

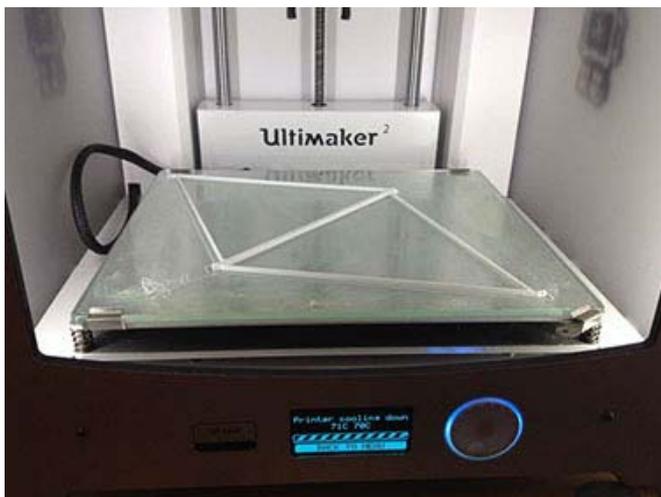
Open Kite—Sehun Oh

Published on Thingiverse, a site for 3D printing topics, this design uses just 4 printed components which, with a bit of ingenuity could be replaced with common components. For the full details and the 3D files see <https://www.thingiverse.com/thing:961471> where the files can be found.

Summary

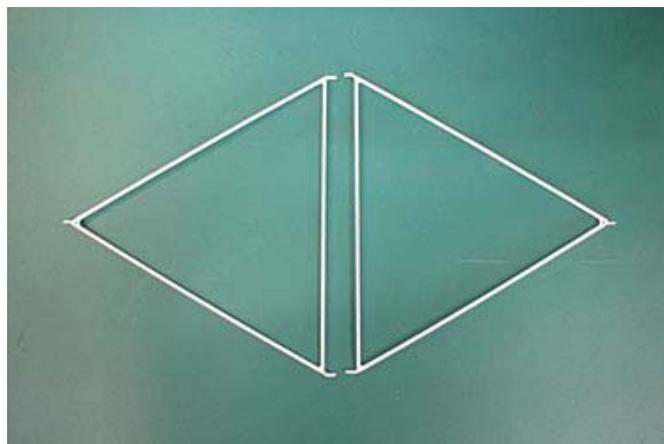
Alexander Graham Bell invented tetrahedral kites while he was trying to make an airplane more than a hundred year ago. Recently two British artists translated Bell's invention into a flying sculpture, Little Shining Man (Heather & Ivan Morrison, 2011). At first I was fascinated by the flying sculpture and tried to build my own kites according to the current instructions on the internet to build tetrahedral kites with drinking straws and tissue papers, but soon I realised that the current way is quite labour intensive process. So I tried to design components for easier kite building, and also I could figure out a way of making the structure collapsible, so that people can carry or store the structure more conveniently. I think I converted Heather & Ivan Morrison's flying sculpture into a more accessible product and I also made the component data downloadable so that people can download, 3d print and build their own collapsible tetrahedral kites.

Step 1. Download openkite.zip file, unzip it for the Wing, the Ring and the Plug STL files and 3D print them. ABS material is recommended than PLA because it is less brittle according to my experience. I haven't succeeded in printing more than a pair at once for the Wing component, because it was not strong enough when it is printed vertically.



Step 2. Left and right side Wing components are the same but you need to be careful with the assembly direction because upper and lower connector shapes of the wing component are slightly different. Beware that the upper connector of the right wing and the lower connector

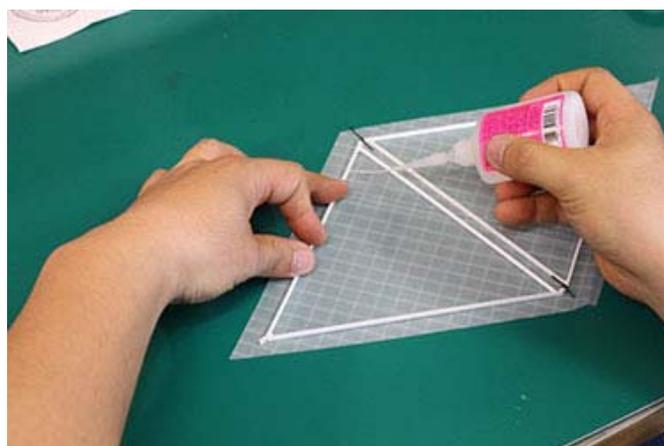
of the left wing reach a bit more outward so that they can cover their counter parts.



