4.1 Overview:-

This chapter represents simulation results with some screenshots to show how the robot can identify the color of the object in different scenarios, and a simplified description of the simulation tools used.

4.2 Simulation tools:-

To simulate the circuit of color sorting robot two simulation tools are used. Proteus is to simulate electronic circuit and Arduino software for writing and compiling the code.

Proteus (PROcessor for Text Easy to USe) is a fully functional, procedural programming language created in 1998 by Simone Zanella. Proteus incorporates many functions derived from several other languages: C, BASIC, Assembly, and Clipper/dBase; it is especially versatile in dealing with strings, having hundreds of dedicated functions; this makes it one of the richest languages for text manipulating.

Arduino is a piece of software, or IED (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board.

4.3 Simulation Scenarios:-

This section illustrates the simulation scenarios of color detection and the corresponding actions.

When the simulation is started the voltmeters display the voltage of each torch. According to the program the highest voltage torch is the detected color of the object. This can be represented by three LEDs as indicators to show the detected color and then the robot moves accordingly.

Scenario 1:

When the red torch has the highest voltage the red LED is ON indicating that the object is red and then the robot moves to place it in its specified position. This scenario is shown in figure 4.1.
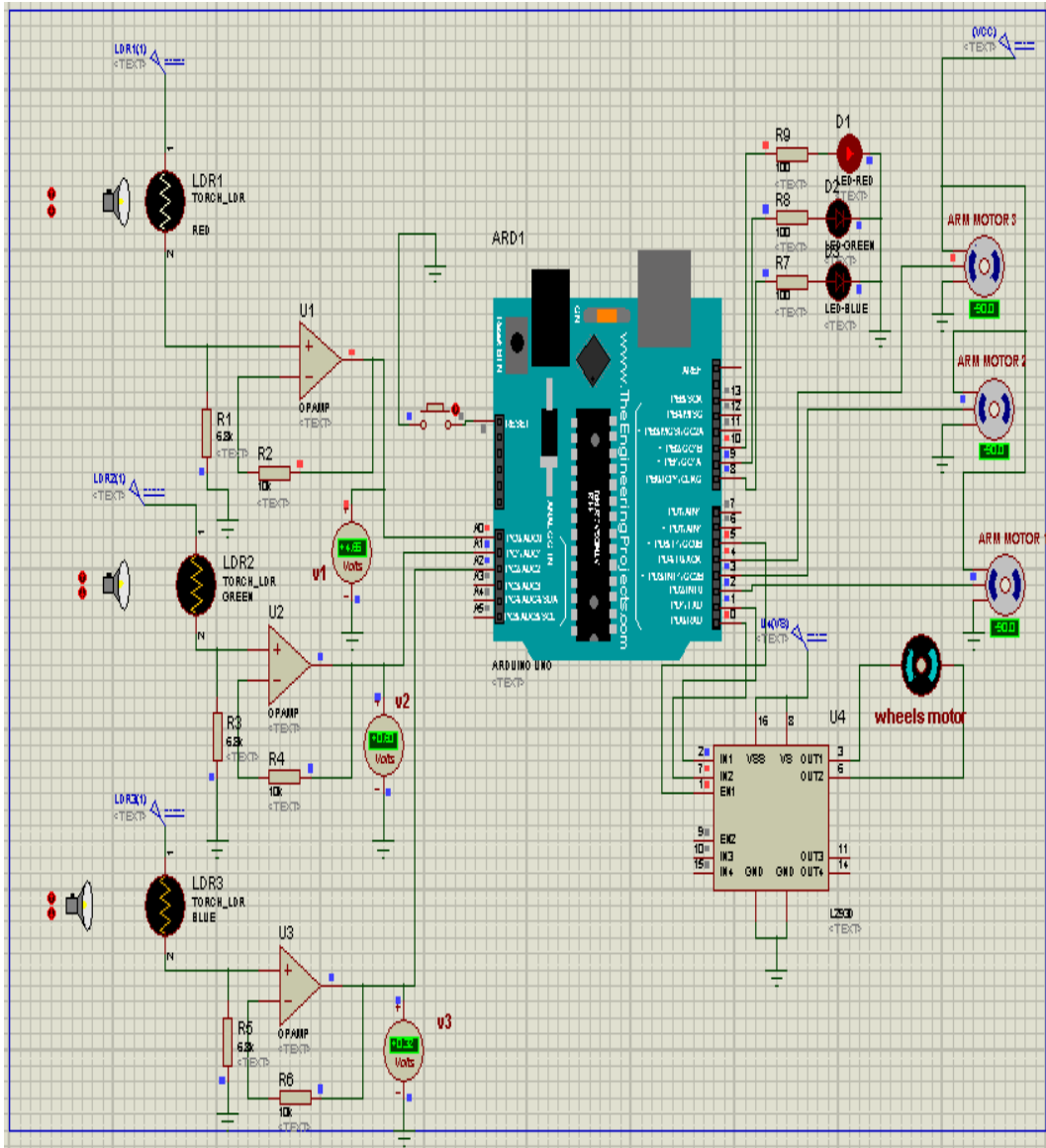

Figure4.1: Scenario of the red color detection.

