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McLaren 765 LT RC car

Introduction:

One of the most common engineering fields is mechanical engineering, and one thing all mechanical engineers have in common is a love for cars. That is why this project is perfect for any aspiring mechanical engineer.

As hinted in the introduction, this is a project in which you build a functioning model of a McLaren 765 LT supercar. A big part of engineering is knowing how to use a 3D modeling software such as Fusion 360. This project is ideal for showing students not only the basics but also the more complicated side of 3D modeling. Furthermore, students will learn how to use an Arduino board, which provides a great introduction to robotics and programming. Finally, this project is a great way to improve the students' team working abilities which is a skill they will use throughout their career.

Descriptions:

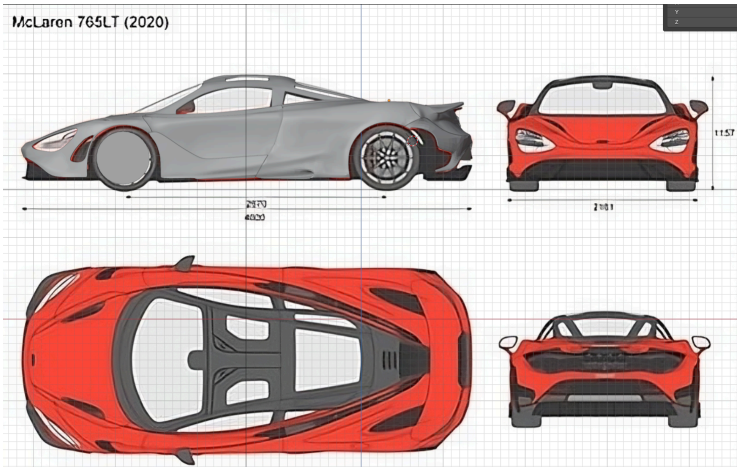
For this project, you are asked to build a remote controlled car with the body of a McLaren 765 LT.

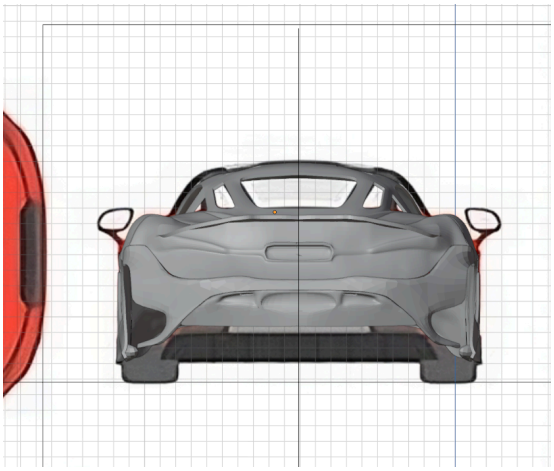
The RC car was made using two different Arduino circuit boards. Placed on top of the base of the car. One circuit board was used to power the headlights of the car, which was made of a pair of white leds. The other circuit board was used to power 1 servo and 1 motor. The servo was used to steer the car and the motor was used to make the car move forward. However, the first improvement we could make to the project is to add an extra motor. If one motor was connected to one wheel, we run the risk of the car no longer being able to move if one wheel is lifted off the ground, and if one motor is connected to two wheels it will not provide enough power to power 2 wheels. The second improvement we can do is add an H-bridge to make the car drive in reverse. This will greatly help with the control and ease of use of the car. The difficulty of this part mostly comes from the programming of the car. We used a WL-206 to control the car with a commercial RC car controller. The revolving wheel on the controller is used to steer the car and the trigger is you to power the motor. If it was rated on a scale from 1 to 10 the programming and construction on the car, without the 3D printed frame, it would be scored at a 6.

The process of creating the 3D model of a McLaren 765 LT was the most challenging part of the project. None of our team members were experienced with 3D modeling, so this phase became the slowest part of the design process. Blender is widely known for creating complex 3D models, primarily for art; however, many people also use Blender to design car bodies and import them into games or other digital media and software. This was why we chose Blender over Fusion 360, as the latter requires significantly more expertise to create automotive models and is not as well-suited for this purpose.