Step 3. Tie both wings together temporarily with short biding wires before gluing them with fabric. You have to keep consistency for wing component directions for later assembly. So keep putting right wings up if you started so.

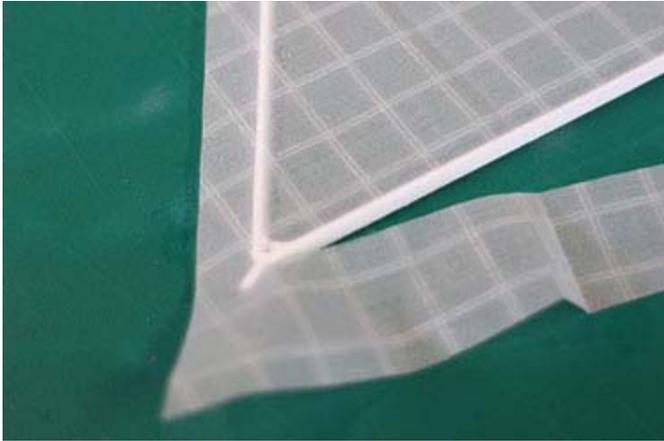


Step 4. Glue the tied wings with a piece of light fabric or thin film. Be careful not to use super glue too much, otherwise the 2 wing components will stick together. The thinner the better for the super glue.

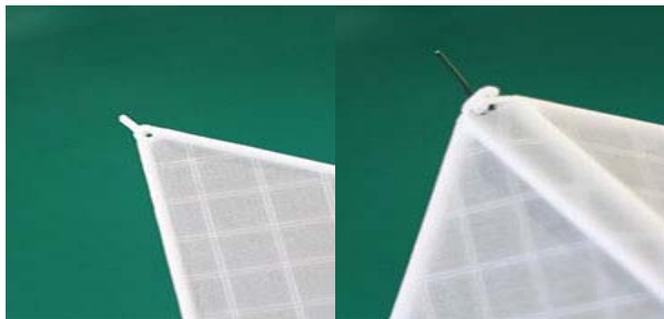


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Step 5. Cut the glued fabric from the fabric side to prevent the un-dried glue from permeating down to the table and hindering the making process.

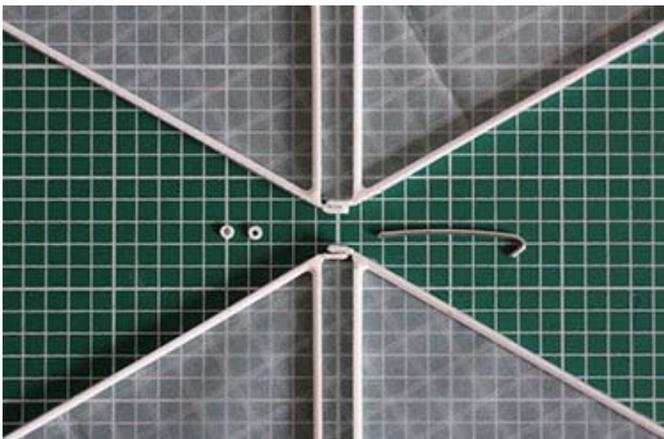


Fabric needs to be cut inside at the corner not to prevent the wing folding (right fig) and the fishing line penetration (left fig).

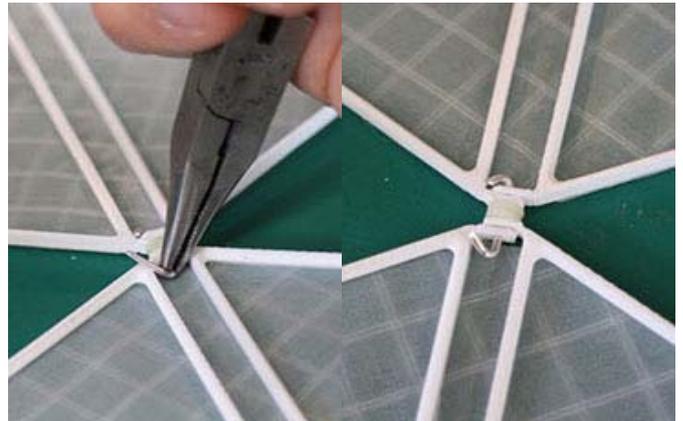


Even plastic bags can be used instead of the ripstop fabric.

Step 6. Connect 2 cells vertically. Cut aluminium wire into short pieces and bend both ends to use as folding shafts.