Table 4.1: Simulation results of scenario 1

	Voltage	Output LEDs	
Red Torch	V1 = 4.66	Red	ON
Green Torch	V2 = 0.60	Green	OFF
Blue Torch	V3 = 0.32	Blue	OFF

Scenario 2:

When the green torch has the highest voltage the green LED is ON indicating that the object is green and then the robot moves to place it in its specified position. This scenario is shown in figure 4.2.
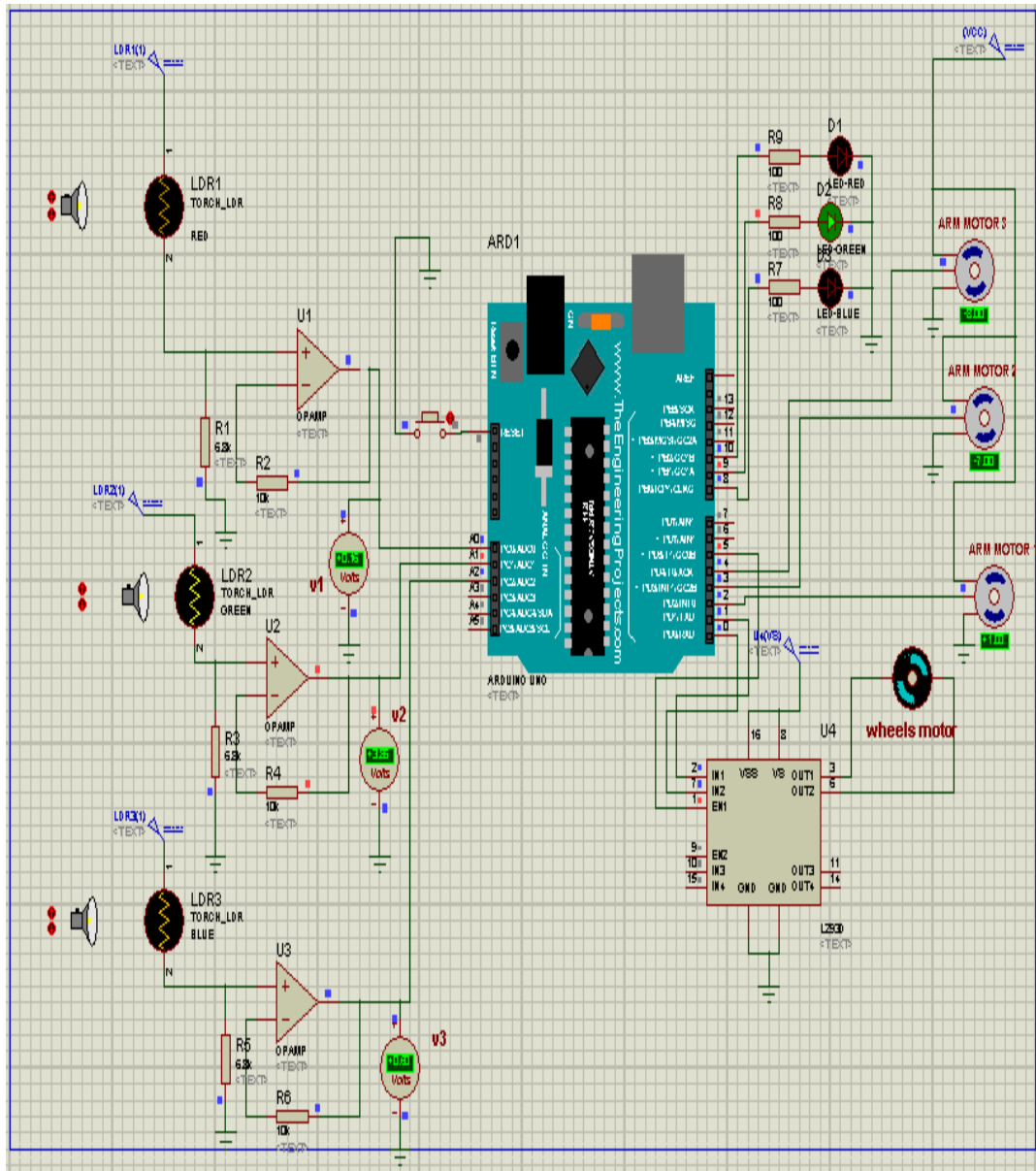
Figure4.2: Scenario of the green color detection.

