GoBabyGo - Lightning McQueen Car Mod

by jjeffrey19

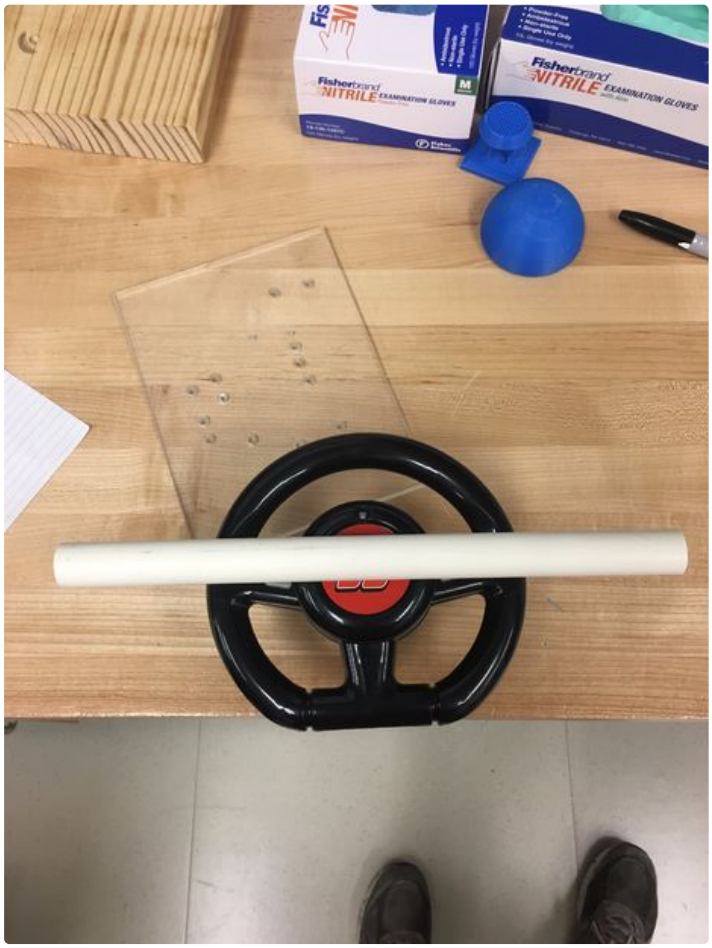
This Instructable provides guidance on a Go Baby Go car modification project using a Lightning McQueen toy car. This project was part of a Biomaterial Manipulation class at Vanderbilt University, working closely with occupational therapists at Belmont University. We aimed to modify this car for a 22 month boy with weak grip strength and several other developmental disabilities, with the goal of improving his mobility and sociability. We hope this Instructable helps future Biomaterial Manipulation classes at Vanderbilt, as well as other Go Baby Go projects around the country.

Step 1: Assemble Lightning McQueen Car

Assembly of the Lightning McQueen toy car essentially consisted of following the directions provided with the car. Even though we would have to disassemble some portions of it in order to configure circuitry, we still found it important to first fully assemble the car to make sure it worked as planned and to obtain measurements. Specifically for our modification, we left the seat and parent guide stick unattached, as we will be creating a seat customized to our client's measurements.

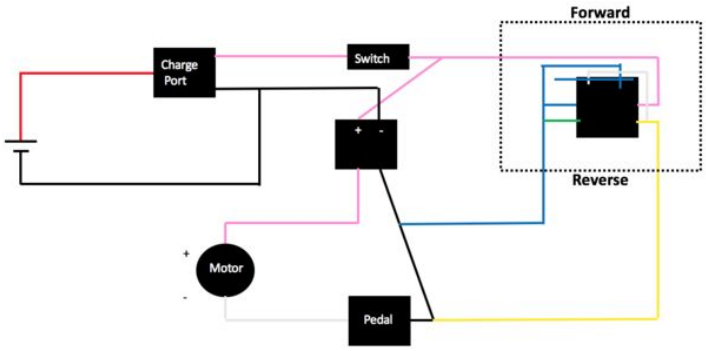
Step 2: Assemble Side Supports and Steering Wheel Support

Our client required side supports to support posture, as well as a steering wheel support due to his weak grip strength. Side supports consisted of 3/4" diameter PVC pipe embedded in pool noodles. The PVC pipe was cut via PVC cutter to 17.5" and placed in 18" long sections of standard pool noodle. These measurements were the length of the seat back to the steering wheel of the car. The steering wheel support simply consisted of an 11" section of 3/4" PVC pipe. These two modifications were assembled separately, and would be put on the car last.



