FEASR

REGIONE DEL VENETO

PSR VENETO 2014-2020

FONDO EUROPEO AGRICOLO PER LO SVILUPPO RURALE: L'EUROPA INVESTE NELLE ZONE RURALI

University of Maribor

Faculty of Agriculture and Life Sciences

Rovitis 4.0

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Motivation

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Faculty of Agriculture and Life Sciences

- Agricultural challenges reaching to 2050
- Precision agriculture will be one of the solutions
- The underlying technology is available - working on end products
- Needed support of policy makers, managing authorities and others

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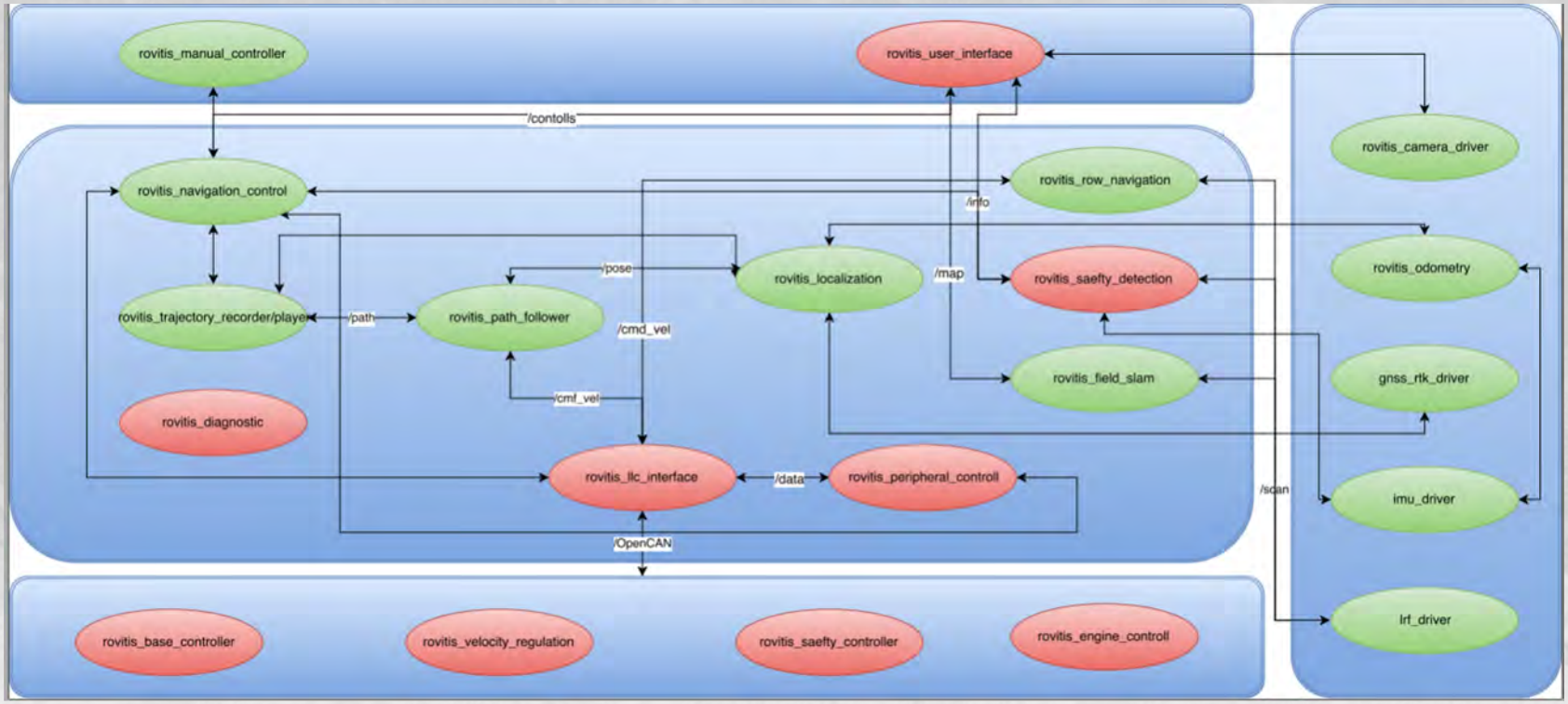
- Rovitis 4.0 - a prototype concept of an autonomous vineyard robot
- Build on top of Energreen remote controlled platform
- Added sensoric systems (LIDAR, IMU, RTK-GPS, odometry, etc.)
- Upgraded Rovitis software stack (ROS + drivers & nodes)