Table 4.2: Simulation results of scenario 2

	Voltage	Output LEDs	
Red Torch	V1 = 0.16	Red	OFF
Green Torch	V2 = 3.86	Green	ON
Blue Torch	V3 = 0.60	Blue	OFF

Scenario 3:

When the blue torch has the highest voltage the blue LED is ON indicating that the object is blue and then the robot moves to place it in its specified position. This scenario is shown in figure 4.3.
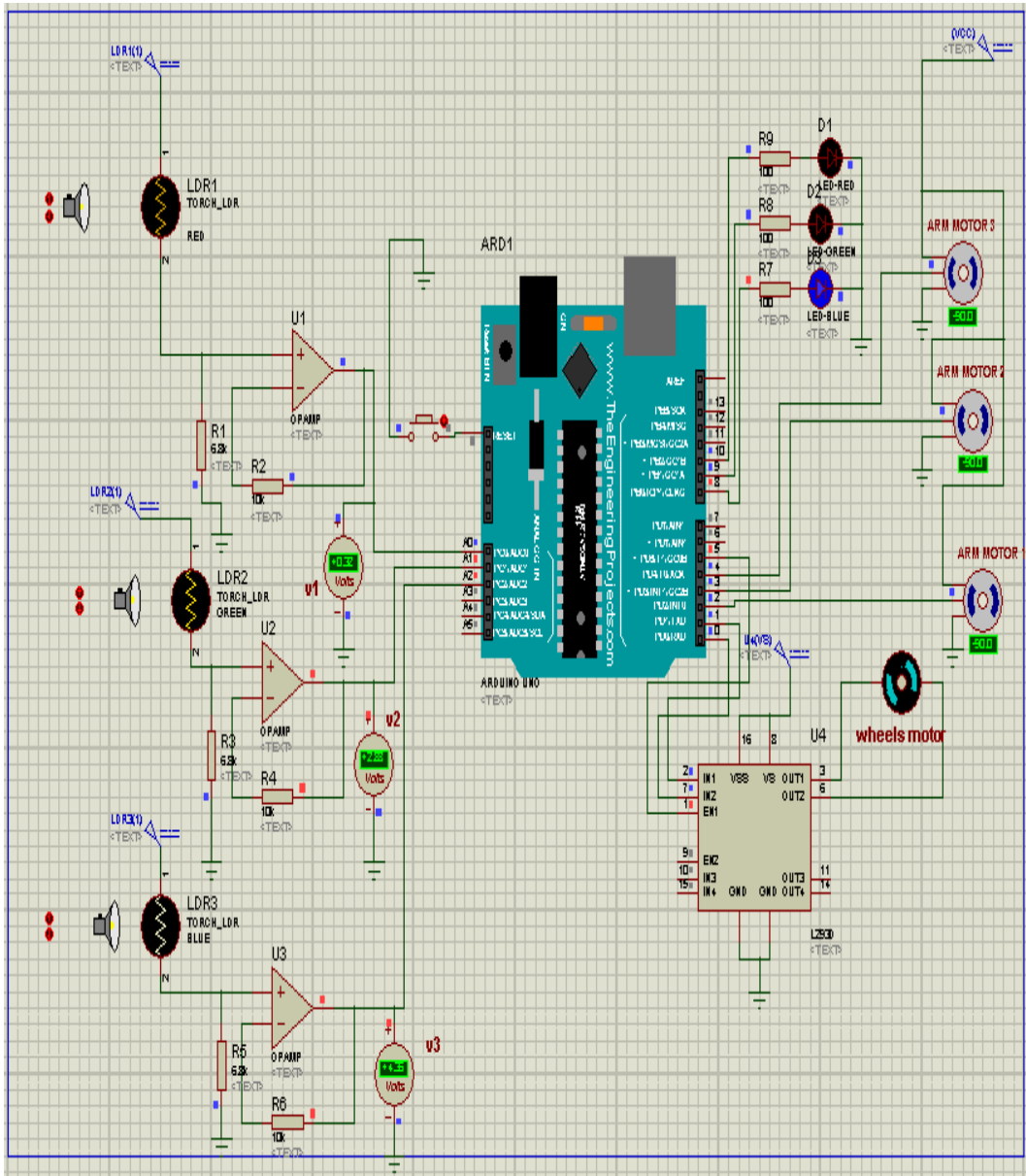

Figure4.3: Scenario of the blue color detection.

