IR Remote Control Self-Avoidance Car with RFID badge

Tag:

An IR remote controlled vehicle use ultrasonic sensor to avoid any solid obstacle within 10cm. Will make a stop and a small turn if any obstacle is detected. RFID can allow it into a locked room if RFID tag is pre-registered with receiver. And also can respond to radio alert lib.

Equipment:

- 2 Arduinos
- RFID receiver and 2 tags
- 2 XBees
- HC-SR04 Ultrasonic sensor
- IR receiver
- LED
- Car base
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System Diagram(-> trigger):

RFID tag -> RDIF reader -> Led
Xbee -> Car base
HC-SR04 -> Car base
IR Reader - > Car base

Executive Summary:

IR remote control self-avoidance car that's able to react on radio alert with pre-defined lib. When things are detected within 10cm distance from the front of the vehicle, vehicle will move back off/stop a bit and make a left turn to avoid mash into the wall even when go forward commend is given. Attached RFID tag is pre-register with another RFID authentication Arduino, which will only authenticate known tags and light up the LED.

Tech Background:

RFID stands for radio-frequency identification. In a simple way of explanation, RFID reader collects radio wave from tag. RFID tag consists of an integrated circuit and an antenna. RFID can be read outside the line-of-sight(barcode), which is provides a better customer experience. Heavily adopted in inventory management/supply chain and daily ID badging.

Implementation:

RFID Arduino:

In this implementation, RFID reader constantly check for incoming radio wave and re-format the wave into a recognizable way. Only when pre-registered wave is checkout, Arduino will write a digital signal to LED to turn it on.

Robot Car Arduino:

Base level:

Four separate motors that control each wheel at a time, four functions are defined for each forward/backward/left/right movement. Digital write to direction pin while analog write to speed pin.

Top level:

IR remote signal is pre-define for each of the movement. When IR signal comes in, it will be decoded to match any of the four movements and defined movement function will be called. Ultrasonic sensor checks for distance frequently. To avoid over sensitivity, a checksum is enforced. Only when 10 times of close distance is detected, a stop and left method will be called.

Xbee is using pre-defined lib will operate a movement when a pre-defined alert is received.

Software:

https://github.com/melodylovepug/IoTFinalPorject.git

Links/References:

https://www.arduino.cc/en/Main/ArduinoXbeeShield

https://playground.arduino.cc/Learning/MFRC522

https://www.sparkfun.com/products/13959

https://learn.adafruit.com/using-an-infrared-library/hardware-needed

Process:

Inspriation: My initial idea of final project is entirely different from what is having here. Initially want to build a smart water bowl that can ingest water if water level is lower than certain amount. However, one day sitting at home, trying to find a way to annoying them since they always stop me at middle of something. While trying to annoying them, I also do not want any of them to be hurt. That's how I came up with this robot car idea.

Goal: A robot car is able to be remotely controlled but also can pre-set to an auto route mode that can start at middle of the day(while I'm not home), and play around(annoying) my dogs. Since it will start on its own, it need be designed to be reusable, that why it has a ultrasonic sensor on it to avoid mash into wall and dogs. RFID tag is designed to be able to unlock door if fire alarm alert is send that dogs will not be stuck in the room when disaster happens.

Success and Challenge:

