

# Mobile platform for seismic measurements

Grzegorz Nieradka

AstroCeNT

Particle Astrophysics Science And Technology Centre

CAMK PAN



European Funds  
Smart Growth



Republic  
of Poland



Foundation for  
Polish Science

European Union  
European Regional  
Development Fund

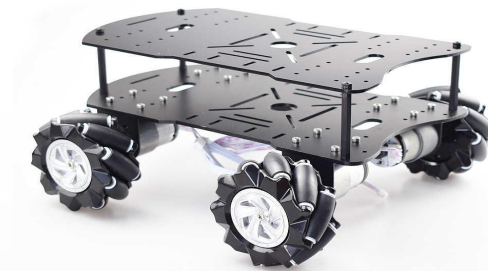
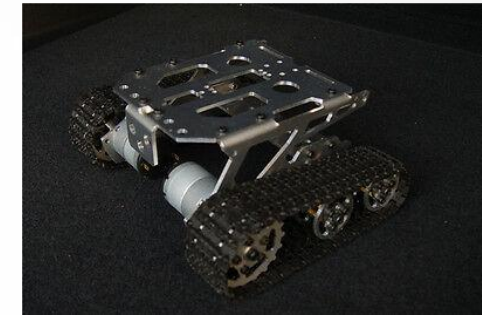
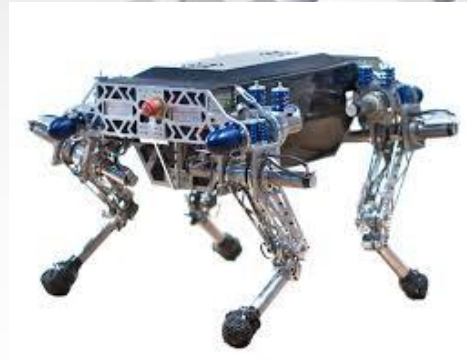


# Robotics

- Is very fast developed area of science and industry
  - Industrial robots - manipulators
  - Mobile robots - autonomous vehicle
  - Flying robots - UAV (Unmanned Aerial Vehicle)
  - Personal robots - vacuum cleaner, medicines assistance
- 
- **Idea:**
  - Mobile robot can make automatic measurements of signal, e.g. seismic signal

# Mobile platform

- Many possibility to moving robotics platform
- Legs, wheels, caterpillar
- Wheels - can be 2WD or 4WD (wheel drive)
- Many types of wheels
- Selected 4WD with mecanum (Swedish) wheels
- Omnidirectional movement allowable



European  
Funds  
Smart Growth



Republic  
of Poland



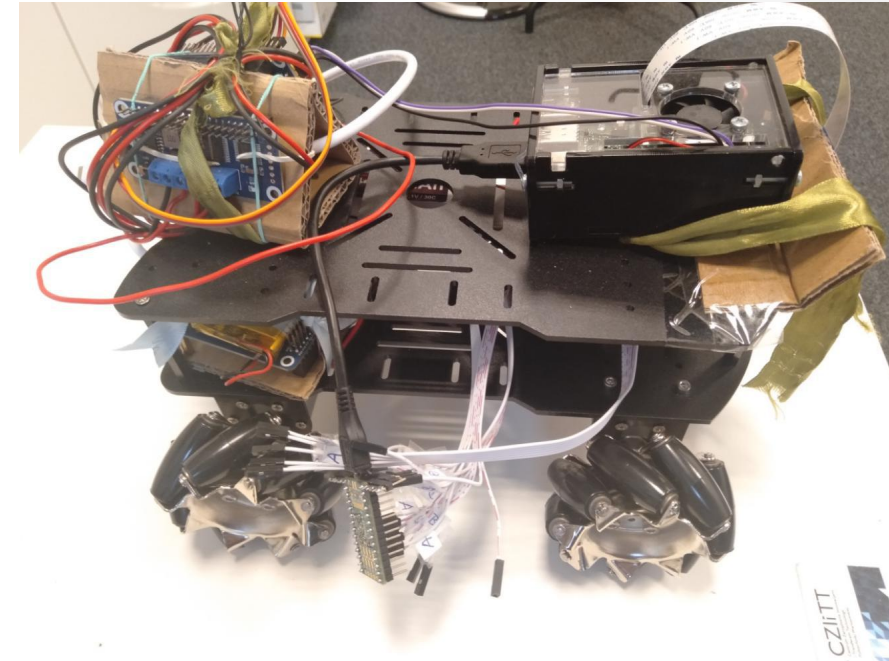
Foundation for  
Polish Science

European Union  
European Regional  
Development Fund



# Basic equipment

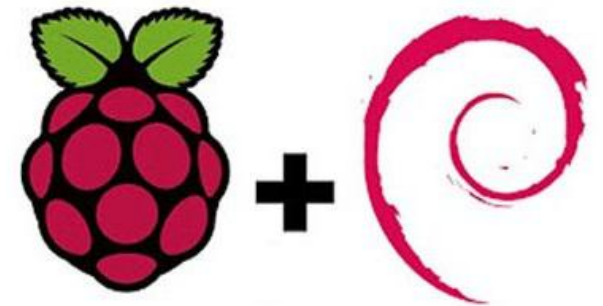
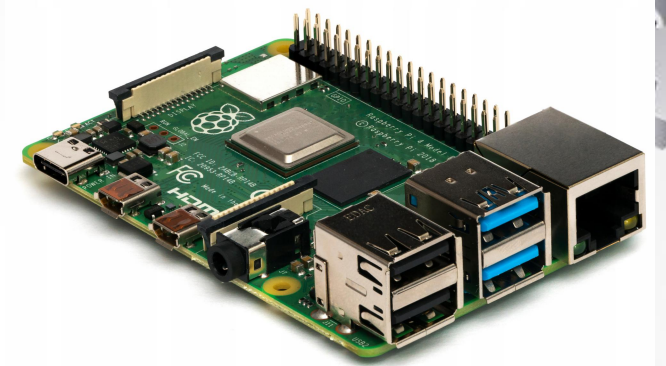
- Linear motors for platform moving
- Motors equipped with encoders
- Drivers of motors with I2C
- Accumulators 12 V and 5V
- Camera for video streaming
- Raspberry Pi for robot logic





