The working topology of the entire system is shown in the figure above. It mainly consists of three subsystems, which are sensor system, mechanical system and communication system.

The direct power supply source of the whole car is 12V DC battery, and then convert 12V into 5V through SY8368 chip.

The Sensor system mainly consists of Visual Processor (OpenMV4 H7 Plus), Ultrasonic Sensor (HC-SR04) and Accelerometer (MPU6050). They are used to accept the signal of external environment and the signal of ultrasonic sensor itself and convert it to binary data for transmission to the mechanical system. Visual processor is used to tile the direction. Ultrasonic sensor is used for beacons and fences recognition. Accelerometer is used to adjust the moving direction. This subsystem is designed to cooperate with the mechanical system to complete tasks that need to locate and respond to the surrounding things.

The mechanical system mainly consists of NUCLEO-F411RE(MCU), Server, Robort Arm and Motor Driver System. The NUCLEO-F411RE(MCU) generates response signals to send to all parts of the car according to signals transmitted by the sensor system and is the main control unit that used to receive, process and transmit signals. If you want to control Robort Arm, you send the control signal to the Server, which controls the SG90 and Clew. The SG90 controls the releasing angle and Clew controls when to release the ball. To control the movement of the car, a control signal is sent to the Motor Driver System to determine how the two motor driven tracks should work together according to the signal received. This subsystem is designed to perform tasks that require the ball to be removed from the car and to work with the sensor system to position the car based on its surroundings and generate movements and responses to the next states.

The communication system is composed of clock module (DS1370) and communication module (HC-12). The clock module is used to synchronize the time between the car itself and the PC. This can ensure that the transmission between the car and the PC end is synchronous transmission, can timely transfer useful data to the PC end. There are two communication modules, one in the car, the other is connected with the PC, the two modules can respectively receive and send signals in the form of half duplex. After receiving the communication instruction from the mechanical system, the communication module located in the car immediately transmits the information to the PC end to the communication module located in the PC end. This subsystem is designed to complete the Task requiring the car to establish communication with the PC end.

In order to realize the above functions, we have programmed the main control devices of each subsystem.