


# O'PAVES

An open platform for autonomous vehicle tinkerers

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 Hackaday.io: Fabien.C

# What is this project?

**Open Platform for Autonomous VEHICLEs (O'PAVES)**

# Video demo!

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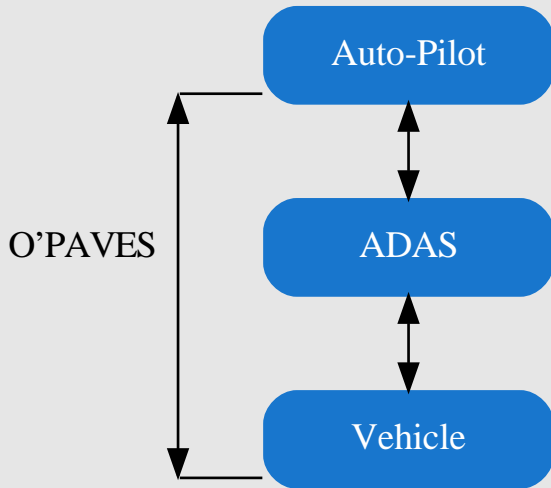
# Autonomous vehicle competitions 1/2



## Autonomous vehicle competitions 2/2



# Advanced Driver Assistance System



# For whom?

- O'PAVES as a prototyping platform:
  - Students
  - Researchers
  - Hobbyists/Hackers/Makers
- OPAVES as an AdaCore tool demonstrator:
  - Customers and prospects
  - Trade shows visitor

# Hardware

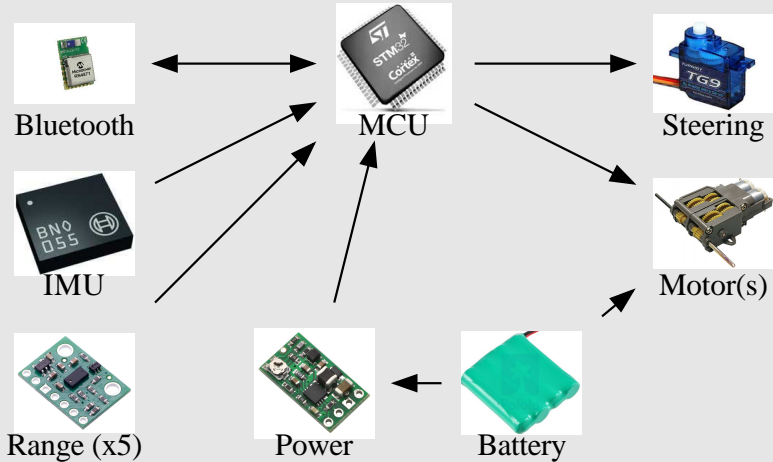
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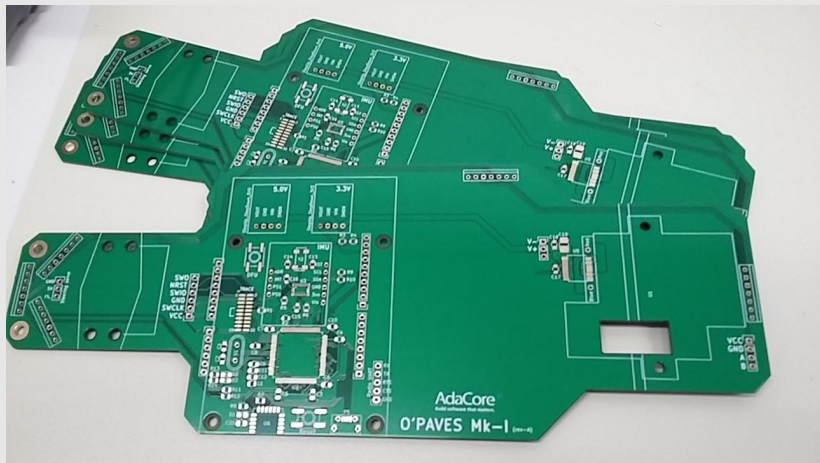
# Hardware Requirements