Software architecture



Hardware level: drivers for sensors and actuators

Processing level: sensor data processing, sensing, localization

User interface level: user controls, teach and repeat actions

Rovitis 4.0 - sensor fusion

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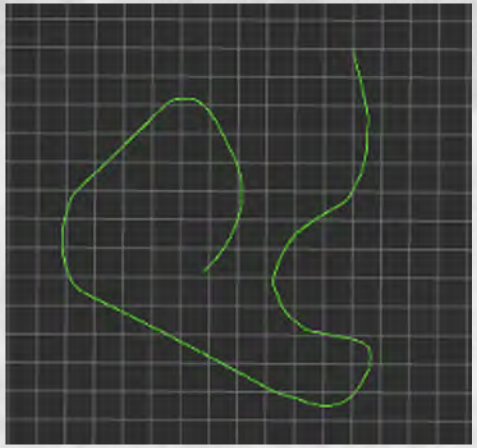
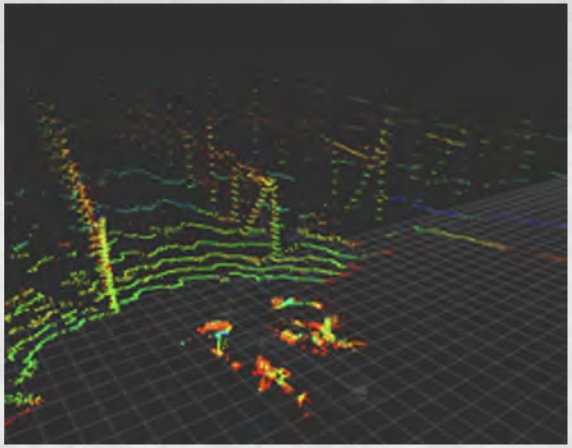
Goal: robust localization of the system

Included sensors: RTK-GPS, IMU, LIDAR, Odometry

Challenge: using low cost sensors to build a reliable approach

Workable solution: sensor fusion enabled approach





Rovitis 4.0 - Path planning

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Task Planning: Teach and repeat task for Rovitis

- Teaching robot path based on precise localization
- Repeating teached path including spraying action
- User guidance
- Using localization
  - Local RTK-GPS
  - LiDAR
  - Odometry
  - IMU

Rovitis 4.0 - Path/row following

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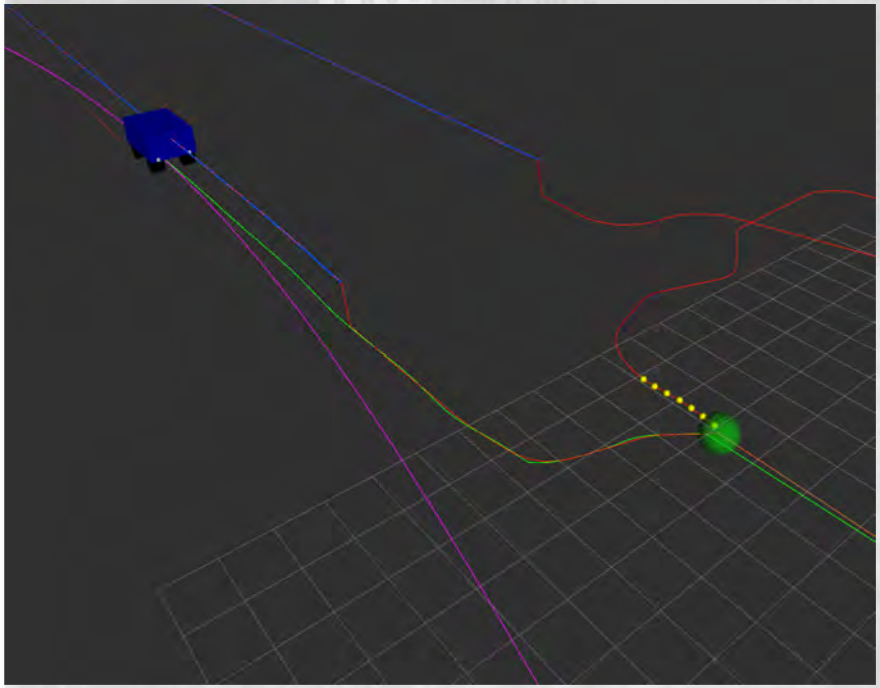
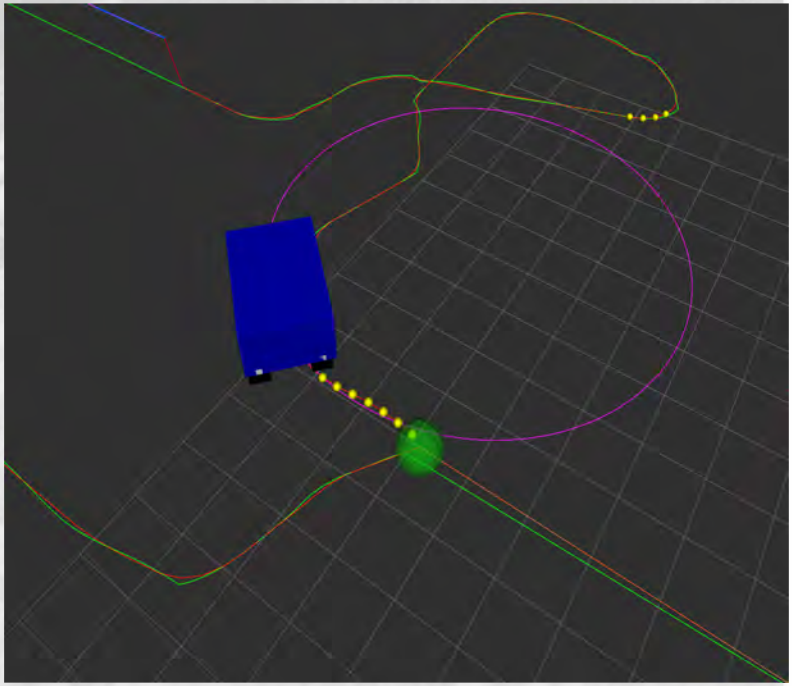
Multi step repeat action:

