

TUTORIAL 1: BUILDING WITH MULTIPLO

Description: Building a robot is like building any other thing. You just need to have an idea from your imagination, and the courage to build it. And, of course, patience. But things are much harder if you don't have any standard method of construction. That's why we develop Multiplo as an integration of different disciplines, so that you don't have any difficulties neither with the mechanics nor with the electronics. And so, you can focus in the process of creation.

The mechanics of Multiplo is based on a mathematical system that keeps proportions of growth in each axis, allowing robots to be 3-D. The design concept is that all the parts should be available "off-the-shelf" and ready to be customized by experienced users. That's why we laser cut and we use standard M3 bolts.

The mathematical relationship is based on a system of 3mm. All thicknesses in materials are 3mm and all screws diameter are M3. All holes are 3mm and all distances between holes are $3 \times 3\text{mm} = 9\text{mm}$. This allows all holes to be coincident when you mount different parts between each other. But even more, it allows users to easily reproduce the parts with simple tools.

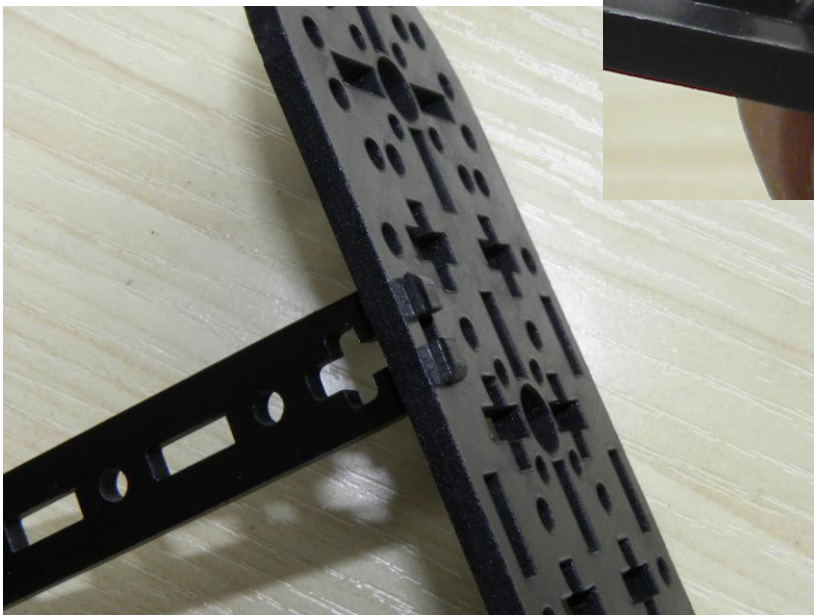
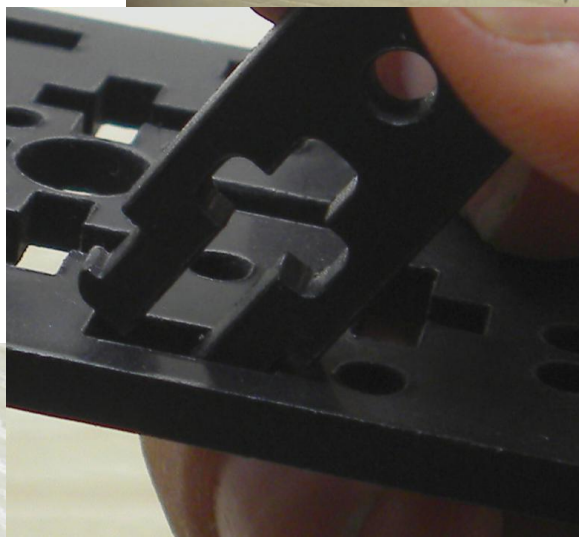
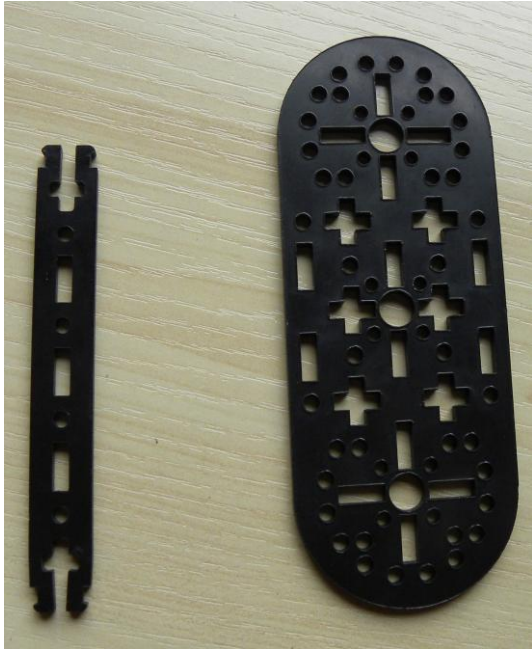
The most important aspect of building with Multiplo is that all resources are shared in an open source philosophy. Anyone can download the blueprints, modify them and cut his/her own pieces. You just need to use a sheet of 3mm thickness and a bit of imagination.

