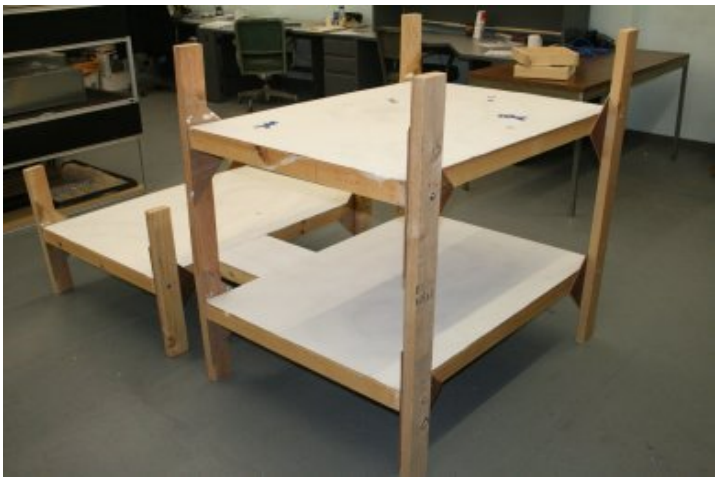
RCJ Rescue Arena

This is a record of the way we built a set of three connected modules for the RoboCup Junior Rescue competition.

This is the third set of modules that we put together, and overall I think we did a reaonable job, but there is nothing terribly clever going on. It is a pretty vanilla version of the official plans for RCJ Rescue.

I'd advise looking at those plans before trying to understand what's going on here, and bear in mind that we are looking at creating something that looks like this:



On other words, three modules, two in a stack, and another module alongside the bottom of the stack.

Main platforms

Start by building the main platforms. You need one platform for each module. Here's a picture of the bottom of one module:

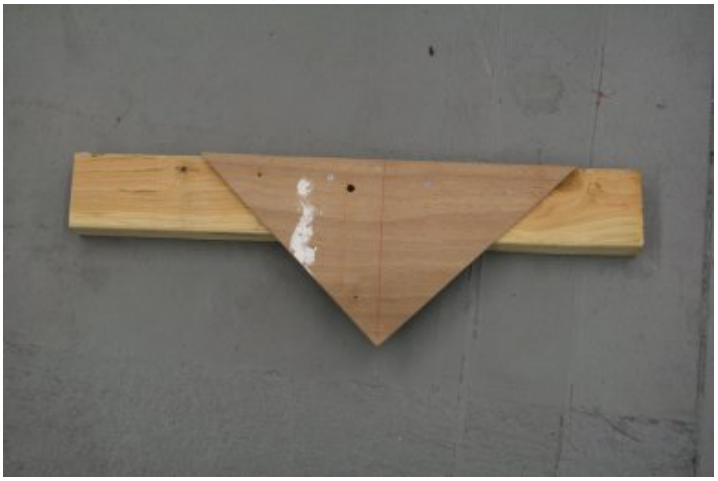
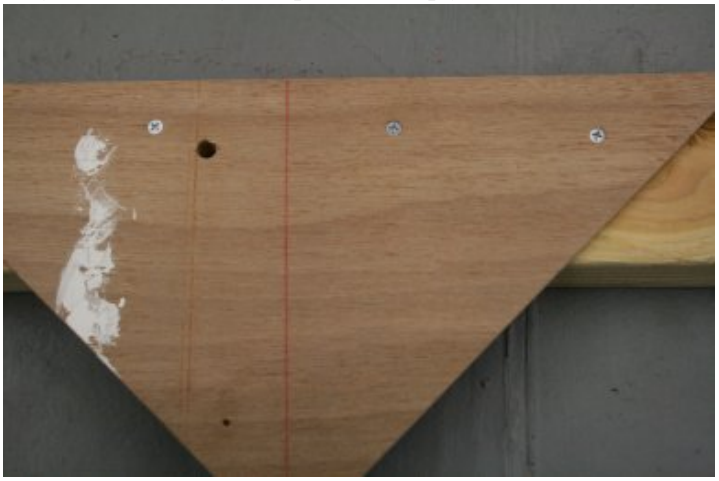
That's a sheet of 3' x 4' quarter inch plywood (anything thinner will bend, anything thicker is unecessarily heavy) (and since I often seem to be carting these things around, that matters :-), with a frame of 2 by 1 baton.

We just butted the ends of the baton together and screwed them into each other. It would have been neater to mitre the ends, obviously, but life's too short.


These pictures also show the holes for the coach bolts that hold the legs on. But don't drill those yet.

