

# Development Module for Radar Safety Sensor in Single-Track Vehicles

Semestral Project

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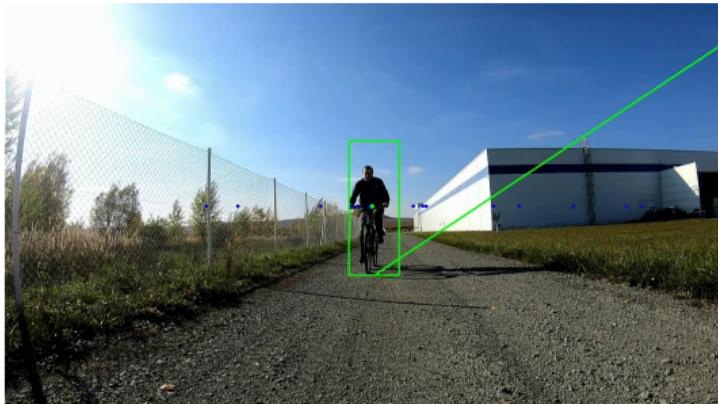
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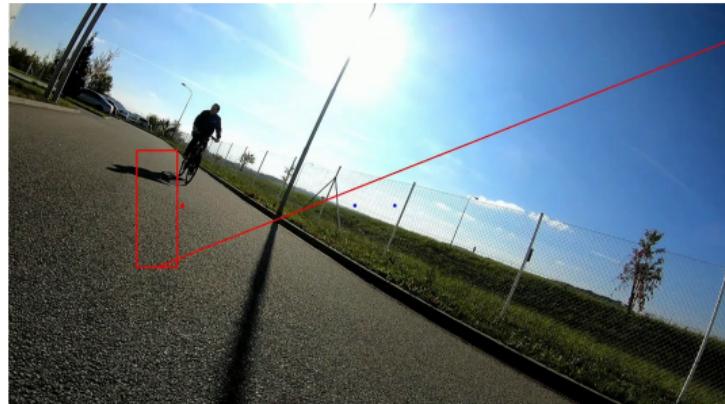
# Aim of the semestral project

- Research
  - Cyclo safety equipment
  - Basics of radar technology and current radar setup
  - IMU
  - ROS 2
- Schematic design of the module
  - MCU
  - Radar sensor and external components connectivity
  - IMU and output peripherals
  - Power management
- PCB layout design

# The problem formulation



Ride in straight line

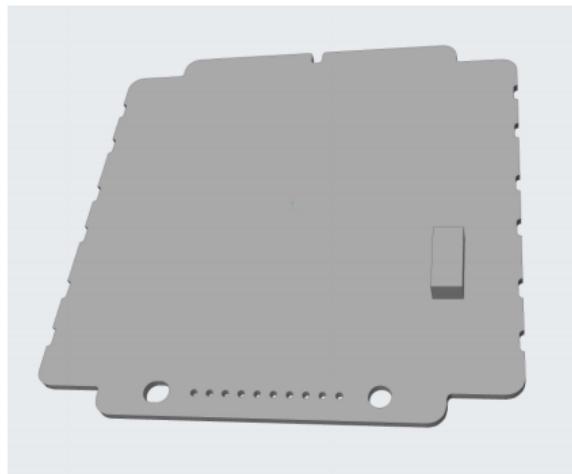


Ride in a turn

- Tracking of objects behind the cyclist – potential threats
- One-dimensional FOV
- Ego-motion estimation and object tracking
- The need for FOV tilt information

# Purpose of the module

- Development purpose – connectors, IMU, power management
- Demonstration purpose – LEDs, buzzer, wireless connection