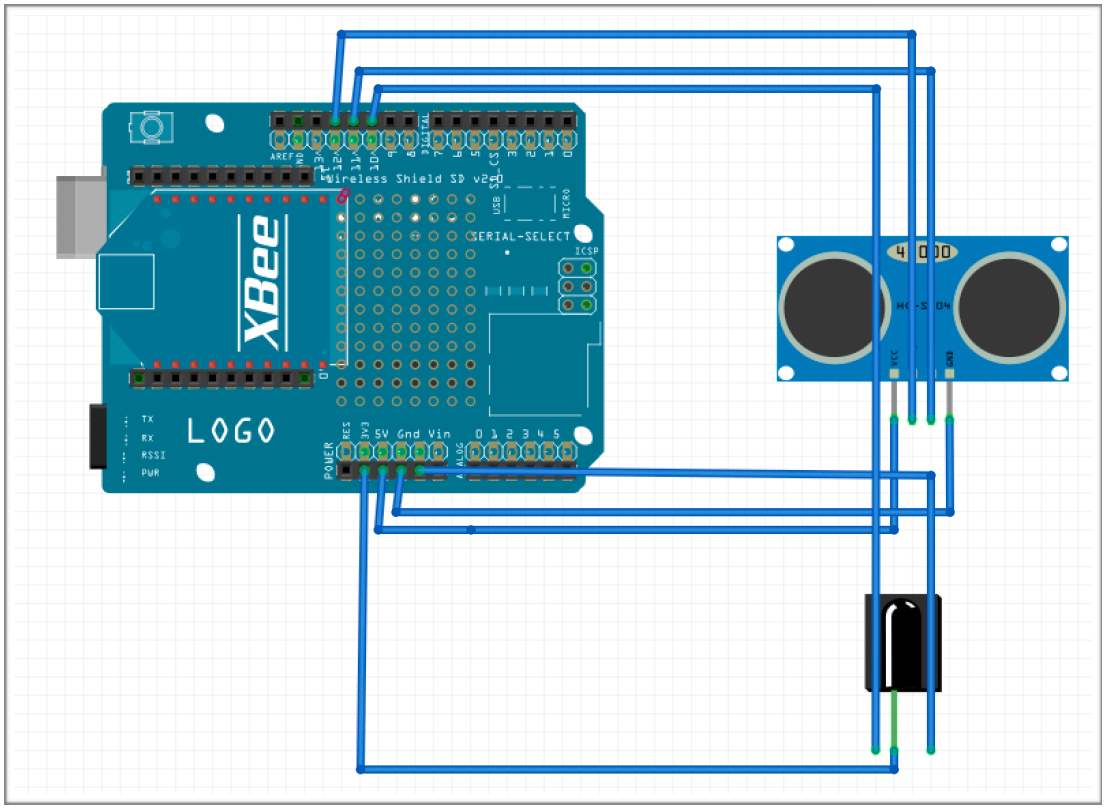
It was time consuming since it has many parts and they all need to connect to each other in a certain way. Hardware setup vs software are 60/40 time spend wise.

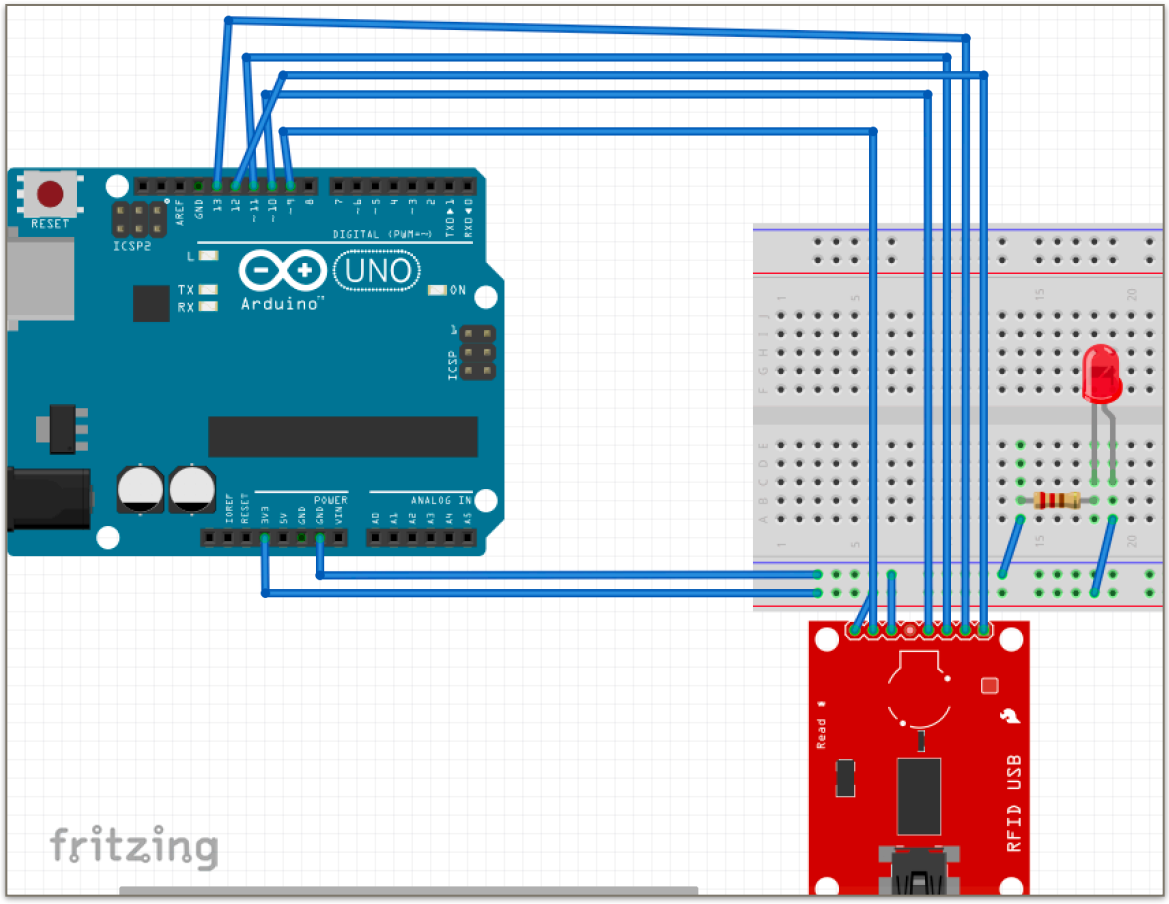
Had so many sensors that I want to install onto this robot car but also do not want to make it over complex.