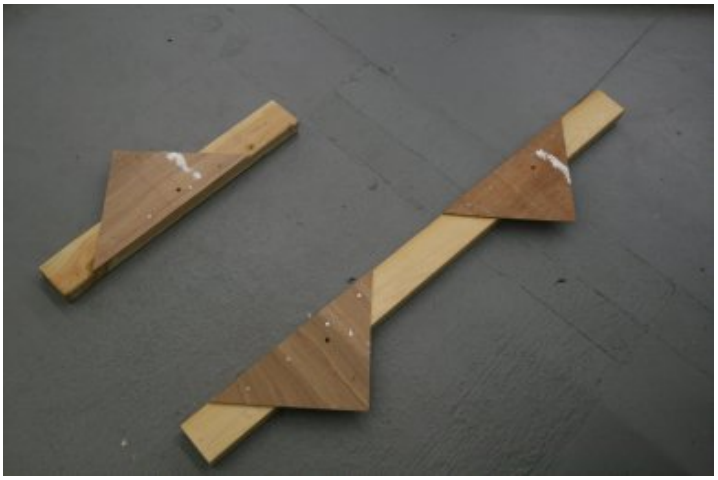
Legs

The four legs for the single level module are each 24" lengths of 3 by 2, with a triangle of quarter inch ply for stability.


The apex of the triangle is 10.5" from one end of the leg (the floor end).

The double level module has four 48" legs from the same 3 by 2, and the same triangles of quarter inch ply.



The apices of the triangles are 10.5 " from the bottom of the legs and 13" from the tops of the legs. You don't want to make the inter-platform distance much more than this or else the connecting ramp will be too steep and robots will never make it up.

We attached the legs to the platforms with coach bolts because we knew we'd be assembling and disassembling the modules a lot, and it's pretty easy to drill the holes for the bolts if you clamp the legs and the platform together first (none of that pesky measuring then).

Anyhow, you want to line up the base of the frame with the apex of that triangle, and after you have the bolt in place you want to put a small screw through the triangle and the frame (an inch long number 6 is fine) to hold the leg steady.

After adding all four legs to the single module, we have:

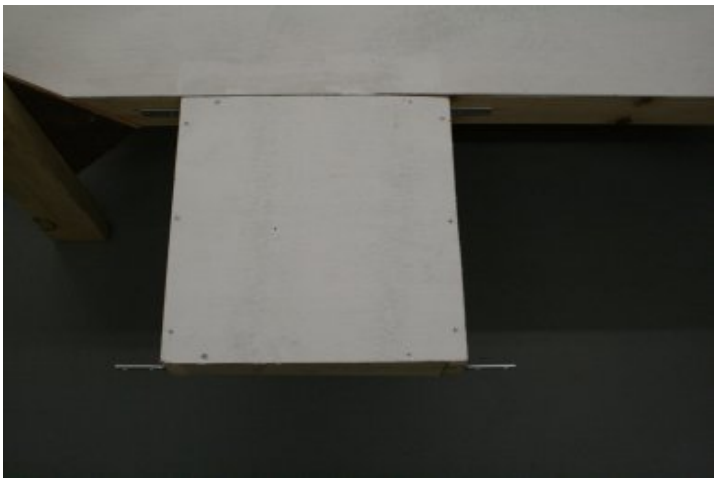
and the stack of two modules is constructed in much the same way.

Hallways

To link the modules, we have three 12" x 12" hallways, each constructed, like the platforms, from quarter inch ply on a 2 by 1 frame.

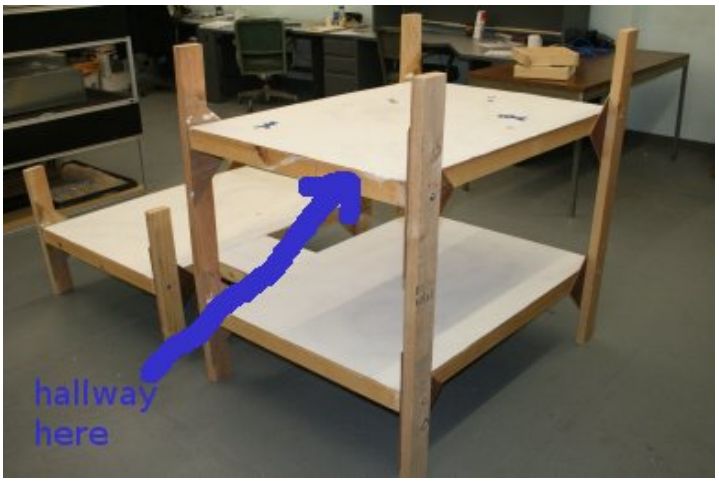


One of these has right angle brackets attached to it, and connects the single level module with the lower of the two stacked modules.




Another of these has a length of baton screwed to the side, slightly offset

This piece is bolted to the upper platform in the position marked.



Note that the ply overlaps the frame slightly in order to butt up against the the ply on the top platform.

The final hallway has a second piece of baton screwed to the side, exactly aligned, and is bolted to the single platform as shown.

Again, the ply on this hallway overlaps the frame so that it butts up against the ply on the platform.

The ramp

The last part to construct is the ramp that joins the upper and lower levels of the arena. This is the piece of the arena that I'm least pleased with, and I'm sure there are better ways to do it, but here's the way we put it together.

