Robots Without Gravity
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Desert Robotics

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Introduction

Imagine creating a robot to navigate in a non-gravitational environment. This idea dawned upon Mr. Clark when he heard about the Zero-G corporation and we took up this extraordinary task as our own. [1] This corporation (Zero-G) gives ordinary people the chance to experience "weightlessness". We decided to take this opportunity to test how the CBCv2 would react to the sensation of "weightlessness". Our robotics teacher, Mr. Clark, was given the opportunity to experience this.

We were then assigned the responsibility to design, build, and program a robot that would navigate adeptly within a zero-gravity environment. This experience may seem mind-boggling to you, but the works of it are actually very simple. The Boeing 727 aircraft was specially modified for a zero-gravity flight; the aircraft flies high up into the atmosphere, then goes straight down so the passengers are experiencing free fall within the plane. This effect lasts for about 15-20 seconds, but the passengers do this for a total of about 30 times during their "Zero-G" experience.

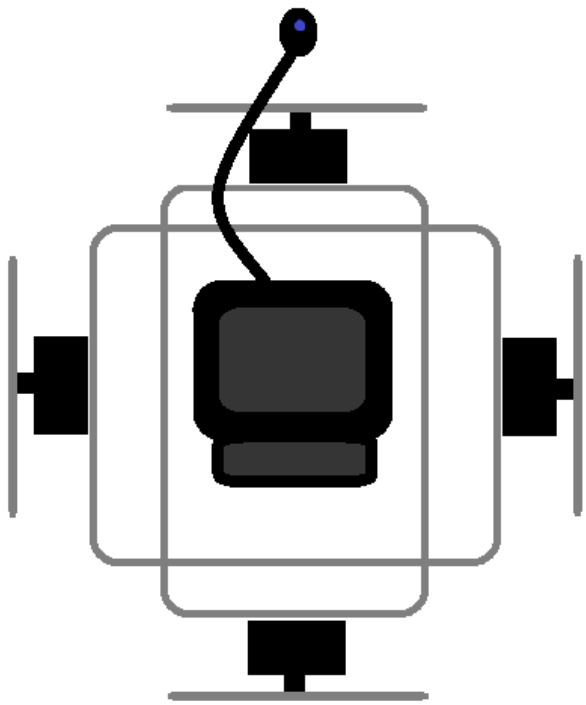
Task

On Wednesday, April 21st, Mr. Clark asked us to make a robot. With him leaving on Friday, we knew we had to hurry up and make this. He printed out an email Dr. David Miller had sent to him containing guidelines to making the robot. In the email he said that there should be different paddle systems to control each of the three axes. There would be a paddle on each side powering the x axis, and one in the front and back for the y axis, but what about the z axis? Without it, it might lean forward or go downwards rather than forwards. And we couldn't do another paddle because one, we ran out of motor ports. And secondly, how would it make the robot increase its altitude? So what did we do?

We used a fan. One of the students in our class figured out how to get a fan from a computer, and make it compatible with the CBCv2. So we had to figure out how to get that attached to the bottom (I'll explain how later) so it could control the z axis. One problem still existed- we needed

another motor port. So we solved that by making a splitter. Yes, we managed to make a splitter (You can ask us for details how). But unfortunately, all this work turned out to be useless in the end, because we couldn't fit the camera in the CBC because the motor was blocking it. So, we took off the two paddles controlling the x axis and had to rely solely on the y and z axes to navigate the robot. Also, we were running out of time- we still had to figure out how we were going to mount the fan. We had to hurry if we wanted to take this once-in-a-lifetime opportunity.