# Operating system

- The main computational unit  
Raspberry Pi 4
- Raspberry Pi OS based on Debian as the operational system (formerly Rasbian)
- For robotic purpose the ROS is installed
- ROS is Robot Operating System
- ROS is standard in robotics at now



ROS

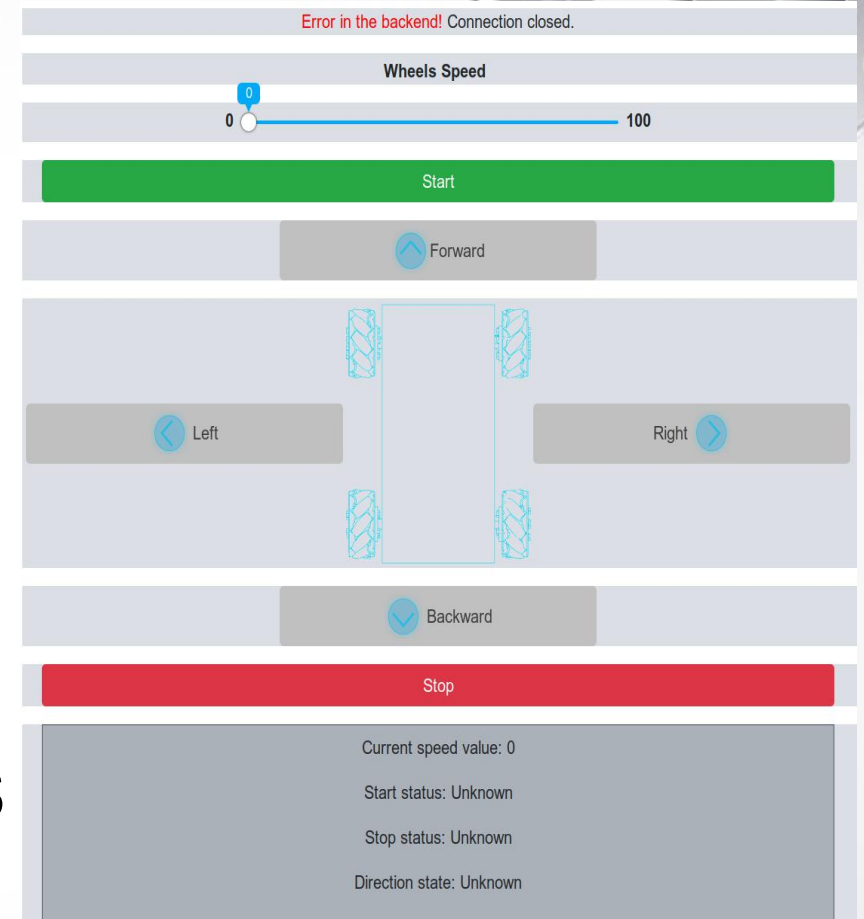


Logo of ROS Noetic Ninjemys



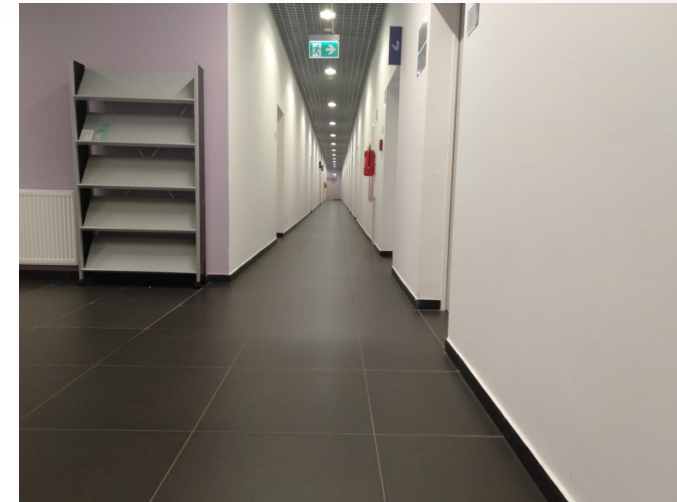
# Teleoperation

- Moving can be done by operator supervision
- Communication over Ethernet type network
- Web page with video view and user interface for robot steering
- Communication by ROS messages and services



# Algorithms

- Wheel odometry based on encoders
  - Trouble with wheel slippage
- Visual odometry based on camera
  - Trouble with homogeneous environment
  - Indoor - flat, gray floor and flat white walls
- Kinematics of omnidirectional platform
  - implement stable wheel speed driver
  - include the module into ROS system



# Futher plans

- Developing of self localization algorithms
- Developing of navigation algorithms
- Using different sensors, e.g. lidar
- Developing the seismic sensor mechanics
- Algorithms for data acquisition
- On board data processing
- Robot health status reporting
- ETC.





# Thank you for Your attention.



contact: [gnieradka@camk.edu.pl](mailto:gnieradka@camk.edu.pl)