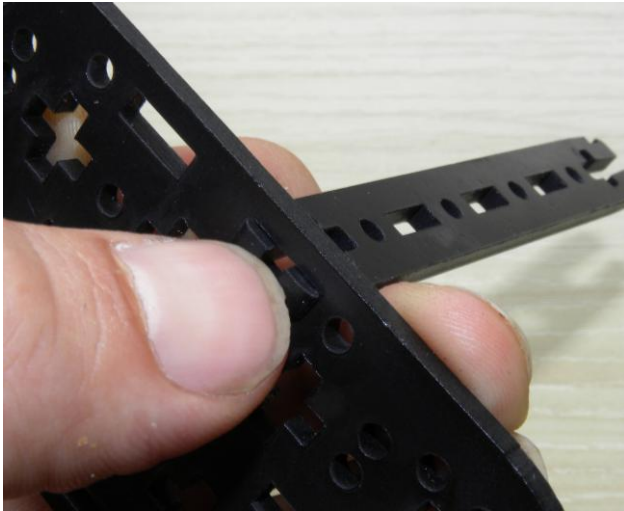
We use for these tutorials materials like acrylic and ABS laser cut. But you can use 3D printer or cut with a sharp razor fiberboard (a.k.a. MDF). This way you can use from aluminum for heavy duty robots to lightweight plastic for quadcopters.

Materials needed:

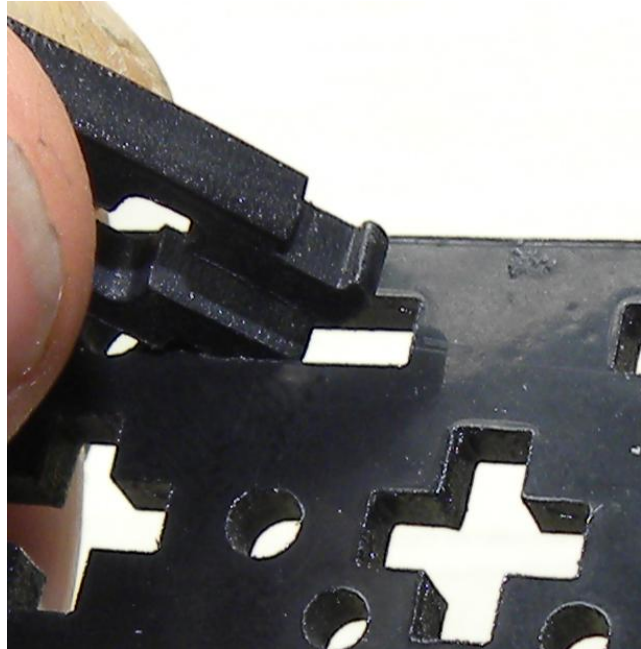
- ABS plastic parts Multiplo compatible
- Plastic Rivets
- Bolts and Nuts (M3 size)
- Creativity and Patience

STEP 1: Hold any SNAP linkable end against any rectangular slot. See that they match together and then press firmly to get them linked.





In order to separate them again into pieces, you need to press slightly on the tips of the link.