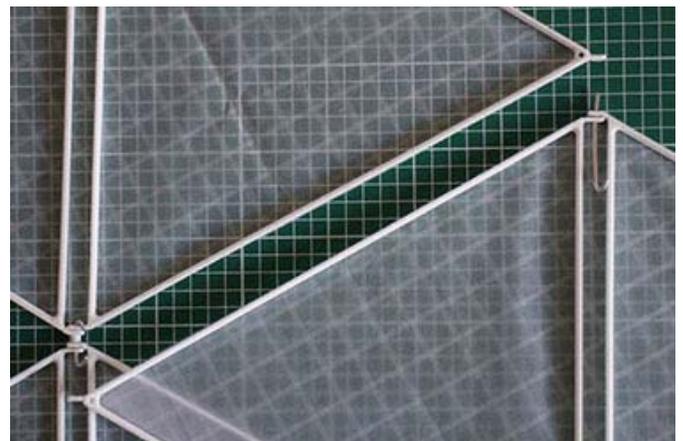
Complete connection should be made of 6 layers of shaft holes to keep the right distance between tetrahedral cells, so use the gap filler rings if there are gaps in between the necessary cells. In this case, you need to add 2 rings. Hold, bend and trim the other end of the wire with a long nose plier after penetrating the shaft holes.



Common aluminium wire is too soft, so you can also use blind rivet pins. You can cap and glue the opposite end of the nail head with a gap filler ring.

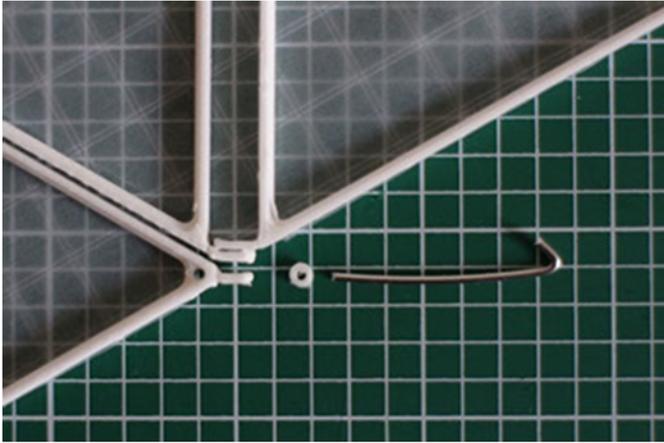


Step 7. Connect right cells' top and bottom with the wing ends of the centre cells. Beware that right ends of wings are slightly lowered and left ends are raised to be assembled in correct positions.

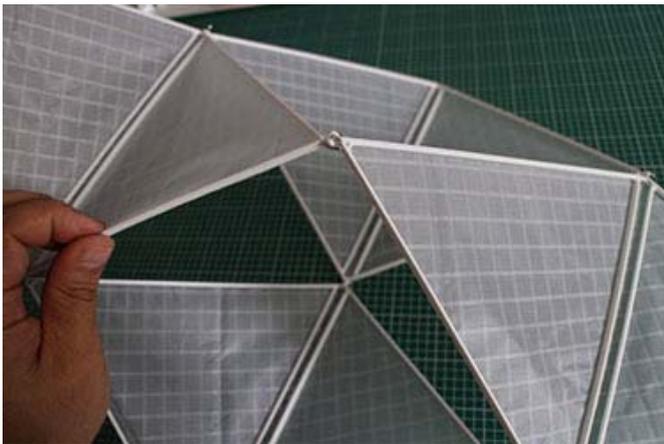


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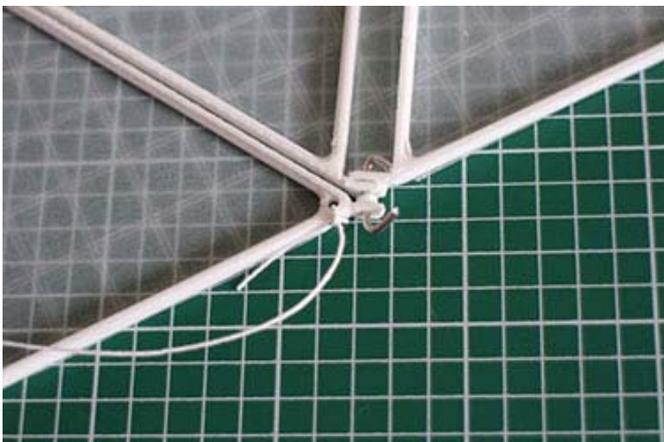
Use the gap filler rings when they are required. In case of this right cell, you need to use one gap filler ring for bottom connection, and also you need to use one ring for the top connection of the left cell.



