Subject: snap-together plates for making rhombic polyhedra
Posted by tivnanr on Sat, 09 Feb 2013 03:46:08 GMT
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This is a proof-of-concept model. There are 12 rhombus plates attached by sprues. Once disassembled, these parts can be snapped together to make a variety of structures. The cool thing is that they snap together with c-clips on a pin (think lego hands), which gives the structure a dynamic hinge motion. You can create polyhedra that fold up! I'm using toothpicks as hinge pins in the picture, but I plan to replace with plastic white hinge pins. I plan on uploading a higher resolution picture soon.

File Attachments

1) IMAG0443.jpg, downloaded 147 times

Subject: Re: snap-together plates for making rhombic polyhedra
Posted by henryseg on Sat, 09 Feb 2013 11:34:18 GMT
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Cool!

It looks like the two hinge piece types enforce an even degree at each vertex. Is that right? I wonder if there's a symmetrical way to do the hinge so that you don't have that restriction?

What are the little bumps in each corner of each rhombus for?

Subject: Re: snap-together plates for making rhombic polyhedra
Posted by tivnanr on Sat, 09 Feb 2013 13:26:34 GMT
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Henryseg, thanks for the reply and your keen observation. It is possible to have an odd number of plates on a vertex, but not in the structure shown in the picture. For example, I couldn't snap one of the rhombus plates into the rhombic "gap" seen in the top of the structure due to the the order of the c-clips on a rhombus plate. The c-clips are spaced differently along the four edges of each rhombus to enable multiple connections to a single pin, but sometimes restrictions emerge as I build complex structures. The solution is to design rhombus plates that have a different configuration of c-clip spacing than the ones shown in the picture. It's an interesting math problem (I'm a math teacher . I have considered the problem of restricted connections, and determined that

there are exactly six unique combinations of c-clip spacing on a rhombus.

Subject: Re: snap-together plates for making rhombic polyhedra
Posted by henryseg on Sat, 09 Feb 2013 13:51:31 GMT
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Could you have a hinge that looks like:

1-2-1-2

Where 1 is a pipe attached to the top rhombus and 2 is a pipe attached to the bottom?

At the moment it looks like:

1-22-1

and so you get these symmetry problems.

Do you ever attach more than two plates to a single pin?

Subject: Re: snap-together plates for making rhombic polyhedra
Posted by tivnanr on Sat, 09 Feb 2013 15:17:18 GMT
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henryseg wrote on Sat, 09 February 2013 13:51

Could you have a hinge that looks like:

1-2-1-2

Where 1 is a pipe attached to the top rhombus and 2 is a pipe attached to the bottom?

At the moment it looks like:

1-22-1

and so you get these symmetry problems.

Do you ever attach more than two plates to a single pin?

Your last question is the key to my overall design. I wanted a system that could attach up to four plates to a single pin, which is possible in the present design (1-3-2-4). This allows for more complex geometries beyond simple polyhedra, such as truss-like structures. For example, if I had a duplicate of the structure in the picture, I could snap them together using a single hinge pin. So plates that have 1-2-1-2 OR 1-2-2-1 are possible, but you wouldn't be able to attach more than two plates to a single pin. However, your idea has the advantage of providing stronger connections to support a structure under stress. These plates are so lightweight that two connectors per edge is adequate to support itself.

Oh, the little dots in each corner are the remnants of the sprues that I detached from the original print, which you can see in my profile picture.

Subject: Re: snap-together plates for making rhombic polyhedra
Posted by henryseg on Sat, 09 Feb 2013 16:00:36 GMT
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tivnanr wrote on Sat, 09 February 2013 15:17
Your last question is the key to my overall design. I wanted a system that could attach up to four plates to a single pin, which is possible in the present design (1-3-2-4).
Ah, I see. That makes it harder. If you were only doing surfaces, then you could use orientation to make sure that faces that meet at an edge are always compatible. But without that I can see that it gets difficult.