Relavant explanation

The following tables and explanations conclude the necessary code explanation and hardware connection to the robot. The detail design please read the code file and the schematic diagram.

Pin Number	Connection Module	Function
A4	SDA（I2C）	Transformation between the master board
A5	SCL（I2C）	Transformation between the master board
D2–D9	8 SG90 servo motors control signal lines	Controlling servo motors by PMV
5V/GND	Power supply	Power supply

Table 1: Pin Connection Table (Between main board and slave board)

Pin Number	Connection Module	Function
A4	SDA（I2C）	Transformation between the slave board
A5	SCL（I2C）	Transformation between the slave board
D0 (RX)	HC-05 TX	Bluetooth serial communication
D1 (TX)	HC-05 RX	Bluetooth serial communication
D2	SHT15（data line）	Data pin of the temperature and humidity sensor
D3	SHT15（clock line）	The clock pin of the temperature and humidity sensor
D4	MQ-2	Smoke sensor data pin
D5	HC-SR04 Echo	Ultrasonic echo signal
D6	HC-SR04 Trig	Ultrasonic trigger signal
5V/GND	Power supply	Common 5V power supply and ground

Table 2: Pin Connection Table (Sensors)

Table 3 conclude the functions and corresponding description about the master file that the programming to the sensors and communication modules.

Master		
Type	**Name**	**Description**
Data members	send	Information sent to the slave board
	is_auto	Automatic mode flag
	send_inf	Send information to operator flag
	t_b	Alarm thresholds for temperature
	mq_2	Alarm thresholds for smoke
	ul_b	Alarm thresholds for distance
	X	Define a variable to store data.
	DHT11PIN	DHT11 sensor pin (A2)
	dht11	Instance of temperature sensor control class

	MQ2_as_pin	MQ-2 sensor pin (A0)
	trig_pin	Ultrasound trigger pin (13)
	echo_pin	Ultrasound echo pin (7)
Function	setup()	Initialize the Settings for each sensor, serial port and Bluetooth communication.
	loop()	The main loop function controls behavior based on Bluetooth instructions, detects sensor data in real time, and performs automatic control or triggers alarms.
	autoMove(t, mq2, d)	The decision function in automatic mode returns the action number based on the sensor value.
	get_dht()	Obtain the data from the DHT11 temperature sensor (return temperature).
	get_mq2()	Obtain the analog values of the MQ-2 smoke sensor.
	get_distance()	Obtain the distance of the ultrasonic sensor.

Table 3: The UMI table to the Master file.

Table 4 lists the functions of the robot's motion control part and their corresponding functions, including initialization Settings, receiving instructions, and performing different actions (such as moving forward, turning left, turning right, and moving backward) according to the instructions.

Slaver		
Type	**Name**	**Description**
Data members	receive	Information received from the master board
	Left_front1	Instance of servo control class for horizontal movement of left front leg
	right_front1	Instance of servo control class for horizontal movement of right front leg
	left_hind1	Instance of servo control class for horizontal movement of left hind leg
	right_hind1	Instance of servo control class for horizontal movement of right hind leg
	Left_front2	Instance of servo control class for vertical movement of left front leg
	right_front2	Instance of servo control class for vertical movement of right front leg
	left_hind2	Instance of servo control class for vertical movement of left hind leg
	right_hind2	Instance of servo control class for vertical movement of right hind leg
	l_f_up	Left front leg lift angle
	l_f_down	Left front leg drop angle

	l_f_move	Left front leg backward rotation angle
	l_f_back	Left front leg initialization angle
	r_f_up	Right front leg lift angle
	r_f_down	Right front leg drop angle
	r_f_move	Right front leg backward rotation angle
	r_f_back	Right front leg initialization angle
	l_h_up	Left hind leg lift angle
	l_h_down	Left hind leg drop angle
	l_h_move	Left hind leg backward rotation angle
	l_h_back	Left hind leg initialization angle
	r_h_up	Right hind leg lift angle
	r_h_down	Right hind leg drop angle
	r_h_move	Right hind leg backward rotation angle
	r_h_back	Right hind leg initialization angle
Functions	setup()	Initialize the Wire communication, serial port, connection, and set all the servos to the initial position.
	receiveEvent(int bytes)	Receive control instructions from autonomous devices (Wire/I2C communication)
	loop()	According to the received instruction values, the corresponding action functions are called, such as walk(), turn_left(), etc.
	walk()	Control the robot to walk forward: Alternately move the diagonal leg combination (left rear + right front, right rear + left front)
	turn_left()	Control the robot to turn left: Achieve rotation through the coordination of the front left leg and the back right leg.
	turn_right()	Control the robot to turn right: The rotation is achieved through the coordination of the front right leg and the rear left leg.
	back()	Control the robot to move backward: Similar to walk() but in the opposite direction.

Table 4: The UML table to the Slaver file.

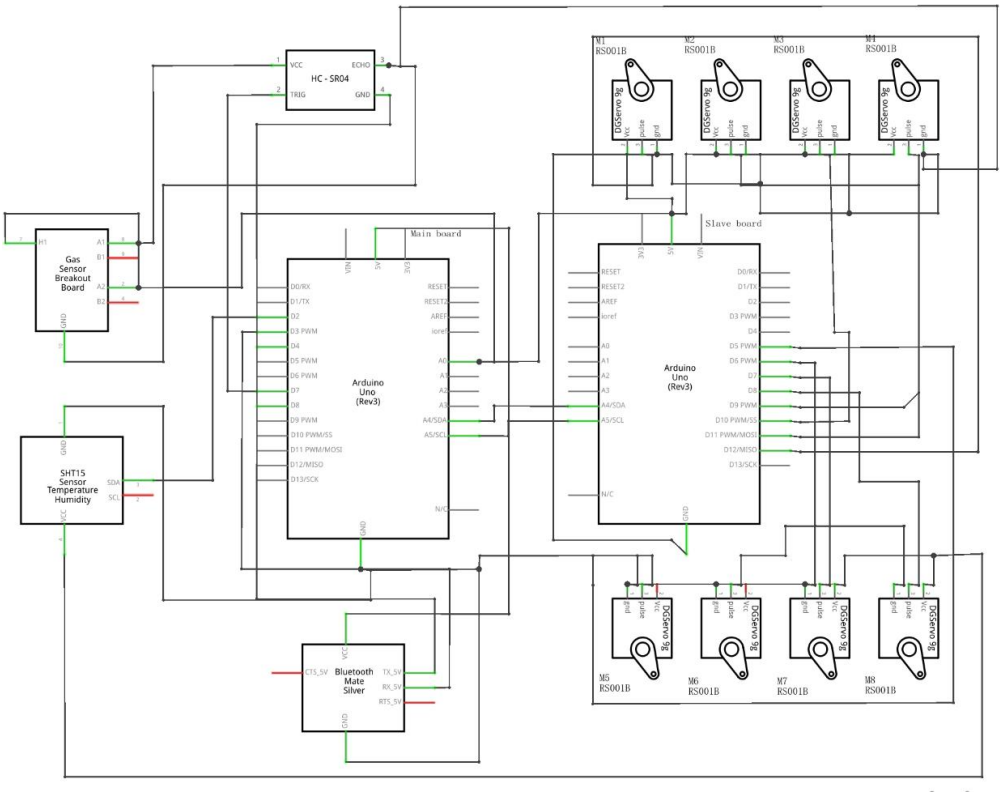

Figure 1: The Schematic figure and connection to the circuit.