Step 8. Connect the inward wing ends of the side cells together. Also fix the top and bottom of the centre cells with wire shafts.

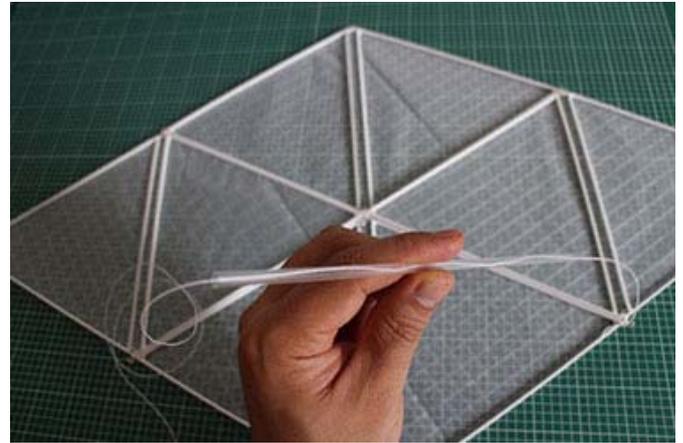


Step 9. Next step is making folding structure with thread and straws. At first, tie thread at a wing end hole of a centre cell.



Penetrate the thread through a straw and the other wing end hole. You can control wing an-

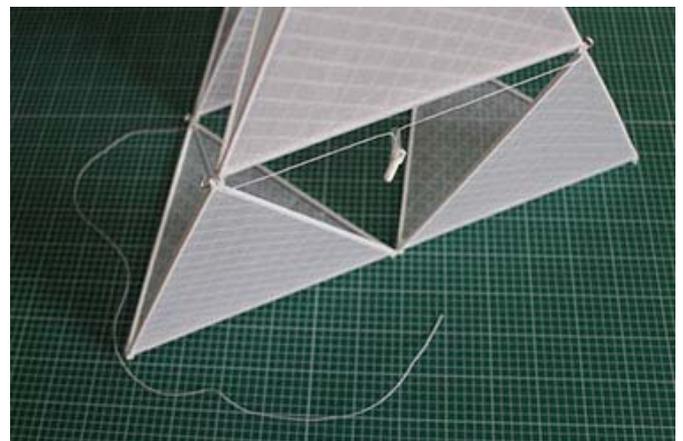
gles with the straw length. If you use 160mm straws, the cells will be a regular tetrahedron. If you use 200mm straws, the wing angle will be 90 degree and you can make cube kite with many cells.



Cut a straw and make 2 pieces of 15mm length plug holders. Penetrate the thread through the other wing end hole, the plug holder and the plug.

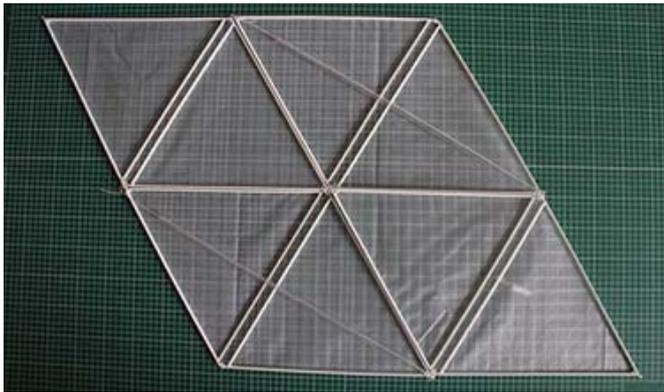


Penetrate the thread through the plug holder again and keep going for the other centre cell.

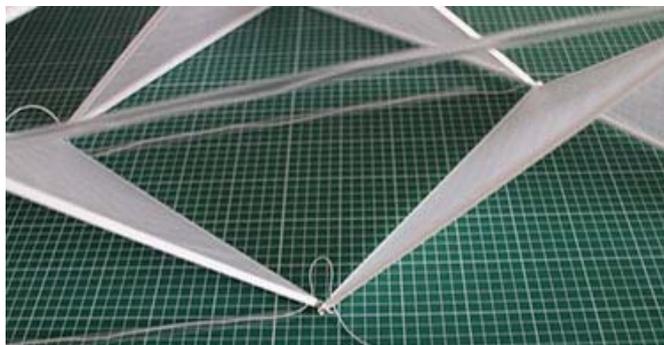


Unfold the structure and tie the other end of the thread as well.

