Building Techniques
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Introduction and Beginning Information

My paper is about my alligator showcase item. I wanted to explain the building techniques used to build it. First of all, the robot is 4' 2" long and 1' 5" wide. I used a lot of axle joiners, both the 3 and the 3 x 3 L shape both with four pins. It is made from two NXT's and it uses all six motor ports and I am using four sensor ports. I am using two touch sensors, an ultrasonic sensor, and a sound sensor. All the wires are long and for the ultrasonic sensor I used a mix of NXT/ RCX connection wires my helpful teacher Mr. Clark supplied me with.

Different Parts and Part Changes

The only non LEGO parts besides the NXT's batteries were rubber bands which weren't crucially needed but helped the movement of the alligator look less robotic and more real. The alligator walks forwards, rotates it's head, bites, and wags it's tail, and even growls which was part of the program on the NXT's. I have put gears on the tail to change the tension, change the height, and add realistic alligator movement with use of the rubber bands.

The alligator has gone through many changes. It's first big change was to make some parts thicker such as the tail and thigh. The second part of the first change was too make the other parts such as the feet and body thinner. The second big change was to strip it of colorful pieces and add a head. To do this I had to replace the colorful pieces with the main colors white, gray, dark grey, black, and orange.

Stability and Even Sides

The head was a big challenge because it was unstable at first, but after some more building techniques, such as using rubber bands and using more axles with more bushings, it finally worked. The last big change was huge. I put a jaw on the head so it could bite, widened the feet for more structural stability, and added extensions to the back feet enabling the alligator to walk. After that I reinforced and stripped the whole body till it was even. I tried to keep all the pieces

even but that was hard. Having things even is a good building technique. The only other reason it was uneven is because I had two touch sensors side by side on the right shoulder and nothing on the left.

Building Opinions and Information

Besides all the mess-ups it is amazing to look at the inside which shows all the building techniques needed to keep this structure's stability. For such a big robot it is very balanced and sturdy. I have dropped it and nothing has broken. The feet are connected by two long axles both covered with bushings to ensure no sliding movement. For those people who would like to know I used roughly 465 pegs, pins, and long pins. I also used 35 bushings and 16 gears. My building design actually consisted of shapes using the 1x7 liftarm bent 3x5 piece, which kept everything together and straight.

Building Stages and Tension

In its building stage I thought of it as three different parts. The main body with the two NXT's is the main part and is stage one. The tail and feet were the second part which consists of stage two. Stage three is just the head. When it walks the gator makes a sliding motion so I used axle tow balls and pin tow balls which helped. Later I changed the feet and they were no longer needed. To change the tension of the tail I added a little axle connected to gears which connect to the tail by rubber bands. By turning the axle you can make the tail raise, lower, be at a stressed position, or let loose.

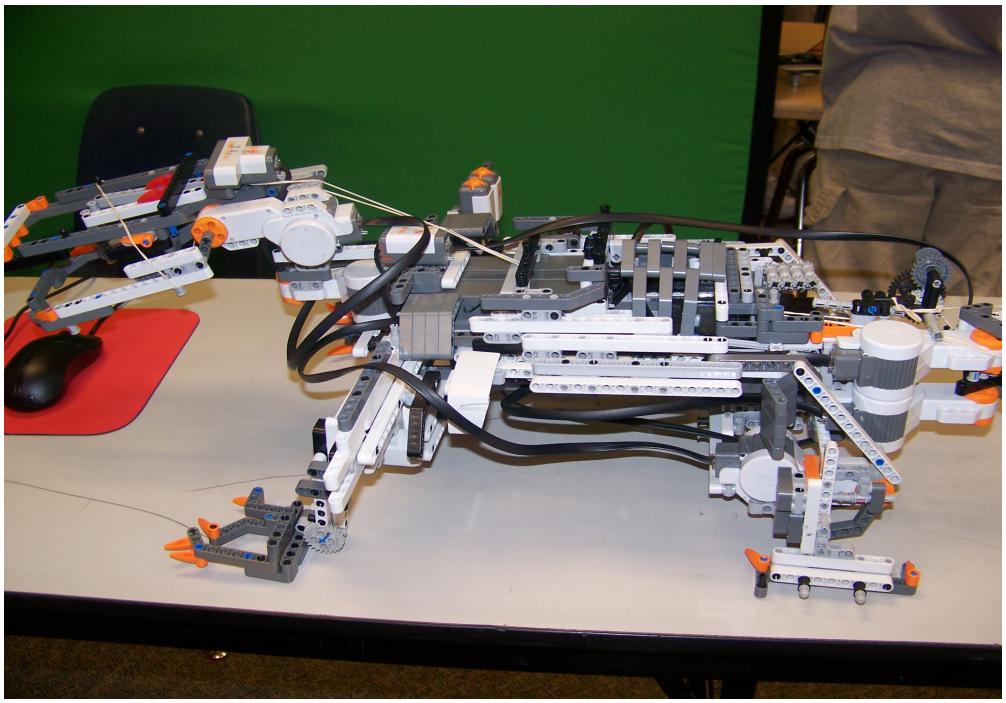
Pieces and Original Ideas

Since I worked on this robot in class and after school at Palm Desert Charter Middle school robotics elective class, the correct pieces were very hard to find mixed in with tons of robots and other pieces. Finally, after crawling and climbing through all the mass of LEGO my robot was done. But I still remember how hard it was to find all the pieces. My original idea was to put the animatronics alligator into a huge alligator stuffed animal without the stuffing. That idea failed when it barely moved inside the stuffed animal skin. I could also not reach the buttons on the NXT so it wouldn't have worked anyway.

Bulk, Armoring, and Cages

There is a lot of extra bulk on the shoulders of the alligator. The places with armoring were the most fragile and vital places such as the place where the two NXT's meet and the rear tail motors. I have a cage on top and a cage near the rear feet. Overall the gator is pretty bulky but it still can walk which is a very important building concept. The building concept is if you distribute the weight correctly you can create less pull against the motors.

Inside layering



Picture 1: Layers

The back part of the alligator consists of layers as you can see in Picture 1. A layer is a segment of the robot. There's a bottom, middle, and top layer. These layers help in the building process. I mainly used them for the back legs. The bottom and the middle layers hold the legs and feet. It keeps the feet in place and holds the whole back part together.

This bottom layer is also important when the alligator walks. The second part of the alligator built with layers is the middle (body.) The first layer holds the two NXT's in place and is a failsafe if they fall out. The second layer is the 3rd thing I built on the robot. It is probably the most important thing on the robot because it holds the main frame together.

Conclusion

A ton of building techniques were used to make this bulk of a robot that I am personally proud of. Remember the 1x7 liftarm bent 3x5 piece. See picture 2. I call it a straight C shape and it is very important to use especially in the main frame. It is useful in forming corners and joining sections together. It is my favorite building piece.

Picture 2: My favorite building piece

When you are building a robot remember to keep everything symmetrical or you will wind up with problems in the end. Check occasionally to make sure everything follows the building guidelines I find helpful and you should have a cool robot.

Remember, follow these guidelines carefully at your own speed. If this does not work for you try and pick a favorite structural piece and use that a lot. The last thing I could think of for building help is to look for information in different places and be willing to redesign if necessary. It could be a bad design, but maybe not. With a little help it could be great.