Online, “blueprints” are available that show each profile of the car you are designing, which can be overlaid onto your design software. This step was crucial for modeling the car, as it would have been nearly impossible to create an accurate model within a reasonable timeframe without these guides. For more complex parts, we used reference images to better replicate the curves in the hood and rear arches. The car model began as a series of nodes (called vertices in Blender), which were extruded to form the outlines of the body panels. The next step involved building linkages of nodes that followed the contours of the panels to mimic the real shape. This process was combined with the Grid Fill tool, which allowed us to convert the wireframe body panels into solid panels (this creates a “face” for the panel, which is enclosed by three or four nodes).

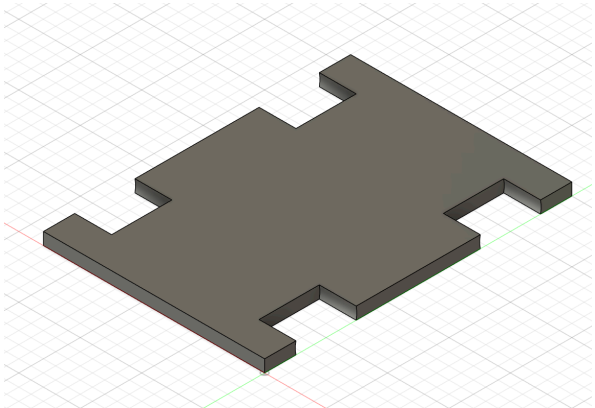
Next, we used modifiers to enhance the quality of the model. Blender’s modifiers are like scripts that alter the physical properties of the model quickly and efficiently. The modifiers we

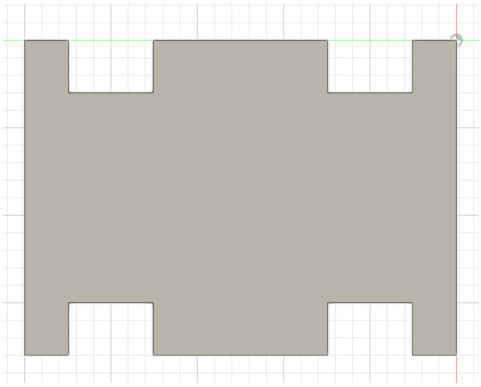


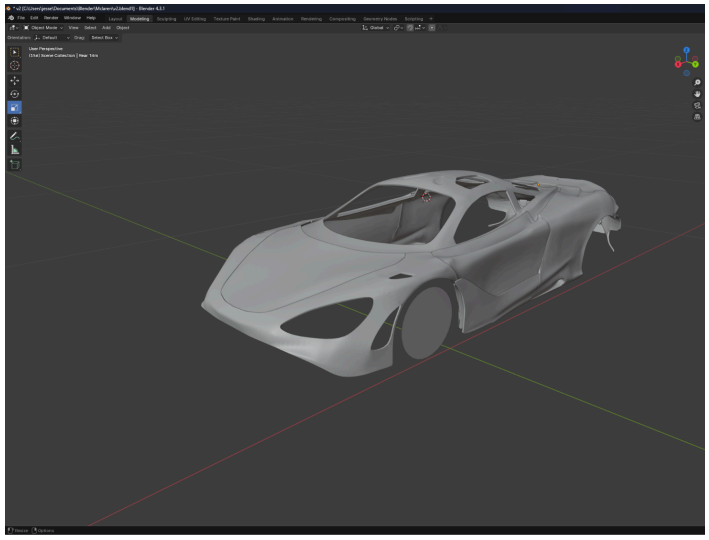


used included the subdivision modifier, solidify modifier, and mirror modifier. The subdivision modifier increases the fidelity of the model by adding additional nodes between existing ones, making curves much smoother. The mirror modifier generates an identical copy of the model along a specified axis, ensuring perfect symmetry. Lastly, the solidify modifier adds thickness to the model, which allows us to assess its structural strength and prepare it for 3D printing.

All of these techniques were learned throughout the project via YouTube tutorials and forum posts, which proved to be extremely helpful but resulted in a tedious workflow.







The model was prepared for 3D printing using Fusion 360, where it was converted into a mesh and segmented into different sections before being sent to the lab technicians. The technicians used Prusa Slicer to optimize the model for the most efficient printing method, after which it was sent to the printer. The final output consisted of 11 separate printed panels, which took approximately 50 hours to complete and weighed around 450 grams.