Alps Generic Radar 5



Garmin Varia

# Software preparation

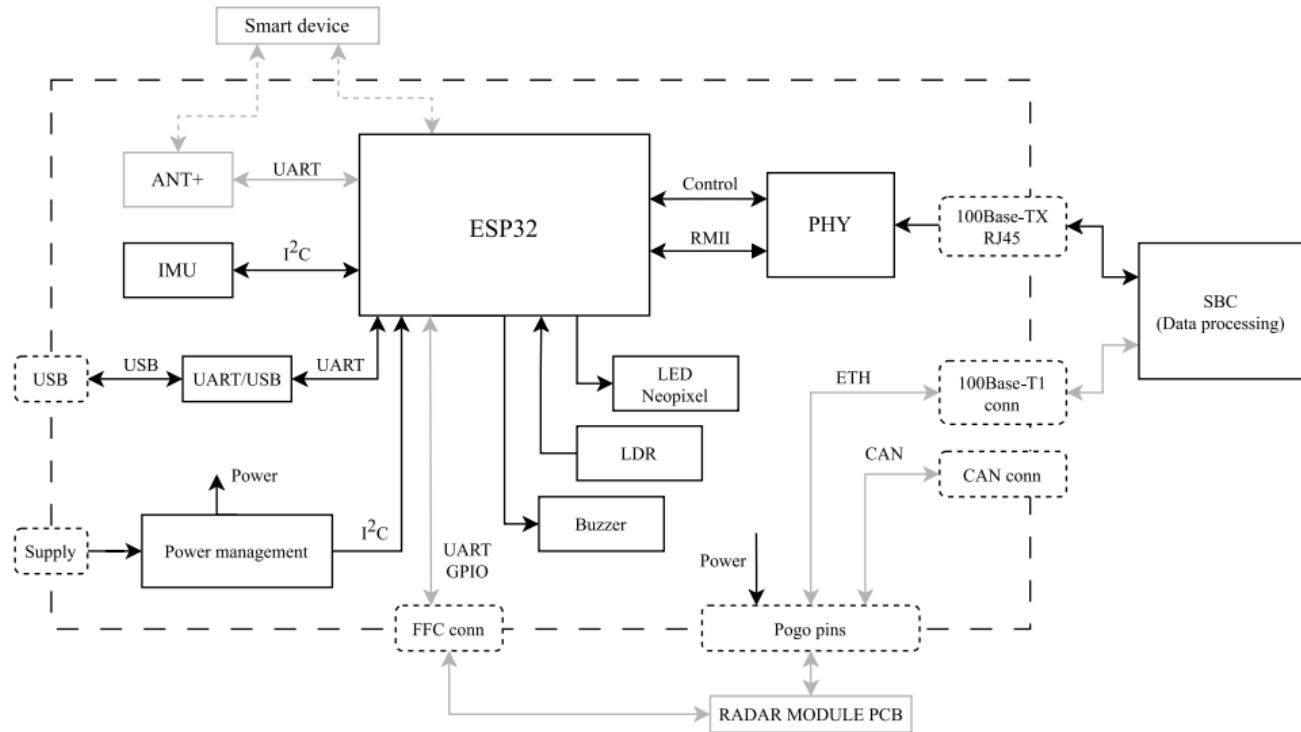
- Preparing ESP-IDF and ROS 2 environments
- Exploring ROS 2 functionalities
- Testing micro-ROS examples
- Creating software prototype of ROS 2 communication



ESP32 Ethernet Kit<sup>1</sup>

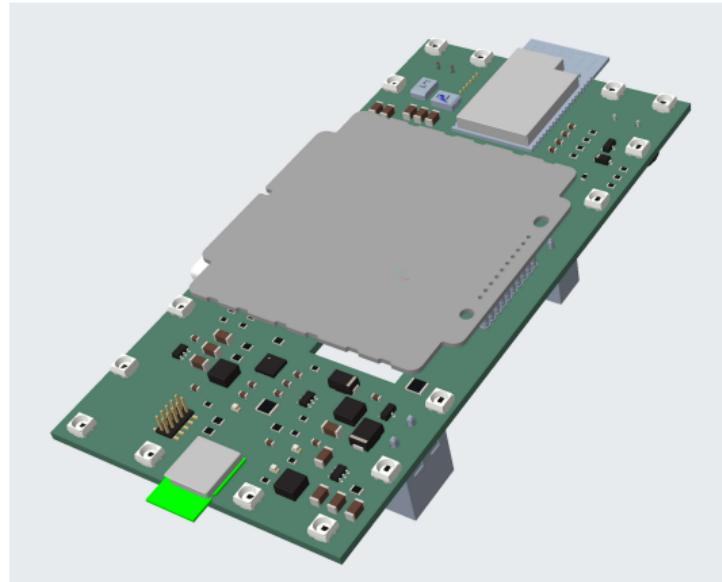
<sup>1</sup><https://docs.espressif.com/>, *ESP32-Ethernet-Kit V1.2 Getting Started Guide*

# Block diagram



# The hardware design

- Connection by spring-loaded pins
- LEDs on the perimeter
- Robust connectors – CAN, ETH-T1, ETH-TX, power supply
- Debug connectors



# Further steps

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- Finish hardware design and have the board manufactured
- Create the firmware
- Test and debug the firmware
- Verify functionalities on real radar data

Thank you for your attention!