

ECE 411
Product Description Specification
(PDS)

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Executive Summary

Our project is a car that's controlled by a hand gesture. Its purpose is to entertain the user, which mostly will be children. The product will work by moving one's hand. If you lean your hand forward, the car will move forward. If you lean your hand backward, the car will move backward. The same thing applies when you lean your hand right and left, the car will move right and left and in this context. Eventually, the car will follow the hand direction.

Brief "Market" Analysis

The intended users of this product are everyone that's 6+ years old. The reason behind the age restriction is for two reasons. The first reason, the hand band will not fit a child under 6 years old. The second reason, a child under 6 years old will not comprehend the way of controlling the car. The competition for this are other hand controlled RC cars which are already in the market. The typical price range for these cars is \$30-\$100. We think we can sell our product for 59.99\$. The reason behind the price is the design of the car in which it's different from other RC cars we have seen. What is different about our product is its simplicity, it's a square car that will grant the user to mount anything they would like to mount.

Requirements

1. Abstract Requirements:

- The product must be a car that responds to hand gestures for movement.
- The product's primary function should be to entertain its users.
- The car may have additional features that complement the hand gesture control for enhanced user experience.

2. Verifiable Requirements:

- The car must move forward when the user leans their hand forward.
- The car must move backward when the user leans their hand backward.
- The car must move to the left when the user leans their hand to the left.
- The car must move to the right when the user leans their hand to the right.
- The car should stop moving when the user holds their hand still.

3. Unambiguous Requirements:

- The hand gesture-controlled car must be designed primarily for children aged 6 and above.
- The hand band controller must not fit children below 6 years of age.
- The car's response to hand movements should be immediate without noticeable delay.

4. Traceable Requirements:

- The product's hand gesture control functionality must trace back to the market need for interactive and immersive toys.
- The age recommendation for the product should trace back to the safety and usability considerations identified in the market analysis.

5. Realistic Requirements:

- The car must be powered by a rechargeable battery.
- The hand gesture detection should be feasible with the GY-61 ADXL335 sensor.
- The car's movements must be controlled using the L298N Motor Drive Controller.
- The product must be safe for children aged 6 and above. Safety mechanisms, such as preventing overheating, should be in place.
- The product should not have any small detachable parts that can be a choking hazard for children.

6. Safety Requirements:

- The product must not overheat during operation or on failure.
- The battery should have overcharge and discharge protection.
- The car's design should be free from sharp edges to prevent injuries.
- The hand band must be designed to prevent any strain or harm to the user's hand during prolonged usage.

System Architecture

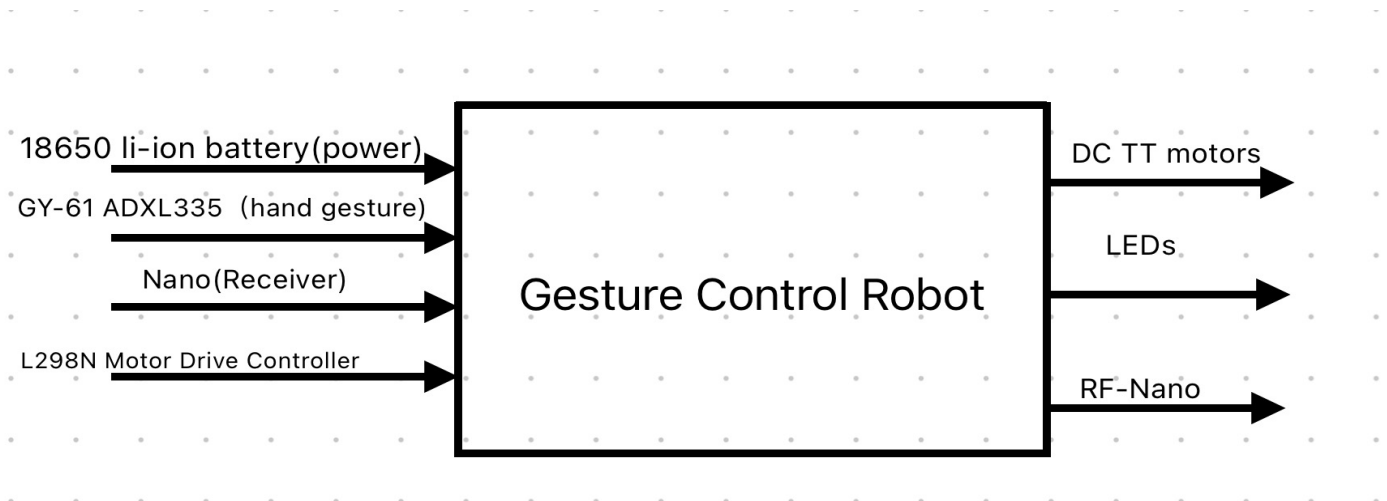


Fig 1: Level 0 Functional Decomposition

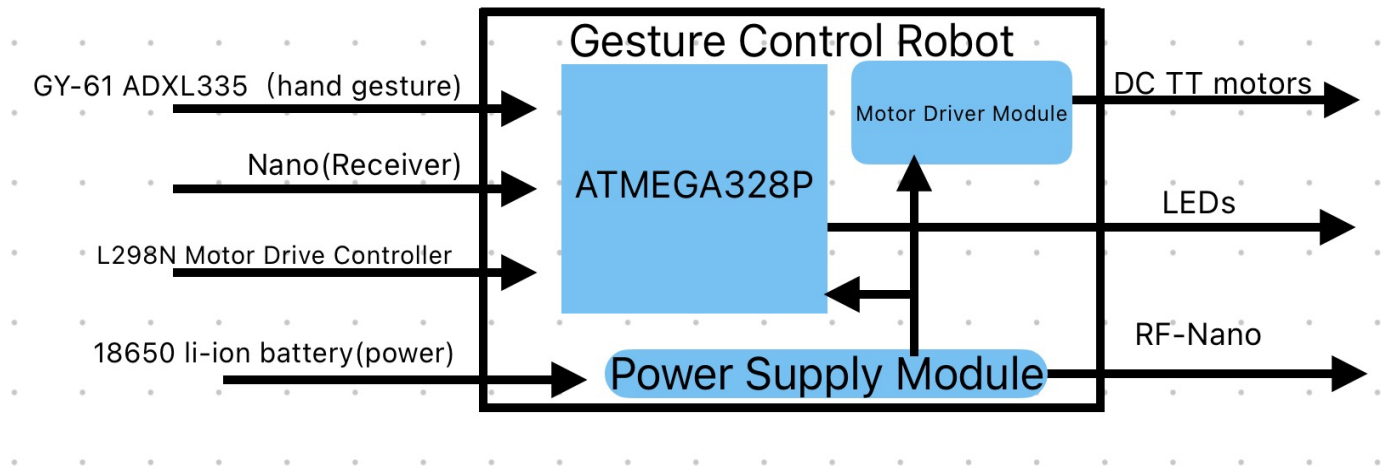


Fig 2: Level 1 Functional Decomposition

Design Specification

- Sensor: GY-61 ADXL335 (Hand Gesture), Nano (Receiver)
- Actuators: DC TT Motor (Wheels Torque), LEDs (Blinkers), RF-Nano (Transmitter)
- Controller: L298N Motor Drive Controller (Motors controller)
- Processor: ATMEGA328P
- Program: Arduinio
- Power: 18650 li-ion battery (Rechargeable battery)
- Base material: Wood