Table 4.3: Simulation results of scenario 3

	Voltage	Output LEDs	
Red Torch	V1 = 0.32	Red	OFF
Green Torch	V2 = 2.88	Green	OFF
Blue Torch	V3 = 4.36	Blue	ON

The following scenarios are neglected by the robot:

When two torches have the same high voltage or the three torches have the same voltage (share the object's color equally) the detection of the object's color becomes difficult using this technique. The LEDs are just OFF indicating that the object's color can't be detected using this technique. These scenarios are shown in figure 4.4 and figure 4.5.
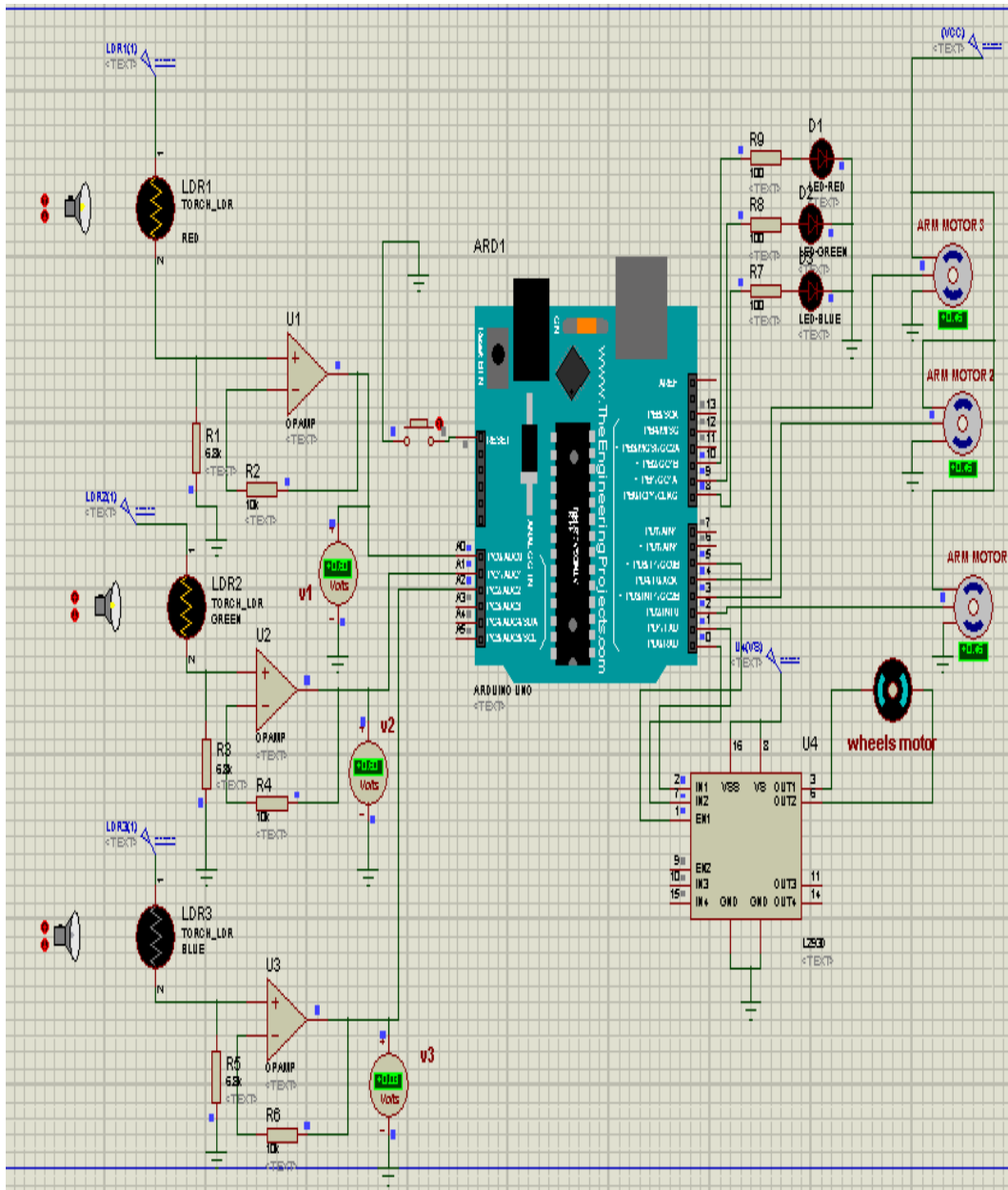
Figure4.4: Scenario of two torches have the same high voltage.

