

Design and Development of Smart Obstacle Detector using Deep Learning Methods for Vehicles to Reduce the Injury/Death Rate of Human Lives



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Abstract

The recent surveys by WHO depicts that 50 million people are injured due to traffic accidents across the globe. This is primarily due to inattentive driving, unclear lane markings, poor visibility, and aggressive driving. The mentioned issues can be addressed by developing a smart system with advance technology that avoid traffic accidents and secure the divers/passengers. This novel design utilizes ultra high radio frequency identification that is fitted with road reflector studs, which function in a two-way system. The smart device is made with an RFID reader (ultra high frequency), Arduino controller (ATmega328p), LED's, cameras (OV7670), and speed limiter, which create a safety network for the driver. Here the RFID fitted in the reflector sends a signal to the nearby vehicle if the vehicle gets near the deadline of the road, and the RFID scanner in the vehicle receives the signal that alerts the driver using an Arduino controller, which decodes the signal and initiates the alert system so the driver can get back into the lane. Also the camera fitted in the smart device on a vehicle identifies the barriers such as walking people, wildlife and other harmful things in an effective manner by image classification using deep learning method. This verifies whether the captured image is harmful to the vehicle or not, so that accidents will be prevented. Once the scanner detects the obstacle, it activates the speed controller present in the vehicle; thereby, vehicle speed will be controlled automatically. The proposed system is modelled and verified with better results.