Next Step!!!!:

It's been my concern over the past few years, what if one day, something like fire happens in my apartment building. Fire alarm will trigger for human runaway, but how about dogs left at home during day time. There is no way for them to escape on a timely manner. This robot car can made into a way that it's able to understand fire alarm and will operate upon that, so it at least can unlock the door(not those regular key opened door), that provide easier entrance. Ideally, door can be opened by this robot car.

Circuit Diagram



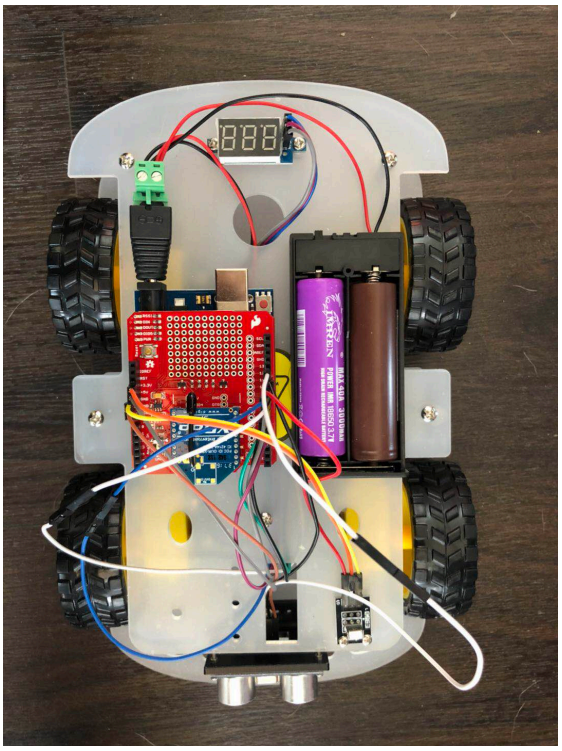


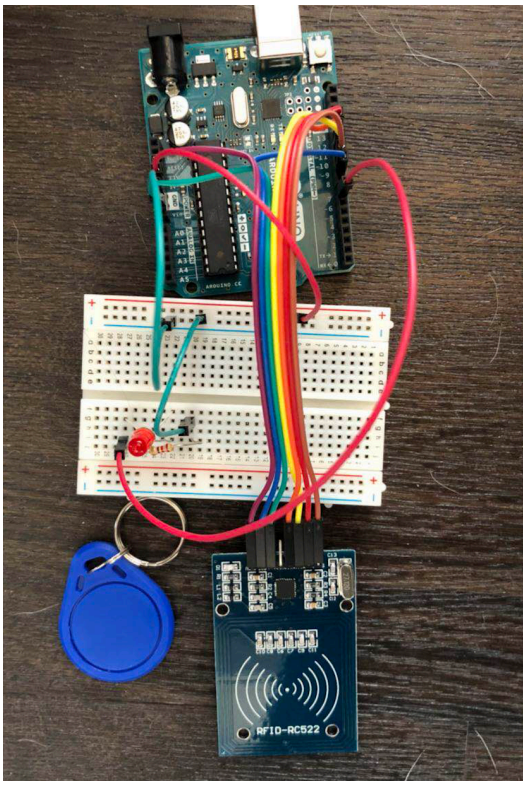
Contact:

Melody Love

melodylovepug@gmail.com

Northeastern University Seattle Campus




RFID-RC522