- Capable of addressing the classical autonomous vehicle challenges
  - Lane following
  - Collision avoidance
  - Autonomous parking
- Affordable
- Easy to buy and/or build

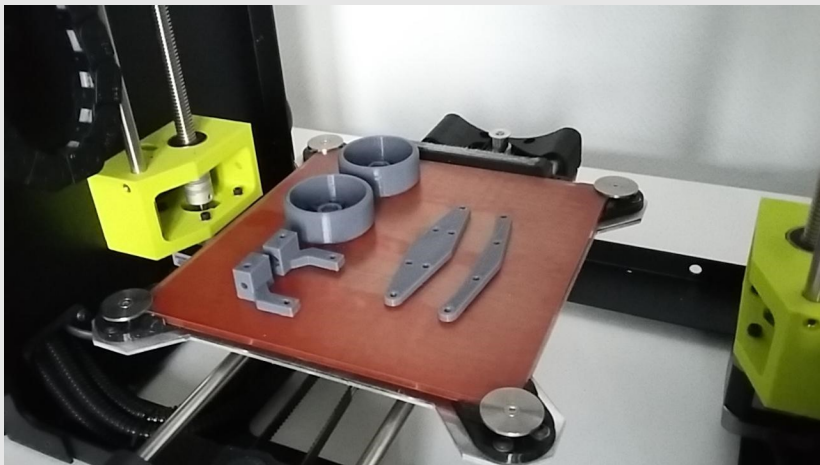
# Components



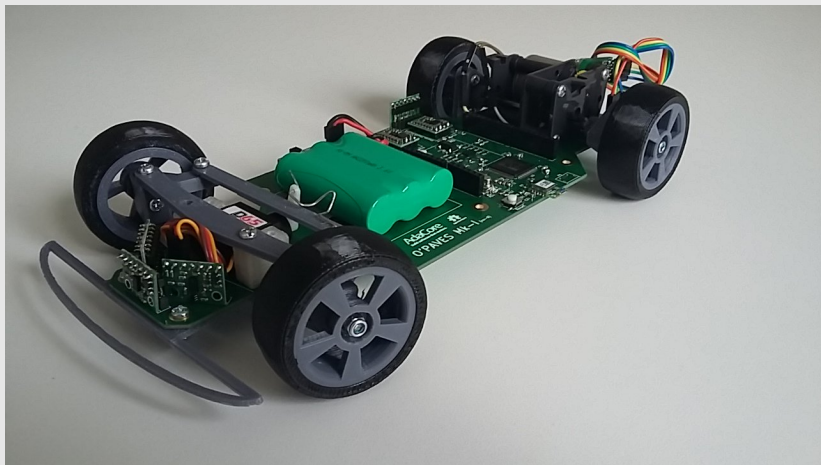
# PCB Frame



## 3D Printed Parts



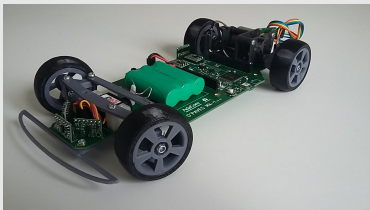
## First Prototype



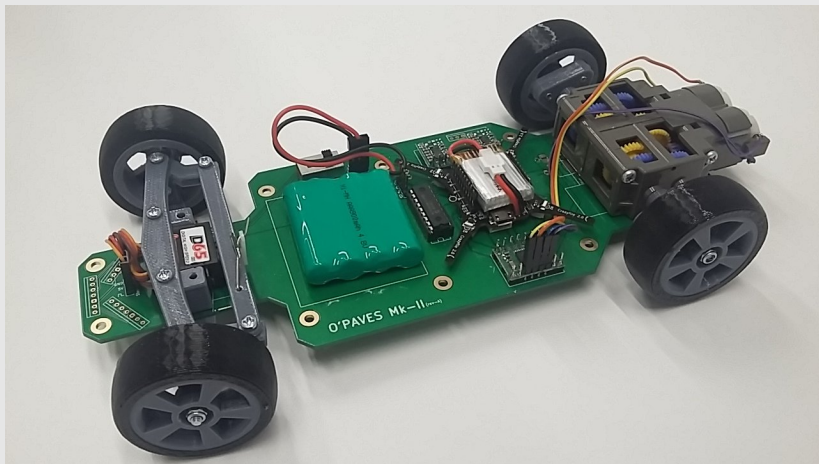
# First prototype vs requirements

- Capable of addressing the challenges - YES
- Affordable - YES
- Easy to buy and/or build - Not really...

