Lab 2: Autonomous Vehicles
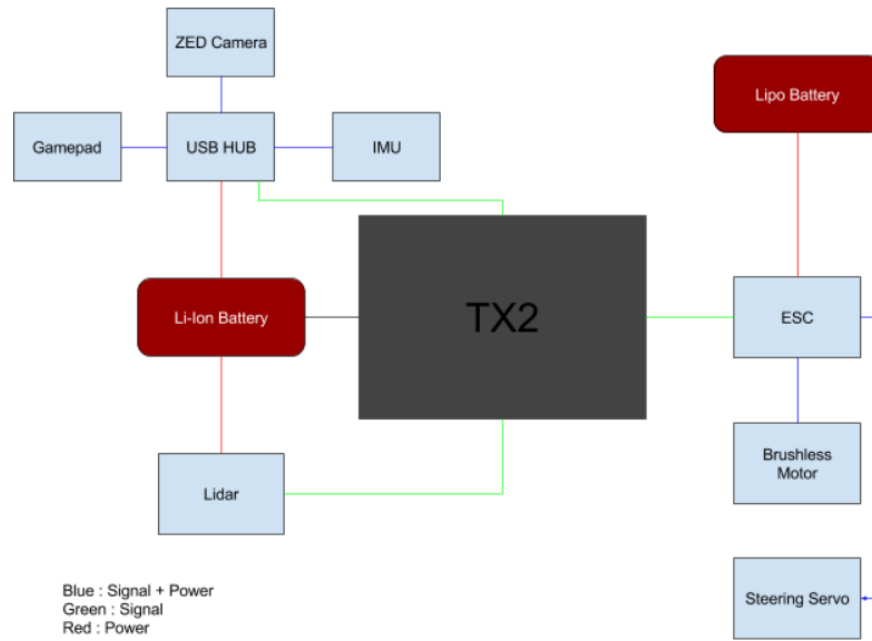
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Contents

1 Block Diagram

ZED Camera

Gamepad — USB HUB — IMU

Lipo Battery

Li-Ion Battery — TX2 — ESC

Lidar

Brushless Motor

Steering Servo

Blue : Signal + Power
Green : Signal
Red : Power

2 Car Specifications

TX2

GPU	NVIDIA Pascal, 256 CUDA cores
CPU	HMP Dual Denver 2/2 MB L2 +Quad ARM A57/2 MB L2
Video	4K x 2K 60 Hz Encode (HEVC)4K x 2K 60 Hz Decode (12-Bit Support)
Memory	8 GB 128 bit LPDDR459.7 GB/s
Display	2x DSI, 2x DP 1.2 / HDMI 2.0 / eDP 1.4
CSI	Up to 6 Cameras (2 Lane)CSI2 D-PHY 1.2 (2.5 Gbps/Lane)
PCIE	Gen 2 — 1x4 + 1x1 OR 2x1 + 1x2
Data Storage	32 GB eMMC, SDIO, SATA
Other	CAN, UART, SPI, I2C, I2S, GPIOs
USB	USB 3.0 + USB 2.0
Connectivity	1 Gigabit Ethernet, 802.11ac WLAN, Bluetooth
Mechanical	50 mm x 87 mm (400-Pin Compatible Board-to-Board Connector)

USB HUB

Power Requirements	5V/2.5A
Interface	7 USB 3.0 ports
Signaling Method	Asynchronous Mechanism.

Zed Camera

Power Requirements	5V/380mA via USB
Range	0.5 - 20m (2.3 - 65ft)
Detection Angle	110 degrees
Detection Range	Same as video resolution
Interface	USB

IMU

Power Requirements	5v
Sensors	Accelerometer, Gyroscope
Interface	Serial

Lidar

Power Requirements	12VDC/24VDC @ 150mA or less
Range	30m
Detection Angle	270 degrees
Detection Range	0.06m to 10m (white Kent sheet),
Interface	Ethernet 100BASE-TX

VESC

Power Requirements	8 - 60V
Interface	10awg motor wires, 2mm JST-PH Connector

Brushless Motor

Power Requirements	3500 (10-turn) RPM/volt
Interface	TRX 3.5mm bullet connectors

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Steering Servo

Power Requirments	6V
Degrees of freedom	60 Degrees
Interface	j type
Other	2 ms Pulse Cycle, 858-1670 s Pulse Width

3 Challenge Systems

For these following section we will assume they are powered by there respective sources as defined in the block diagram

3.1 Wall Following and Lane Centering

- TX2
- Lidar
- ESC
- Servo
- Motor

3.2 Image Color detection for parking

- TX2
- ZED
- Lidar
- ESC
- Servo
- Motor

3.3 Lane line detection

- TX2
- ZED

3.4 Simultaneous Localization and Mapping (SLAM

- TX2
- IMU
- Lidar

3.5 Lane departure warning and parking

- TX2
- Lidar
- ZED
- ESC
- Servo
- Motor
- ESC
- Servo
- Motor

3.6 Final Challenge

- TX2
- Lidar
- ZED
- ESC
- Servo
- Motor
- ESC
- Servo
- Motor