Step 3: Configure Circuit to Implement Speed Controller

We wanted to implement a speed controller so that our client could slow down or speed up the standard speed of the car. To do so, we replaced the existing forward/reverse switch with a microcontroller that consisted of a resistor, a new forward/reverse switch, and a potentiometer that would allow for speed control. We first investigated and drew out the circuit diagram of the car, and in doing so found that we needed to implement the 6-pronged microcontroller with the existing circuit components (motor, charge port, power switch, battery, and pedal). Carefully, we appended the microcontroller to the car circuitry and disconnected the original car controller (within dashed lines) from the circuit. We tested the potentiometer and found that our circuit was indeed functional and that speed could be controlled, both in the forward and reverse direction.



Step 4: 3D Print and Install "case" for New Forward/reverse Button

Using the free Tinkercad software, we designed and 3D printed a case that perfectly fits the new forward/reverse switch (22mm x 30mm x 5mm). We secured the case to the new switch with hot glue to ensure it would be stable. We then removed the original car switch, and hot-glued the new case/switch module into the existing hole on the dashboard of the car. This allowed for a more aesthetically pleasing dashboard, and also allowed us to hide the wirework once we reattached it back to the base of the car.

Step 5: Drill Hole for Potentiometer and Fasten

A 1/4" hole was drilled on the right side of the dashboard that would allow for the potentiometer to be fastened snugly. This will allow our client to be able to adjust speed without worrying about wires or disassembling the car.

Step 6: Install PVC Back Support

We created a rectangular PVC back support from two 10" and one 6" PVC pipes fixed together at 90°. We then drilled two 3/4" holes near the rear of our car and inserted the rectangular PVC back support. To secure the back support, we bolted the piping to the nearest rear car wall. To complete the back support, we next added polyethylene foam and a kickboard.

Step 7: Install Polyethylene Foam for Seat Cushion and Back Support; Install Kickboard for More Back Support

We screwed in the cover for the battery, which sits under the seat. We then velcroed on a 10 x 8 x 1" section of polyethylene foam to the bottom to allow easy access to the battery compartment, and hot glued two sections of 4 x 8 x 1" polyethylene foam on the sides. An 11 x 8" section of polyethylene foam was sandwiched between the rectangular PVC frame and a standard kickboard (no modifications) to create the most comfortable back support for our client and additionally supporting posture. The bottom sides of the kickboard were trimmed using the heated-foam cutter to better suit the outline of the car. The three components of the support (PVC, styrofoam, and kickboard) were hot-glued together to ensure maximum stability.

Step 8: Hot Glue Side Supports

Next, we attached the PVC/pool noodle side supports to the car. With the power drill, we established two 1/4" holes that were 4.5" apart on both sides of the car and through each side support. Holes were positioned to allow the side supports to be as parallel and flat to the car as possible, with one end touching the back fin of the car.

Step 9: Bolt PVC Pipe Onto Steering Wheel

We bolted the PVC pipe onto the steering wheel using two 1/4" bolts, 4.5" apart. We then reinstalled the steering wheel apparatus onto the car. Additionally, we added rounded caps to the ends of the PVC pipe.

Step 10: Final Assembly and Hand-off

Our car was fully assembled at this point, but we double checked all screws and wiring to ensure client safety. We will soon be delivering the car to our client.

Step 11: Optional: 3D Print Parking Sign

We used Tinkercad to 3D print a parking sign for our client. This of course is optional, but adds a nice touch.