First you have the ramp itself:

It is 12" wide, the same width as the hallways, is made out of that same old quarter inch ply and has the same kind of support that the hallways and main platforms do, except for the fact that you can't run the supports to the end of the ramp. As you can see, I didn't get that right first time, and had to cut away the support at the bottom end:

You can also see that by this time we were down to the last of the 2 by 1 and didn't have enough for a cross piece at both ends. The ply was also pretty warped, and the frame wasn't enough to pull it quite flat.

The ramp is 62.75" long, as close as I could cut it to the precise distance between the pieces of hallway at top and bottom. That makes the angle of the ramp a little less steep than the maximum in the official plans. You probably don't want to make it any steeper since it is already a pretty stiff challenge to get a robot up it.

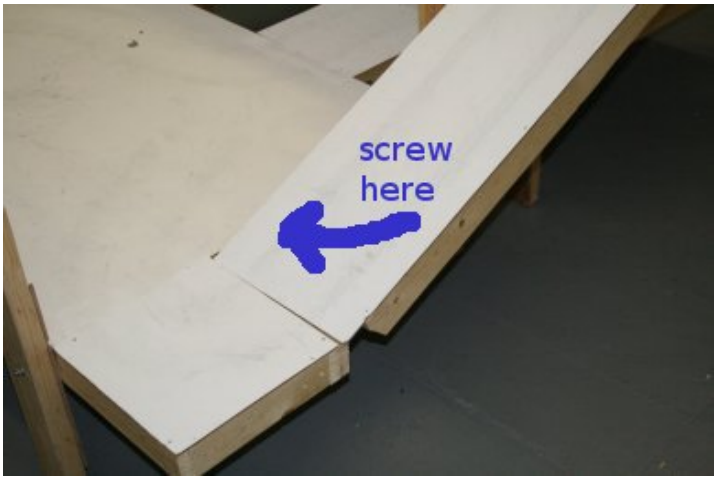
The ramp rests on the those extra pieces of wood attached to the upper and lower hallways, and then is screwed to the rest of the structure in three places:

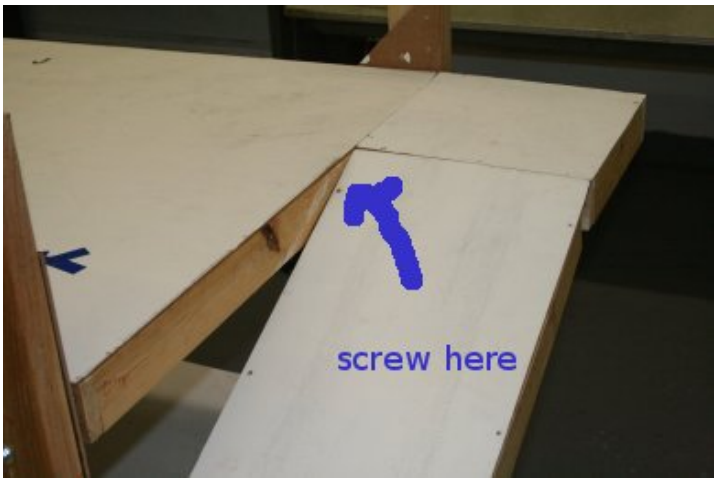
1. The frame of the lower platform;

2. The frame of the upper platform; and
3. One of the legs of the single platform.

FWIW, these are the holes for the screws:

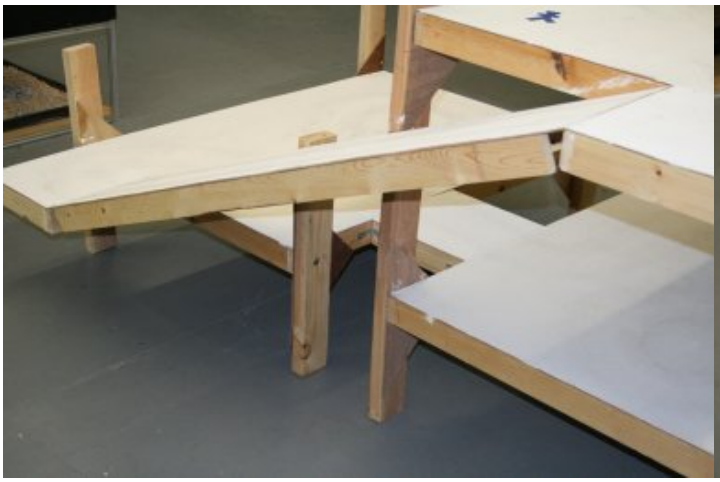
The following pictures of show the assembled ramp, indicating how the bottom, middle and top relate to the rest of the arena, annotated to indicate where those screws go.





Finished

That's it, so here are a couple of views of the complete structure.



The problem with the ramp is that it tends to bend away from the platforms when a robot is on it --- exactly what you would expect from a structure that is attached as a cantilever. The right thing to do is probably to build an extra leg to support it, somewhere about halfway up.

Of course, once you have the structure, you need to add walls to it, but that is a story for another day.

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