# New Version



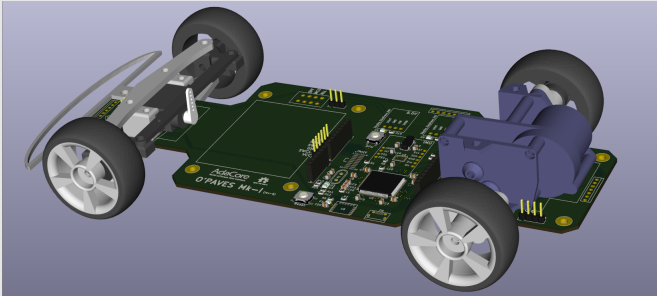
## New Version





# Open-Source Hardware

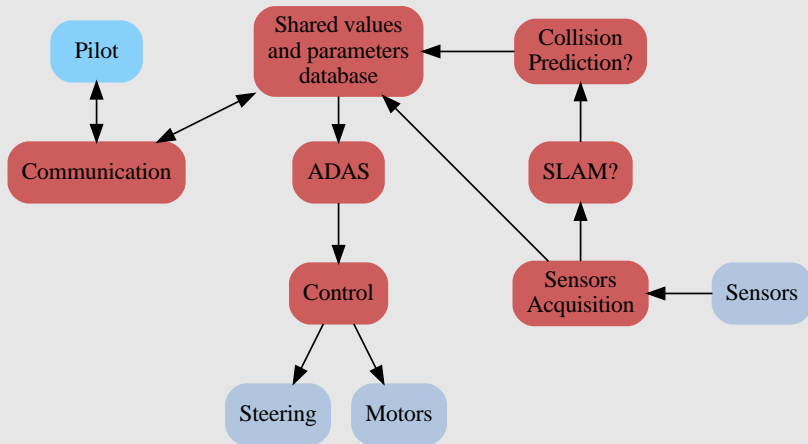
- Released under the CERN Open Hardware License
- Designed with open-source software:
  - KiCad
  - FreeCAD
- Repository: <https://github.com/AdaCore/OPAVES>



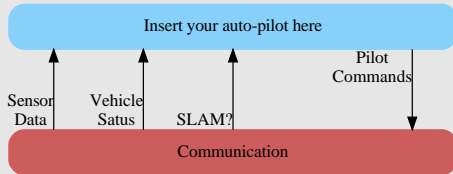
# Software

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# Software Architecture



# Auto-pilot interface



- Ada and SPARK: programming languages
- Ada\_Drivers\_Library: Drivers for micro-controllers
- Certyflie: Flight controller written in Ada and SPARK
- GNATprove: Formal proof of the the SPARK code
- GNATcoverage: Source coverage analysis (up to MCDC)

# Costs

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PCB (by 10)	~\$50
Misc Components	~\$110
Crazyflie 2.0	\$180
<b>Total</b>	<b>~\$380<sup>1</sup></b>

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<sup>1</sup>That's less than a Tesla

# Fork it, Build it, Use it, Improve it

Build it and make your own autonomous car!

Potential improvements:

- Hardware
  - Encoders on the motors
  - Change the PCB to make it compatible with your favorite dev board
- Software
  - Active differential
  - Actually use the sensors available

Follow the project on:

- GitHub: [github.com/AdaCore/OPAVES](https://github.com/AdaCore/OPAVES)
- Hackaday: [hackaday.io/project/17555-opaves](https://hackaday.io/project/17555-opaves)
- Twitter: @OpenPAVES