Material Required + Project Cost:
LOW END BUILD (113.60$) → HIGH END BUILD (256.50$)

Electronics	Materials
Arduino: 10$: 30$	Thin Plywood: 5$ (per sheet) : 15$
Breadboard: 5$: 10$	Paint: 10$: 25$
Servo Motor: 5$: 15$	Wheels: 5$ (per pair) : 15$
Wires: 3$ (x15) : 8$ (x15)	Bolts and nuts: 3$ (per pair) : 10$
Yellow Motor: 2$: 5$	Coloured Filament: 10$ (per roll) : 20$
2x Battery: 5$ (2x) : 20$	Bearings: 3$ (each): 5$
WL-206: 25$: 50$	Printing Filament: 0.10$/g (185g) = 18.50$
White & Red LEDs: 3$ (x10) : 7$ (x10)	
1kΩ Resistors : 0.50$ (x3) : 2$ (x3)	
2kΩ Resistor: 0.10$ (each) : 1$ (each)	

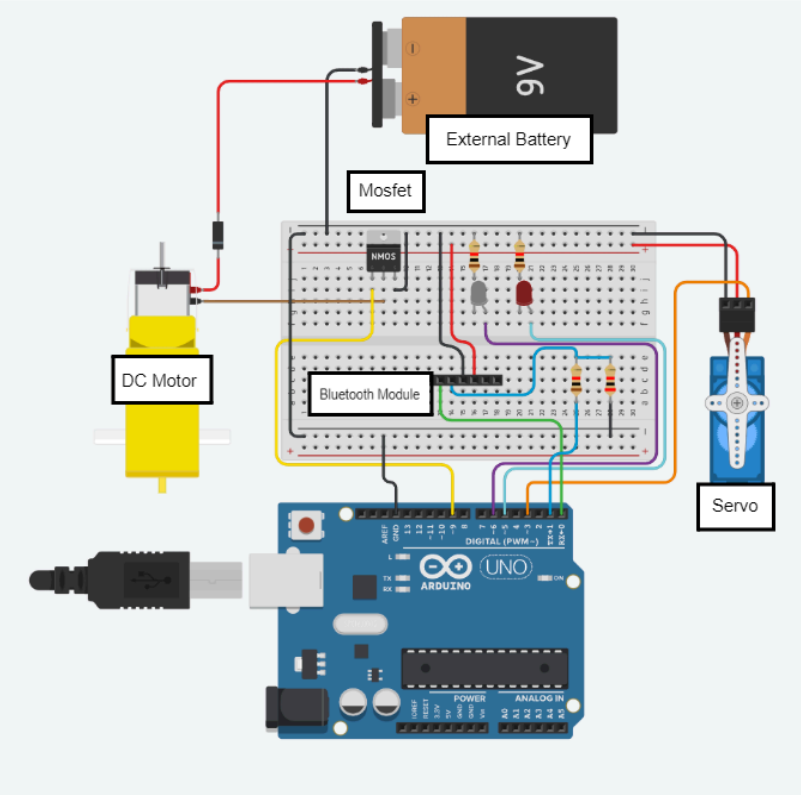
*IRLZ44N, STP55NF06, IRLB8721 are all compatible Mosfets

CODE: (BOLDED PARTS OF THE CODE EXPLAIN PARTS OF THE CODE)