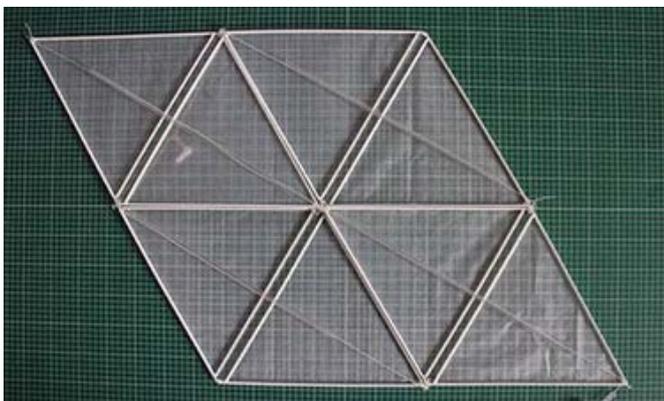
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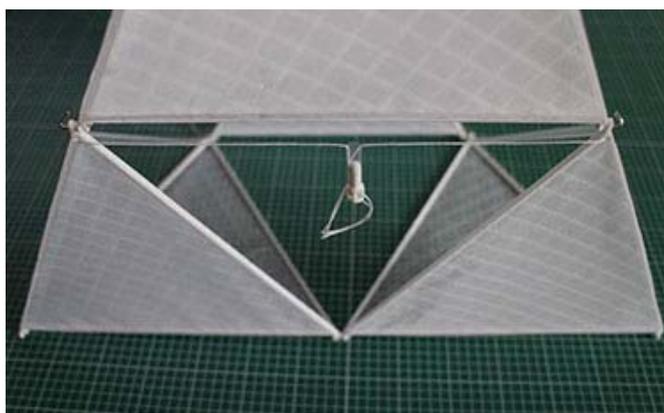
Step 10. Connect the thread and straws for the side cells as well.



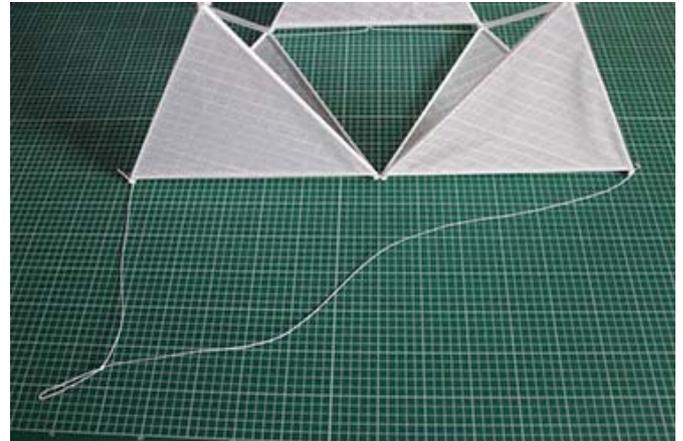
This time there are no more holes to go through after a plug, so the other end should be tied at the plug.



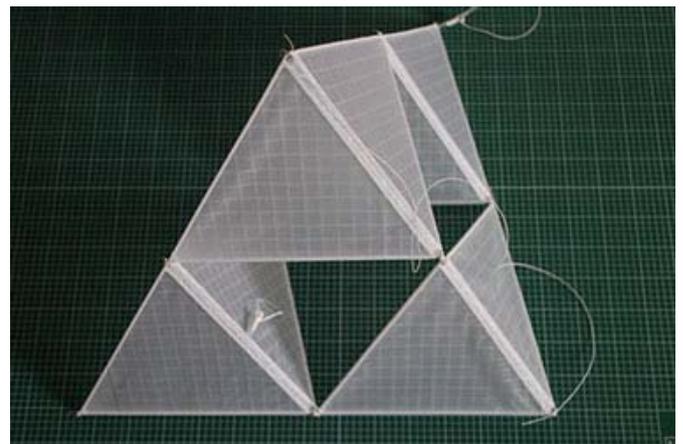
Now you can pull the plugs and then push it into the plug holders to fold and hold the structure.



Step 11. Tie a loose bridle from the top to the bottom of the kite. You can adjust the pulling point of the bridle when you fly it.



Just go outside and enjoy it! Once you make and fly this basic tetrahedral kite, then you can expand this structure and apply for your own kite design.



If the rear straw braces are not rigid enough when you fly bigger kite in strong wind, you can reinforce by overlapping them with thicker diameter straws. Good luck!



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