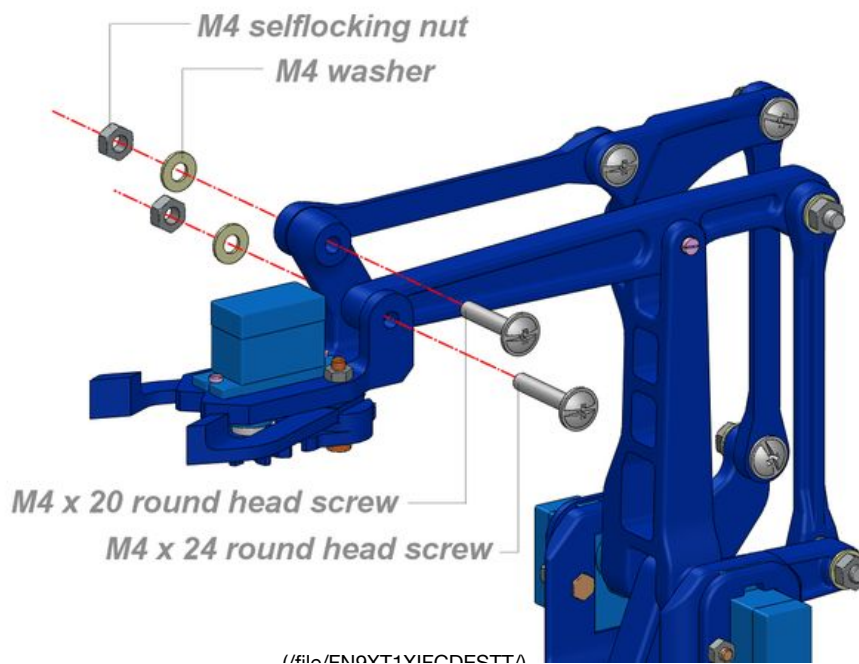
(/file/FHD09BBIFCDFRO4A)

Sequence for the forward&backward driving servo is similar to the previous. In this case the servo horn has to be installed with the servo in neutral condition aligned vertically.

Step 17: Last link

M4 washer

M4 selflocking nut

M4 x 20 round head screw

(/file/EHSM7TOIECDESMOA)
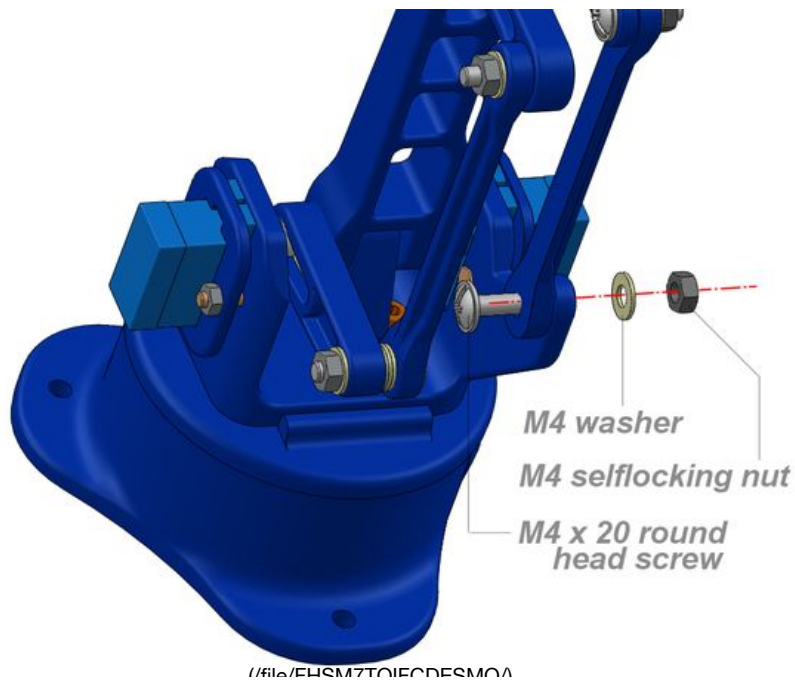
attach the latest link to the fixed arm on the rear side of the base using a M4x20 a washer and a selflocking nut

Step 18: Attaching the gripper

M4 selflocking nut

M4 washer

M4 x 20 round head screw

M4 x 24 round head screw

(/file/EN9XT1XIECDESTTA)

The last assembly step is to join the gripper to the horizontal arm as shown on the picture.

Step 19: Making it works
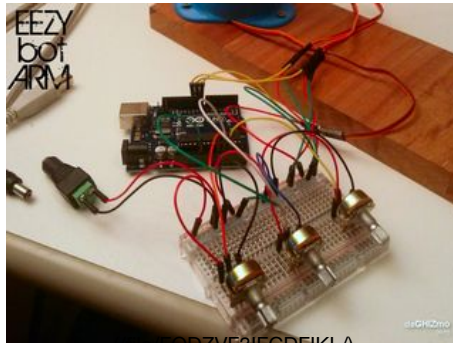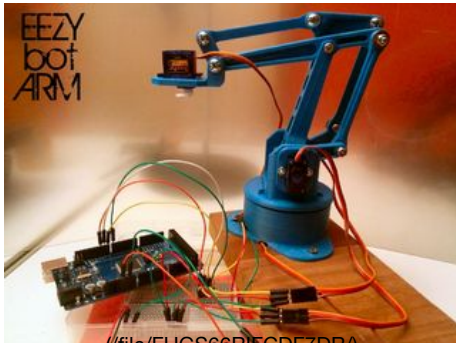
At the end of the last step the ARM is ready to work.

As an optional, In the 3D model downodable from Thinghiverse, I add a round ramp that allow to easy obtain a loop test with a ball (3D printed, obviously!). In the video linked on first page is shown what I mean.

To make this tool to work you have to attach another servo (cheap SG90) to the end of the ramp. I keep th ramp center at a distance of about 180mm from the base vertical axis.

There is also a 3D model of a support dedicated to the Pololu USB servo.

The way to drive the servo are several. I tried them pretty all. To explain it will take to much and this instructable is big enough ..... probably I'll make a new instructables dedicated, If I get time. Anyway if you want to explore there are quite enough material around the web.

As told at the beginning, I found very easy using a Pololu USB servo Mini Maestro, it is not very cheap but solve a lot of problems. You have to install drivers, a software and when connected to usb you're are immediately able to drive the servos choosing their speed and acceleration also. You can store the

servo position to a sequence and when ready it can be played once or in a loop. Can also be stored in the internal script memory and it can be automatically played without computer connected.

be nice

We have a be nice comment policy. Please be positive and constructive.

✋ I Made it!   📷 Add Images   Post Comment

alextrantanella (/member/alextrantanella) made it!   15 hours ago   Reply

Awesome! Now it only needs purpose!

(https://cdn.instructables.com/FRP/8SKE/IY0FU3ZU/FRP8SKEIY0FU3ZU.LARGE.jpg)

AsdOmega (/member/AsdOmega) made it!   13 days ago   Reply

Nice "weekend" project - took me a little bit longer during the holiday (to mutch christmas cookies to eat).

I modifed the sweep-example from the arduino library for the first run. Now I´m thinking if I should print the ramp our build somthing else to have a nice little application.

(https://cdn.instructables.com/F81/3MM9/IXGG1828/F813MM9IXGG1828.LARGE.jpg)

MarkT150 (/member/MarkT150) made it!   14 days ago   Reply

Nice one =) Thanks a lot!. Now i gonna make mkII, i hope new servos will be much stronger =)