

**Autonomous driving
written by DragonCoder**

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Motivation

The most important motivation for this project was the training of C++ skills and skills of electronic basic. Besides this, I wanted try something new to see, how something like this is working. This project should help to train C++, Python, Web-languages and Qt-API skills.

Hardware

In this part we will concentrate us on the hardware, this mean elements and appropriation in the project. For the end we will estimate the cost of the project and possible extension to reduce the cost of project.

1. Arduino Due
Arduino Due will be the heart of controlling DC-Motors and the Ultrasonic Sensor and another. I choose Arduino Due, because it is the most powerful variant of Arduino Shields. For first version of the project, we will use only one of Arduino Due
2. Raspberry Pi
Raspberry Pi is second important element of communication, which will send data do server, get this data back and send the signals to Arduino Due.
3. Arduino Nano
Arduino Nano should be element of brake system. More about that in another part of document.
4. GPS Module
The GPS Module should be connected to Raspberry Pi and to the Arduino (Tracking system)
5. SIM-Card Modul
This module will connect to Raspberry Pi or the Arduino (Access Module)
6. SIM Card
SIM Card will use to Internet Access
7. Mega Sensor Shield v2.0
Sensor shield will use to connect all of our sensors and the dc motors, this mean our MOSFETS
8. DC-Motors
DC-Motors will be the used to moving our car. For this project we will use 12V or maybe 24V
9. MOSFET
The MOSFETS will help with controlling the speed and right of the DC-Motors but they will too used for the LEDS
10. Camera
Camera will be connected to the Raspberry Pi and will show straight in the direction of travel and collect pictures which then will be processed on server (Sign system)
11. Ultrasonic sensors
Ultrasonic senors are really basic sensors they will use to count the distance from our car to car behind us and of the front of our car and on booth sides (right and left). (Auto detection system)
12. Server
Server will be used as a computing power, where all of mathematics calculations will be executed
13. Moisture sensor
This sensor will check the moisture (Moisture system)
14. Temperature sensor
This sensor should get data of temperature from atmosphere and DC-Motors (Temperature system)
15. Laser sensor
This sensor will count the speed of car which is behind our car and then choose, if the car can overtake another car or not (overtake system)
16. Housing
In first version the housing will be of plastic but I try to do this foolproof

17. Battery

The car will need a big battery. I will try to do a home battery, which should be lightest and have biggest capacity, how it is only possible. In later part of the project, I will try to do a battery system, more about this in possible solution/extension.

Languages

For the project I chose C++, Python, SQL. C++ is the most important language of hardware level. With these languages I will write the code for Arduino and its elements, programs with usage of Qt.

Systems

1. Tracking system

Tracking system is one of the most important system in the car. The system is responsible to navigate the car between 2 points, choose the right way by using algorithms, which will such ways, which doesn't have any stoppage/plug. The navigation system will be too part of another system, this mean Overtake-system. For the tracking system will be written a app which should help the user to see, where the car has been and to tracking car moves. Really important element of this system will be another system, battery system, more about that in another part. For the tracking system will be used 2x GPS Modul one will be connected to Arduino and another one to Raspberry Pi, which should prevent mistakes in navigation.

2. Access Module

Access Module is nothing more as only internet access, but the car need to have a pretty internet access and use so less internet how its only possible. For this action will be written a special code which will disable and enable the internet access to public internet and switch it on and off. Most important system gap is the switch time between WiFi Access and cellular access, because its time, where the car doesn't have access to internet but the car muss still work.

3. Sign system

The sign system will be assisted by the camera which will be connected to Raspberry Pi. The system will probably work near with database and should recognize the sign on the way and behave rightly with the meaning of the sign.

4. Auto detection system

The auto detection system is really important system which should avoid the accident with usage of 2 cars. The car should be positioned between 2 cars and change his speed in according to the another cars (in front and back), but the space between 2 cars should be the "secure space". The system will be really important by backwards driving and leaving the park place

5. Temperature system

Temperature system should count the temperature of atmosphere, car dc motors and battery.

1. Task: monitoring the atmosphere temperature and battery, which have influence the battery life and working length

2. Task: monitoring the temperature to say the user, if it is a good idea to drive or not to drive

3. Task: the system won't start, if the temperature is to high or to low, because of possible hardware defect

6. Overtake system

Overtake system is hardest system to implementation, because of many sensors and another system like sign system. For this system I will try to do a laser speed counter, which will count the speed of cars, which come of left or right side and the system will decide, what is to do.

7. Fingerprint system

The user will have a excursion guide with the fingerprint sensor, which will take the fingerprint and compare them with the saved. If the fingerprint will be correct, then the car will come to user.

8. Weather system

The weather system will decide, if the car will started or not. When the weather will be really bad and the car will be in save places, where is not a water or something like that, then the car will not start. But if the car will be on the way to the another point, then the tracking system will search save place, this mean place where is not a water and something like this

Schematics

Software

Possible solution/extension

1. Hardware

- battery system
 - All hardware elements will have their own battery, which will be chosen, so that all elements can work this same time. For all of this battery I will do possible to load this.
- PCB for motors and sensors
 - The motors will get own PCB, which will have possibility to using a lot of sensors or I will make a sensor PCB, which will use the motor shield from adafruit.
- PCB for the fingerprint system
 - For the fingerprint system I will do a own PCB, so that this will possible littlest and get communication with the server.