Introduction

• This GoBabyGo! Project build is for Brecklyn who has Down’s Syndrome. Our goal is to build and design a car that meets her needs.

• We are a team of students from Wichita State University in the course ENGR 202 Service Learning in Engineering in Fall 2016.

• This is a multidisciplinary class project that involves students from engineering and volunteer students from physical therapy. The children for whom we are building this car receive their therapy services from Rainbows United, a non-profit organization that provides center based, community based, and home based service options for young children with special needs. The child’s licensed Rainbows physical therapist advised our team on measurements and modifications for the child.
How to get the most out of your car

⚠️ DO NOT use your car for the first time without having it checked by an electrical engineer or other professional.

⚠️ DO NOT use a battery if the wires or casing shows any sign of damage or modification.

⚠️ DO NOT allow the child to use the car unsupervised.

⚠️ DO NOT use the car outside in any inclement weather or leave the car outside in such weather.

⚠️ DO NOT use the car if you smell or smell smoke.

⚠️ DO NOT leave the toggle switch in the ON position when the car is not in use.

⚠️ DO NOT TAKE ANY UNNECESSARY RISKS WHEN USING OR MODIFYING THE CAR!

⚠️ DO contact a clinician about your child’s use of a modified ride-on car and involve him/her in the modification process and later ride-on car use.
Prior to Modifying

⚠ Please always wear safety glasses and be sure to wear gloves to remove plastic burrs.

⚠ Always be aware of where your fingers and hand are during the modification process, especially when drilling or using PVC Cutters.

⚠ Do not use wire of a gauge higher than 16. A higher gauge means thinner wire, which may run this risk of causing overheating and wire melting.

⚠ When stripping wire, make sure to cut only through the plastic tubing and not the wire itself. Also, make sure to strip only enough wire so that you do not leave wire exposed when connecting wires together.
  - Cutting too deep into the wire or leaving unprotected wire may cause sparks, short circuits, and overheating. Always use wire strippers and not scissors.
  - Please note that you should never cut wires on the battery.

⚠ Please cover any wire nuts and crimp terminals with electrical tape.
Equipment: Tools and Hardware

- Tools
  - Power drill
  - 1”, ½”, ¼” drill bits
  - Wire cutter
  - 16 gauge wire stripper
  - Wire crimper
  - Phillips head screwdriver
  - Flat head screwdriver
  - PVC cutter
  - Pliers
  - Scissors
  - X-acto blade/cutting tool
Tools and Hardware

• Hardware:
  – Bolts
  – Nuts
  – Pink Pool Noodle
  – 4 ft. industrial-strength Velcro
  – ¾” PVC Pipe (10’ section)
  – PVC Elbow connectors
  – Walking Wings
  – Hinges (2)
  – Zip Ties
  – WSU Sticker
  – Tape Measure
Hardware (Cont.)

- Electrical: –
  - Analog Joystick
  - (2) Ring Crimp Connectors
  - (2) SPST Toggle Switch
  - Wire Nuts
  - 14-16 Gauge Wire
  - Female Crimp Connectors
  - Male Crimp Connectors
  - Electrical Tape/Duct Tape
Install SPST Switch (Kill Switch)

- Step 1: Under the seat, cut the red wire that connects the car to the battery.
- Step 2: Using ring crimp connectors, and attach 2 lengths of 14-16 gauge wire. Mount the 2 wires to the SPST switch. Then drill a hole in the back of the car with a battery operated drill (diameter will correspond to switch).
- Step 3: Route the SPST wires through the hole into the battery compartment, then mount the switch in the exterior drilled hole.
- Step 4: Connect the SPST switch “ON” wire to the cut wire (the side away from the battery connector). Connect the “OFF” wire to the side nearest the battery connector.
PVC Support Installation

- Get measure of the kid’s body in order to cut the PVC into the rectangle.

- Cutting 4 pieces of PVC base on the measurement.

