Progress report from Dr Roboto

I now know why the worlds largest supplier of robots is China. One reason is their small hands and this is no reference to The Donald. I had to use tweezers to attach some of the nuts to the bolts.

After much research, I decided that my first robot, which Patricia has called Hobbie, would be a tracked vehicle. In order to minimize width and maximize stability, one drive motor is front left and the other is back right. That made the hardware design/build easier but not the software/operations. That is because to go forward, one motor turns clockwise (forward) and the other counter clockwise (backward). You control the motors by indicating port # and +/- amount of RPMs. Even more fun determining the settings for left and right turns.

Example: set-encoder-motor (1, 50); set-encoder-motor (2, -50);

So that I would not be lynched, the first sensor that I tackled was the ultrasonic. It reports the number of cm between the sensor and an object. I did not want to bang into the newly painted walls. I wish I had paid more attention during high school physics classes. When the robot is moving towards a wall, speed multiplied by constantly reducing distance is important.

Note: the operating system on the robot is NOT interrupt driven. The software, I have to write, must ask the sensor for a reading.

Being totally over confident, my first project is to get the robot to drive along a road/path. To accomplish this, I must use an infrared light (IR) sensor which has a detection range of about 1.5 cm and therefore must be installed under the front axle of the robot. (Do NOT want to have the sensor protruding out the front of the robot, in case I forget to check the value on the ultrasonic sensor and drive the IR sensor into a wall).The IR has two sensors, each with a transmitter and receiver and the sensors are about 1cm apart from each other. If the IR light is absorbed (non reflective black colour) the resultant output value is 0, if reflected then 1. In summary 0 (on black), 1 (left on black), 2 (right on black), and 3 (no black). In summary, a 2cm wide sensor to control a robot which is 20cm wide and constantly moving. A whole day, maybe more, of testing to understand how the IR sensor worked. It really only works with black, not dark blue, grey, purple, etc.

The next step is to design and build a test road. I should have taken some civil engineering courses. Multiple “where are you going robot!@!@$?” experiments to determine minimum width of black road so that robot is not constantly turning left and right when it goes of the black strip. Answer 5cm. Also found out that the colour of cardboard and our flooring (both “brown”) confuses it and that I must have a 5cm white boarder around the black strip. Two + days and Robbie can now drive down a straight road.

Now we come to corners. Here is the analogy. You are driving down the road with no windshield, side windows, rear window and no mirrors. Like driving at night with no lights in a fog. You have 2 levers. One controls the left track and the other the right track. To go forward, you pull one lever and push the other. You have a display with two buttons. You push one (ultrasonic) and the display tells you if there is an object within 40m (robot sensor is actually up to 4m) in front of you and how far away. You push the other button (IR sensor) and it gives you a reading of 0-3 (on road, right track off road, left track off road, totally off road).

If the corner is too tight (sharp angle), you go from “on road” to “ totally off road” instantly.

If you are going too fast, you go from “on road” to “ totally off road” instantly.

What to do when you are “ totally off road”. Backup and then turn left/right ???

If one track is off road, what speed (RPMs) to each track to get back on the road BEFORE you are “totally off road”. How much time turning so that you do not over turn and have the other track off the road (reverse fish tailing).

If the corner is too shallow, eg. 10 degrees, you need a large area to eventually make a 180 degree turn. (Plus Robbie eats a lot of 6xAA batteries. Rechargeable 7.4V batteries on back order.)

My optimistic goal is to have Robbie autonomously driving on a 1m x 2m “oval” course, minimum of 6 corners, by the end of the month, maybe even this month. Bonus round #1 if I can design the course in sections that can be changed. Round #2, a mini Mosport, excluding my favourite corner 5.

NOTE: my next robot will have a bigger and easier to access STOP switch.