VCU : part 2

1-Vehicle Control Unit : General approach

The vehicle control unit splits into 2 main part:high-level VCU & Low-level VCU.

as the vehicle navigates , it collect data from different sensors, and get information about position , speed , images ,etc ..

all the collected data needs to be processed at first in the High level control unit , and it will be responsible for running major algorithms : perception and computer vision , localisation , state estimation , etc .. , and sending final feedbacks , including steering angle and vehicle speed.

The low-level vcu is directly linked to the high-level vcu , it will be sending electric signal to the motor controller. as explained in the next figure



A- High level control unit

Since we will use multiple sensors, including (cameras, radars, ultrasound sensors ...) and convolutional neural networks in image processing, a DRIVE AGX Developer Kit developed by NVIDIA will be used as the vehicle computation unit. Worth mentioning is that the Nvidia company provides a complete tutorial on how to Integrate DRIVE AGX in our vehicle and implement our own processing algorithms.

In addition , nvidia offers another powerful tool : tensorRT

As we are working smart VCU based on AI algorithms , Nvidia offers more possibiliy for optimisation .

Tensor RT sdk’s allow us to run this algorithms with minimum latency and power consumption , even with a VCU with limited performance , deep learning inferences will be optimized to a maximum.

A- LOW level control unit

VCU choice : Raspberry pi 4

Raspberry Pi 4 is based on arm cortex-a72 64 bit , unlike any microcontroller-based boards , it provides more raw power , ram and CPU performance .

This single board computer is a great match for nvidia , regarding boards performance , communication and overall performance.

1-wireless control unit

A-wireless controller

A wireless controller has two major functions :

security precausions: the vehicle should have a remote emergency stop button to intervene when nedded

remote handling: the user should be able to operate the vehicle from the outside

B- Transmission-reception :Overall Principle

A large method of wireless communication systems are used in this case , the choice will depend on the prise , performance, and most importantly the range needed for remote transmission.

Considering all this factors , our communication choice is 2.4G radio , R-C communication system .

Only two devices are needed : a transmetter and a reveiver , and unlike Wifi , bluetooth, zigbee or other communication tools , radio transmission is secure , and have a wide range up to 3 kilimetres long.

C- Device selection

D- RC - VCU communication