Figure 1



Developing

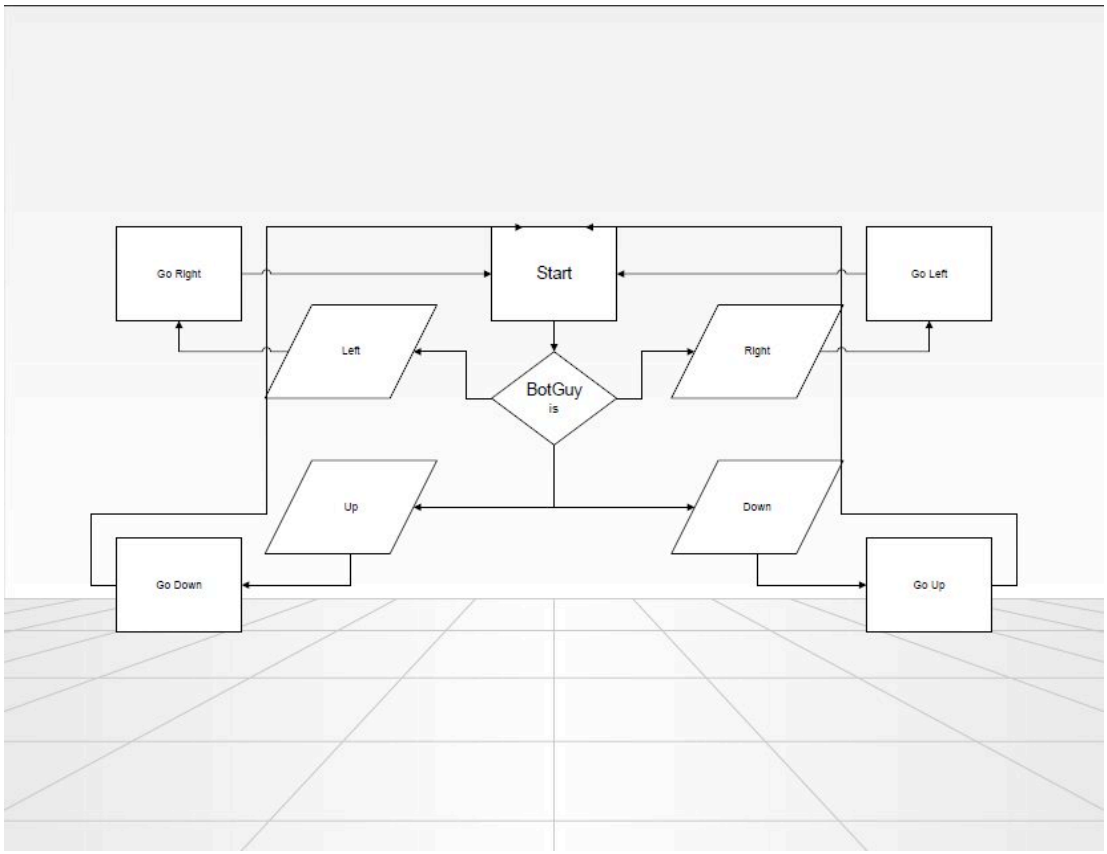
You may be asking yourself, "So how did they make such a robot?" Figure 1 shows a picture, but this is *how* we did it:

We installed a CBCv2 onto a "'Zero-G' approved" base. This base consisted of two (2) metal plates, four (4) motor mounts, four (4) motors, and four (4) rims (which secured the paddles to the motors), four (4) lego axles, various (various) amounts of random screws, nuts, bolts, etc., and an unknown (you get the point) amounts of UGlu pieces. We had a few changes to the robot. One change was the splitter/motor. At first, we thought we were all set because we had a splitter so we could control all of the motors, including the fan. But then we ran into a problem. About an hour before Mr. Clark left. The camera didn't fit in. The paddle component was blocking the

the USB port! And we couldn't just move the component over, because that would off-center it and the robot would swerve to one side. So since the sand was getting higher in the hourglass, we couldn't make a major adjustment. We had to take off the front part, and just rely on the back. This way, we could use the camera to tell when we needed to go up. Yes, we could have used the accelerometer, but we didn't have that long to program. So along with the motor, came the amazing splitter. And that was that. A problem we had was mounting the fan. This was the biggest problem. The fan we had didn't fit the screws we had, and therefore couldn't fit into the metal post. So, we went to our last resort. UGlu, to the rescue! Yes, we used UGlu to mount the fan. In the interest of time, we just placed UGlu onto the fan corners and onto the metal posts already connected to the base. It was *very* unsecure. But that was the best we could do.

We had a simple program for our robot. Since it was only a 15-20 second time period, we couldn't make it long and elaborate. And after all, KISS. So basically, our program looked like this (Figure 2):

Figure 2



So we have this great (or not so great) robot built and programmed, ready for action. The thing is, we can't test it. We can't simulate a non-gravitational environment because it doesn't exist here on Earth.

Showtime

Now the part you've all been waiting for. The RESULTS. Mr. Clark went to Florida to go on his "Zero-G" flight. As they get on, the flight attendant asks what they would like to bring on the plane. They cannot take it on themselves, for security reasons. So he told her that he needed his box. So unfortunately, the lady only brought the box. By that time it was too late. Our robot was taken out of the box through security or something. Sadly, our robot could not go on. All of those hours of work, and we never got to test it.

Conclusion

From this experience, we learned that it's hard to create a robot to "survive" in a different environment. We also need to manage our time better and we learned that things like this take time. If you want to do a good job on something, plan it out first. Things take time. We also learned to be very precise with people when you depend on them for something. Overall, this may not have worked, but it was a great learning experience.

You can read about the zero G company at:

[1.] ZERO G the Weightless Experience <http://www.gozerog.com/>