Table 4.4: Simulation results of two torches have the same high voltage

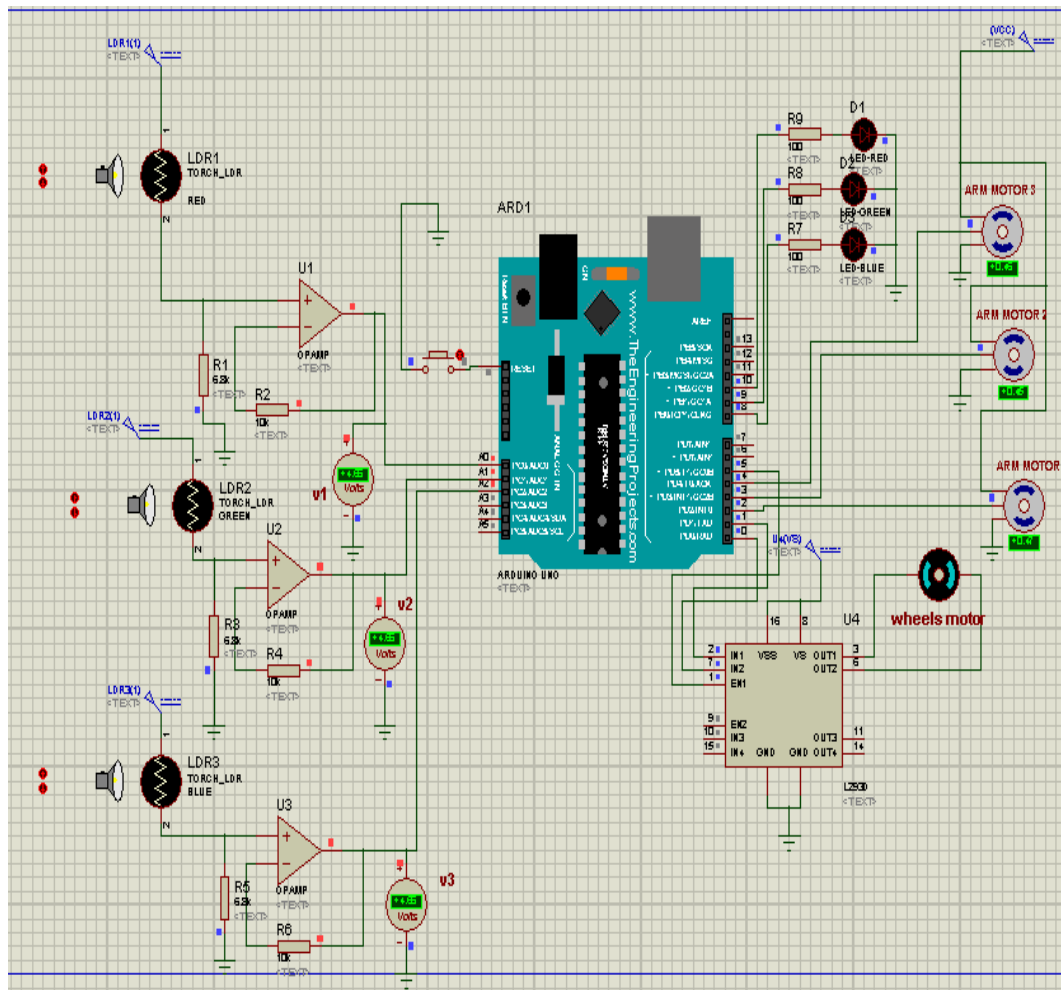|	Voltage	Output LEDs	
Red Torch	V1 = 0.60	Red	OFF
Green Torch	V2 = 0.60	Green	OFF
Blue Torch	V3 = 0.30	Blue	OFF

Figure4.5: Scenario of three torches have the same voltage.

Table 4.5: Simulation results of the three torches have the same voltage

	Voltage	Output LEDs	
Red Torch	V1 = 4.66	Red	OFF
Green Torch	V2 = 4.66	Green	OFF
Blue Torch	V3 = 4.66	Blue	OFF