1. Developed Smart Device

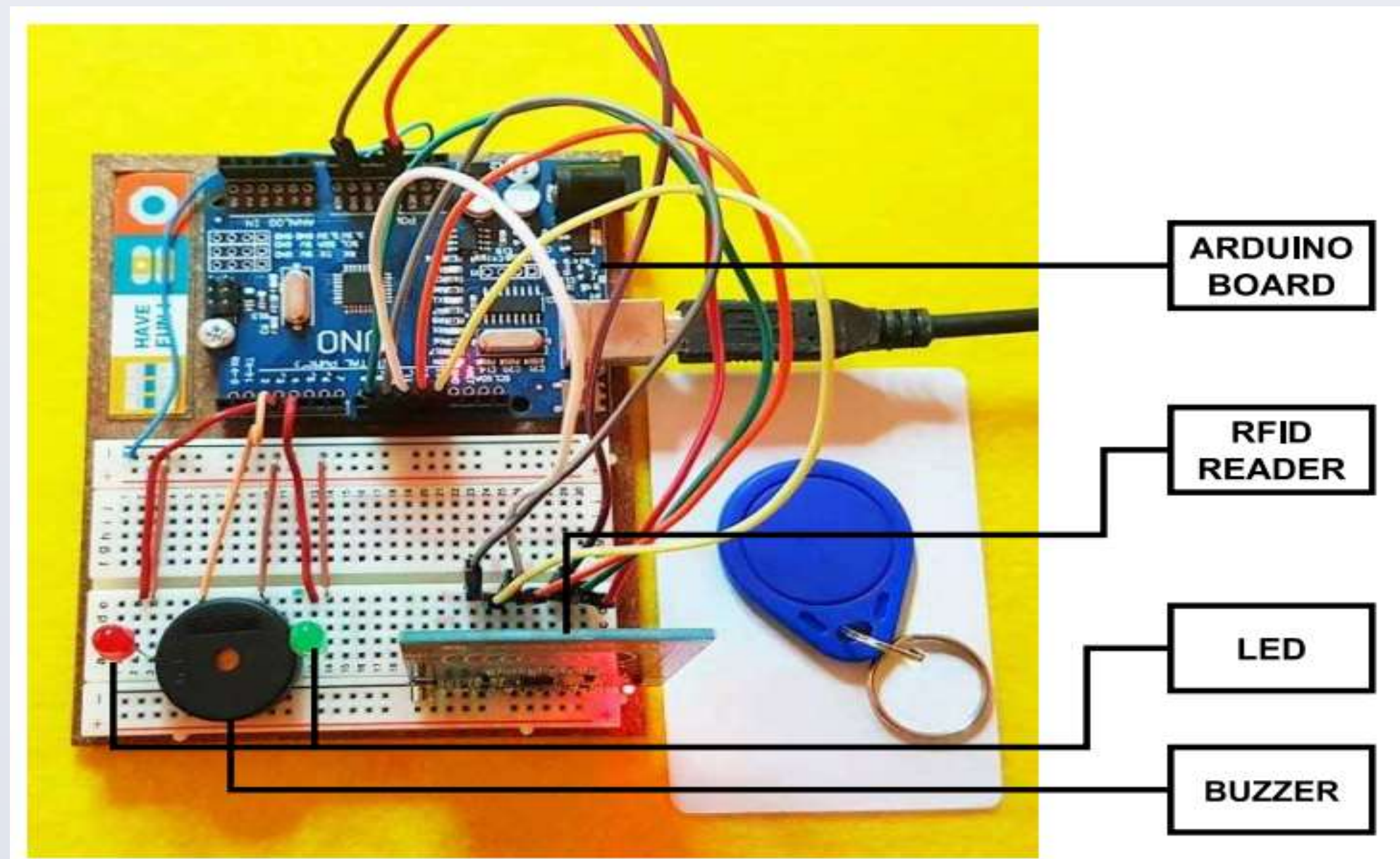


Fig. 1. Smart Device Model

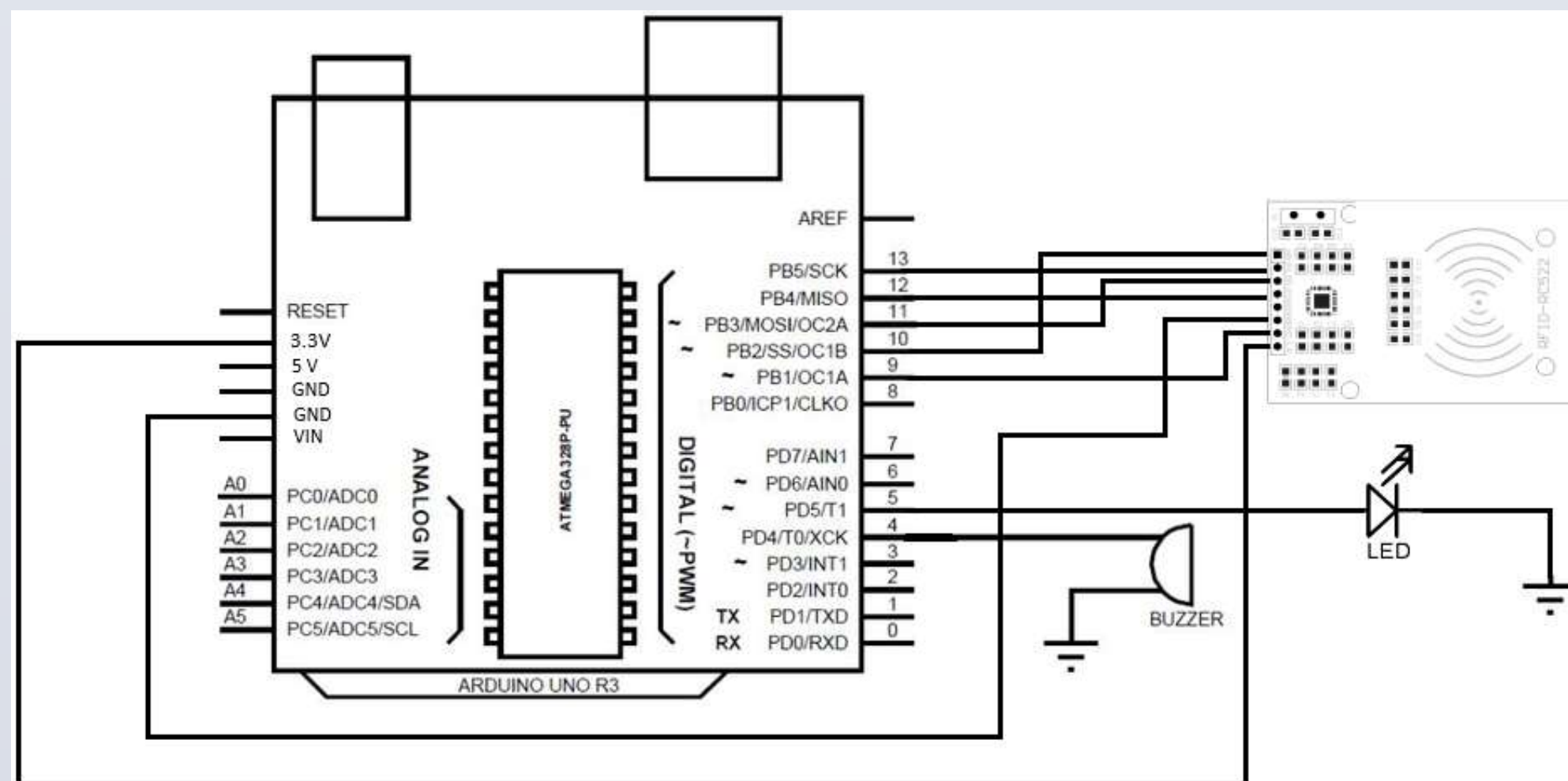


Fig. 2. Schematic Representation of Smart Device

2. Simulation and Explanation

```
void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT);
  Serial.println("Please scan your RFID TAG");
}

void loop() {
  while(Serial.available() > 0)
  {
    c = Serial.read();
    count++;
    id += c;
    if(count == 1)
    {
      Serial.print(id);
      //break;

      if(id=="1")
      {
        Serial.println("--Vehicle Approaching deadline");
        digitalWrite(13, HIGH);
      }
      else
      {
        digitalWrite(13, LOW);
        Serial.println("--No frequency detected");
      }
    }
  }
  count = 0;
  id = "";
  delay(500);
}
```