- Drilling one hole in the middle of the front PVC and the PVC where the wire will be insert in.
Adding The Walking Wing Seatbelt

- Step 1: cutting 3 PVC tude base on the measurement of the baby’s body and the car.
- Step 2: make it into U shape.
- Step 3: drill two hole on each side of the end of the car where you want to put the PVC.
- Step 4: put the walking wing seatbelt on.
Modify Motor Control

- Step 1: Remove housing on motor controls.
- Step 2: Using a voltmeter locate the four output pins. A wire will need to be soldered to each one of these connections.
- Step 3: Drill a hole into the casing of the motor controls and pull the new soldered wires out of the hole before resealing the motor chassis.
Mounting the Analog Joystick

- Step 1: Drill a hole on the front PVC pipe to install joystick.
- Step 2: Zip tie joystick to the pipe near the hole and wire the joystick back to the control board using the hole.
- Step 3: Cut pieces of pool noodle to cover the straight sections of PVC pipe.
- Step 4: Slice open the bottom of the noodle pieces and zip tie them to the PVC pipe.
- Step 5: A hole will need to be created in the noodle for the joystick to be placed accessible.
Wiring the Attiny85 (Repeat twice)

- Step 1: Connect the 5v pin with the 5v from the battery.
- Step 2: The ground will be connected to the negative lien of the battery.
- Step 3: Pin 2 is connected to one output wire from switch.
- Step 4: Pin 7 will be wired to the positive axis on the motor control and Pin 6 top the negative.
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### Attiny85 Code

```c
int LeftRightPinIn = A3;
int UpDownPinIn = A0;
int Down_Out = 2;
int Up_Out = 4;
int Right_Out = 0;
int Left_Out = 1;

int Up_Threshold = 900;
int Down_Threshold = 10;
int Right_Threshold = 900;
int Left_Threshold = 10;

int LRIN = 0;
int UDIN = 0;
```
void setup() {
    pinMode(LeftRightPinIn, INPUT);
    pinMode(UpDownPinIn, INPUT);
    pinMode(Left_Out, OUTPUT);
    pinMode(Right_Out, OUTPUT);
    pinMode(Up_Out, OUTPUT);
    pinMode(Down_Out, OUTPUT);
}

void reset(){
    digitalWrite(Down_Out, LOW);
    digitalWrite(Up_Out, LOW);
    digitalWrite(Right_Out, LOW);
    digitalWrite(Left_Out, LOW);
}
void loop() {
  LRIN = analogRead(LeftRightPinIn);
  UDIN = analogRead(UpDownPinIn);
  reset();
  while (UDIN > Up_Threshold)
  {
    digitalWrite(Up_Out, HIGH);
    LRIN = analogRead(LeftRightPinIn);
    UDIN = analogRead(UpDownPinIn);
  }
  reset();
  while (UDIN < Down_Threshold)
  {
    digitalWrite(Down_Out, HIGH);
    LRIN = analogRead(LeftRightPinIn);
    UDIN = analogRead(UpDownPinIn);
  }
}
reset();
while (LRIN > Right_Threshold) {
digitalWrite(Right_Out, HIGH);
LRIN = analogRead(LeftRightPinIn);
UDIN = analogRead(UpDownPinIn);
}
reset();
while (LRIN < Left_Threshold) {
digitalWrite(Left_Out, HIGH);
LRIN = analogRead(LeftRightPinIn);
UDIN = analogRead(UpDownPinIn);
}
reset();
}
Theory

• The analog joystick is being used as a means of forward/reverse and directional control. The joystick uses 2 10K Ohm POTS to read the x (Horizontal) and y (Vertical) values. The Analog inputs will be between 0-1023.

• We enter threshold values to ensure that the joystick is not extremely sensitive. These values should always be the same if using a similar joystick module. » Now that the values are known, this will be used to convert the Analog into a digital out. Thus sending the logic level needed to the motor driver board.
Installation of fitting materials

– Using any webbing of your choice and some plastic buckles, fashion a very simple seatbelt.

– Attach the seat belt ends to each side of the car’s removable seat.

– Using the foam kickboard and an X-acto knife, fashion a seat and back cushion, and secure to removable seat with industrial strength Velcro. – Using a tape measure, determine the interior sections of the car that need cushioning to avoid any falls or bumps. » Then using an X-acto knife and the pool noodles, section the noodles down the center, and secure to all needed areas of the interior with industrial strength Velcro.
WARNINGS!!!!!

- If you smell smoke or notice any burning/melting, UNPLUG IMMEDIATELY!

- Pay close attention for any weird smells, actions from the motor etc.