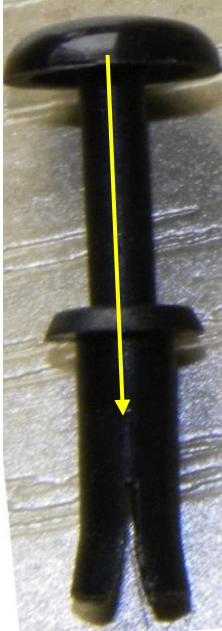


STEP 2: Take a rivet or two. Practice by pushing its head against its body. The way that it works is that when it gets completely inserted, the tip of its body expands. They are reusable, so you can make robots with them without the need of using any tools.

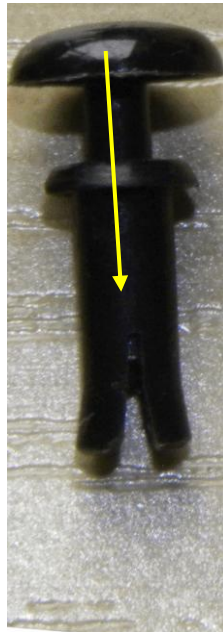


If the inner “nail” gets inserted too tightly, you might need to use your nails or some thin pliers in order to remove it. Be careful of not damaging the tip of the body in the process, because you want to keep them healthy, so that they stay with you for many, many robots.

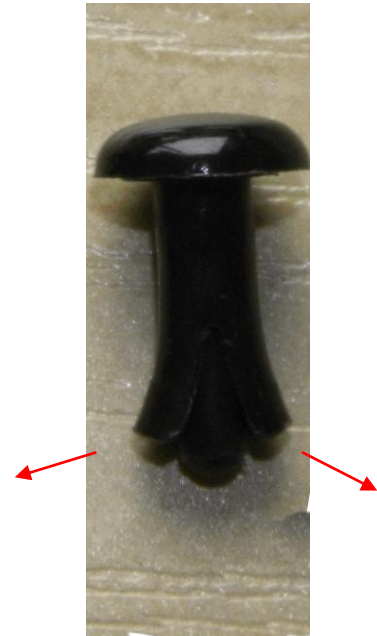
*Press this
way*



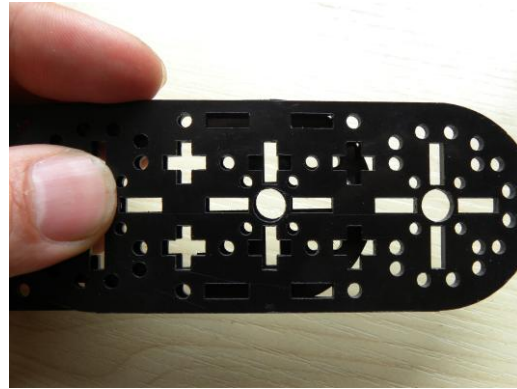
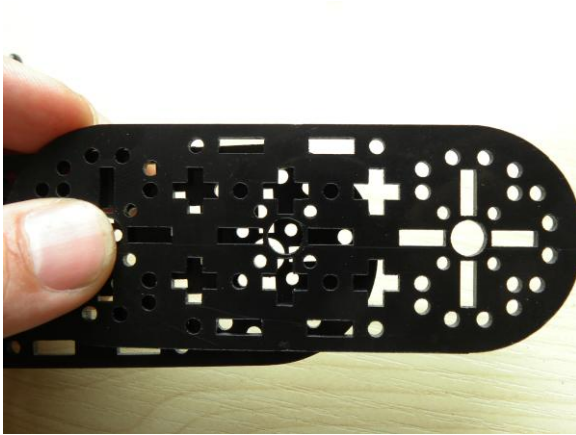
*Push to
tighten up*



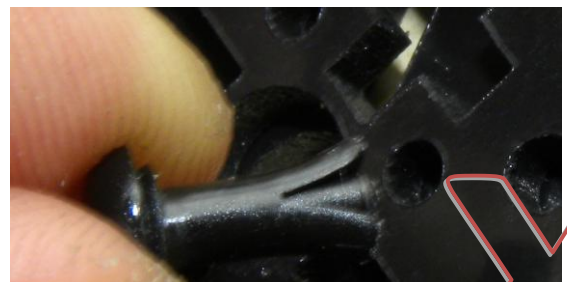
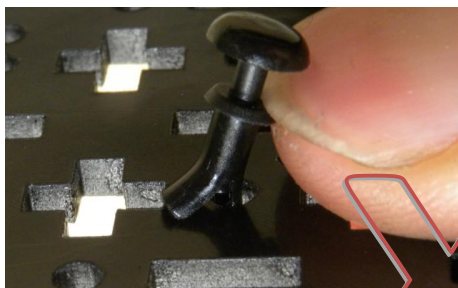
*Its tip will
expand to
both sides*