Fig. 3. Simulation of Arduino Uno

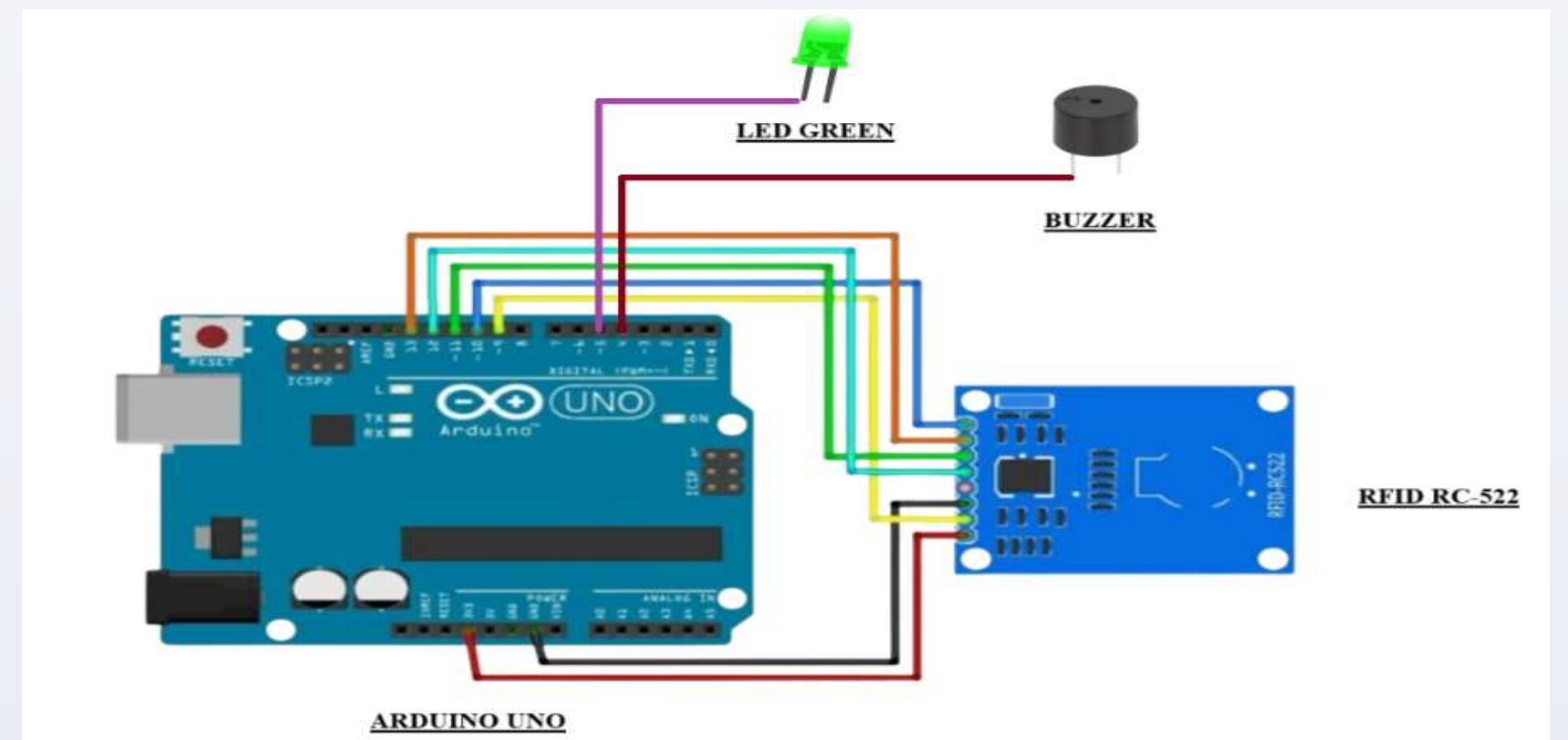


Fig. 4. Simulation of Smart Device

3. Real Time Implementation

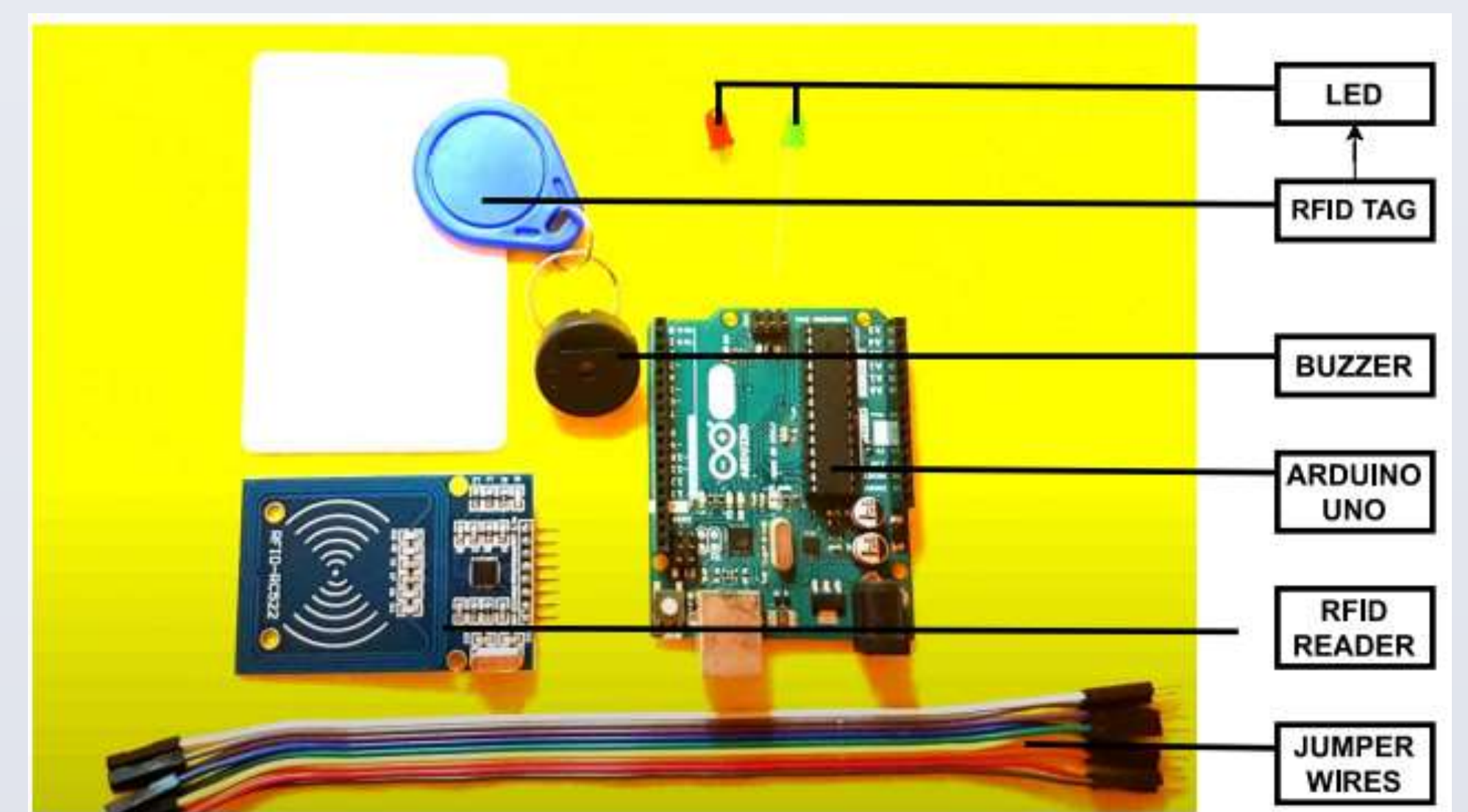


Fig. 5. Prototype model of Smart Device

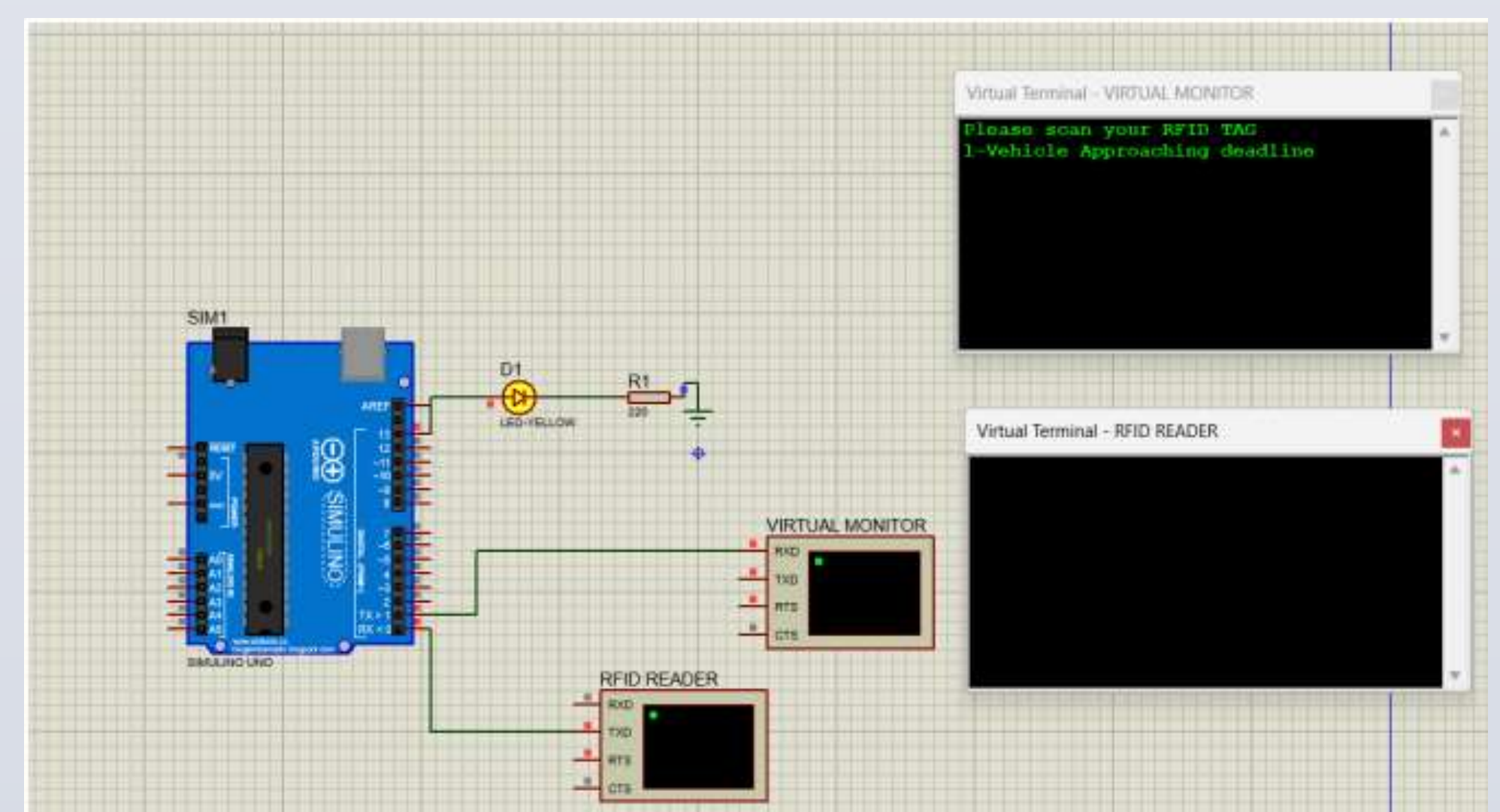


Fig. 6. Virtual Working of Smart Device

Conclusion

In conclusion, the proposal addresses a pressing issue of increasing accidents across various transportation modes, with road accidents being the most prevalent in India. By leveraging RFID technology integrated into road reflector studs, the solution aims to mitigate the risks associated with lane deviations and enhance road safety, particularly in challenging terrains like hilly regions, rural areas, and urban thoroughfares. The design of the system, illustrated through block diagrams and layouts, showcases a practical approach that capitalizes on existing infrastructure. Through the deployment of RFID tags, RFID readers, and an Arduino UNO microcontroller, the system can effectively detect potential lane deviations and trigger real-time alerts on the drivers dashboard, aiding in proactive navigation and reducing the likelihood of accidents. Moreover, the prototype of the alert device, supported by schematic and workflow diagrams, demonstrates the feasibility and functionality of the proposed solution. With components such as RFID readers, LEDs, and buzzers, the prototype serves as a tangible demonstration of how technology can be harnessed to enhance road safety and save lives. Overall, by integrating innovative technology with existing road infrastructure, the proposed solution holds significant potential to substantially reduce accident rates and ensure safer transportation experiences for individuals across various regions and terrains in India.