- Row following (LiDAR), row turning (LiDAR, localization)
- Path following (LiDAR, localization)
- Garage parking (LiDAR)





Rovitis 4.0 - Path/row following

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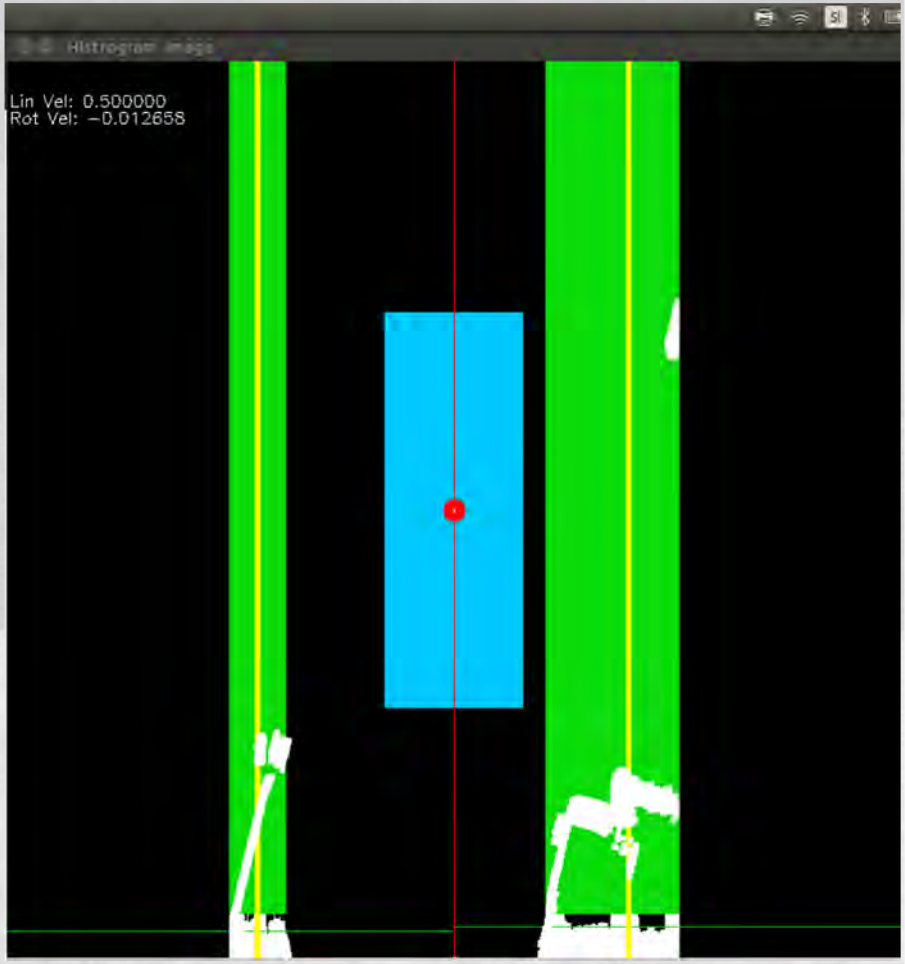
Row following:

- local localization based on LiDAR
- using 3D point cloud
- IMU for PC stabilization
- transformation to 2D space
- auto calibration of sensor data at row startup
- histogram row detection approach
- middle pose offset calculation for base control commands



Rovitis 4.0 - Conclusion

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Completed - working prototype of an autonomous vineyard robot

- Base driver development and integration (ECU, Energreen platform, etc.)
- Completed sensor fusion for robot localization
- Tested autonomous robot guidance
  - Path teaching
  - Path following
  - Row following
  - Spraying application
  - Garage parking
- Successful verification in relevant environment

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Thank you to all the partners and audience!

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