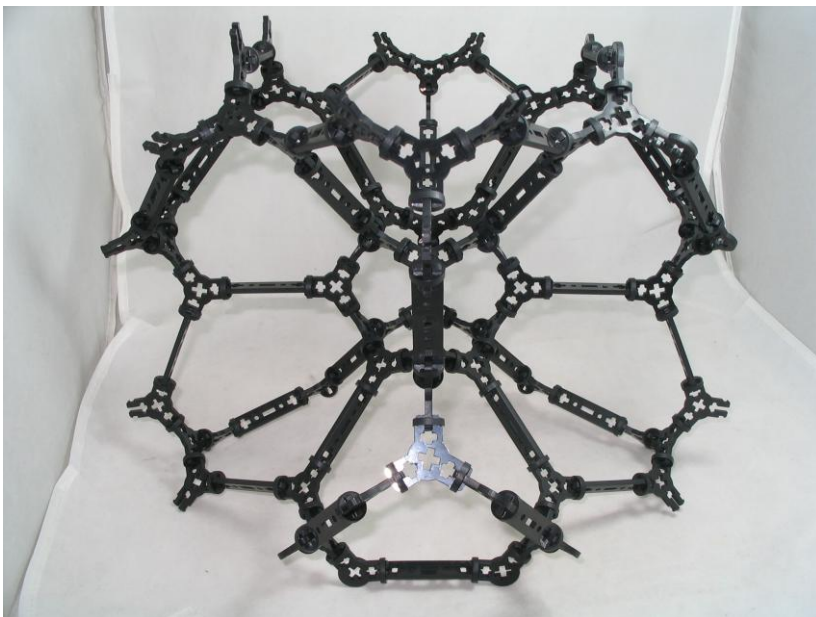
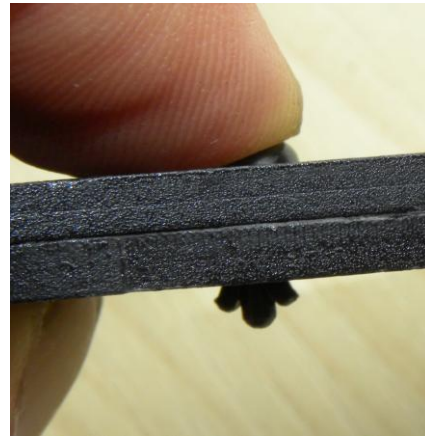
Align the two parts that you want to match together. Make sure that these two parts are aligned in the correct position. You should be able to see that their holes are rounded shaped.



Insert a plastic rivet, taking care that both ends of its tip go through. Be careful of inserting the whole plastic rivet. Below you can see some examples of what you DON'T have to do.



Press its head till it gets inserted and expands from the other side.



Congratulations! You are ready to assemble your own robot. Try your imagination, use our assembly guides, and experiment new shapes. Post your designs in our forum, so that we can create in our website a section called "Hall of Fame".

STEP 3: For even stronger links and parts that you don't want to be easily detached, you can use the screws and bolts compatible with Multiplo. The system uses different "off the shelf" solutions, mainly by using components from the industrial ISO standard. The length vary from one bolt to another, but all of the ones included in standard kits are what it's called M3 (because they are based in the Metric System, with 3mm).

You can purchase your own bolts and nuts at any hardware store, just make sure that they are also M3. You can read more about these standards at http://en.wikipedia.org/wiki/ISO_metric_screw_thread



STEP 4: You can build up your own parts with the blueprints that are available. If you are in a hurry for prototyping something and your robot cannot wait, just need to remember that holes are 3mm and distances are 9mm. Good luck with that new robot!



Tutorials for intermediate and advanced users include detailed information about how to laser cut, 3D print and drill parts compatible with the system.