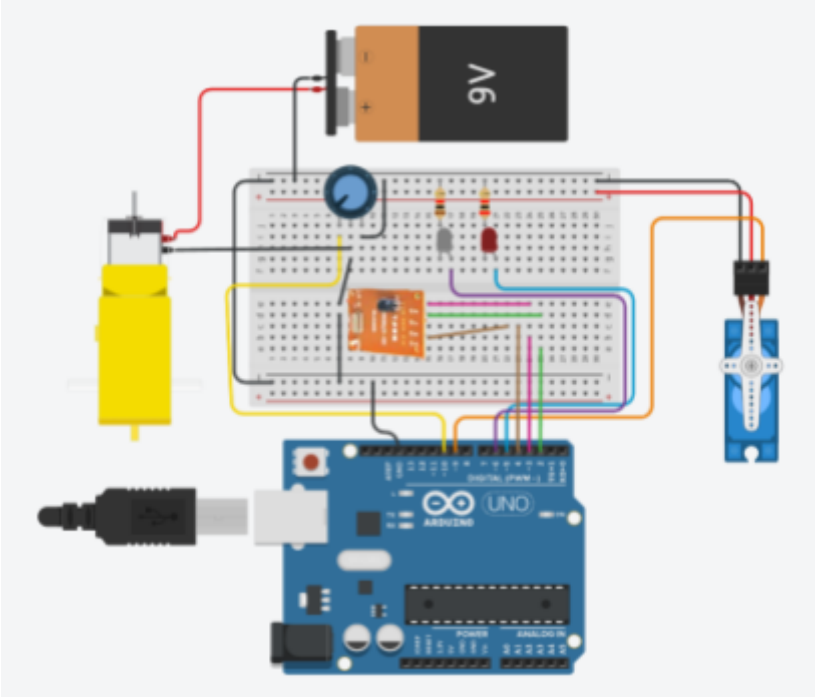
```
#include <Servo.h>

// Servo Setup
Servo myServo; // Servo object for controlling the servo motor

// Pin definitions for WL-206 sensor
const int rightPin = 2; // Right output from WL-206
const int leftPin = 3;  // Left output from WL-206

// Servo control pin
const int servoPin = 9; // Servo signal pin

// LED pins
#define LED1_PIN 6 // Pin connected to the first LED
#define LED2_PIN 5 // Pin connected to the second LED

// Servo control variables
const int initialPosition = 90; // Initial (center) position
const int moveAngle = 30;    // Angle to move right or left from center

// Motor control pins
#define RC_BUTTON_PIN 4 // RC receiver button signal pin
#define MOTOR_PIN 10    // Pin connected to MOTOR control

void setup() {
  // Servo initialization
  myServo.attach(servoPin);       // Attach servo to signal pin
  myServo.write(initialPosition);  // Initialize servo at center position

  // WL-206 sensor pins
  pinMode(rightPin, INPUT);
  pinMode(leftPin, INPUT);

  // Motor control pins
  pinMode(RC_BUTTON_PIN, INPUT);   // Set RC signal pin as input
  pinMode(MOTOR_PIN, OUTPUT);      // Set MOSFET gate pin as output
  digitalWrite(MOTOR_PIN, LOW);    // Ensure motor is off at start

  // LED pins
  pinMode(LED1_PIN, OUTPUT);
  pinMode(LED2_PIN, OUTPUT);

  // Turn LEDs on
```

```
  digitalWrite(LED1_PIN, HIGH); // Turn on LED 1
  digitalWrite(LED2_PIN, HIGH); // Turn on LED 2
}

void loop() {
  // **Servo Control**
  if (digitalRead(rightPin) == HIGH) {
    myServo.write(initialPosition + moveAngle);  // Move servo right
  } else if (digitalRead(leftPin) == HIGH) {
    myServo.write(initialPosition - moveAngle);  // Move servo left
  } else {
    myServo.write(initialPosition);  // Immediately return to center
  }

  // **Motor Control**
  if (digitalRead(RC_BUTTON_PIN) == HIGH) { // Button is pressed
    digitalWrite(MOTOR_PIN, HIGH); // Turn motor on
  } else { // Button is not pressed
    digitalWrite(MOTOR_PIN, LOW);  // Turn motor off
  }

}
```

FIRST DIAGRAM: (INITIAL MODEL)



SECOND DIAGRAM: (FINAL MODEL)



Schedule Management:

The project can be done by two to four people, the only factor that will change depending on the number of people is the workload.

Here is an example plan for a team of two people: The first person is assigned the task of programming the car and the second person is assigned the task of creating the 3D model. The time it takes to programme the car varies depending on one's knowledge of the program but an estimated time would be 15 hours. The time it takes to model the car once again depends on one's knowledge program but an estimated time would be 30 hours. Once the printing of the model is done, the two teammates can work together to build and finalize the project.

The example plan for a team of four people is extremely similar. Except any time someone is working alone they will have someone else helping them and the estimated time can be cut in half.

Some of this time can be spent during the lab periods throughout the weeks but most of it will be done at home.

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