SpaceRegion

Make your robot see. A survey on visual navigation technology

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Centrum Badań Kosmicznych PAN (Space Research Centre PAS)

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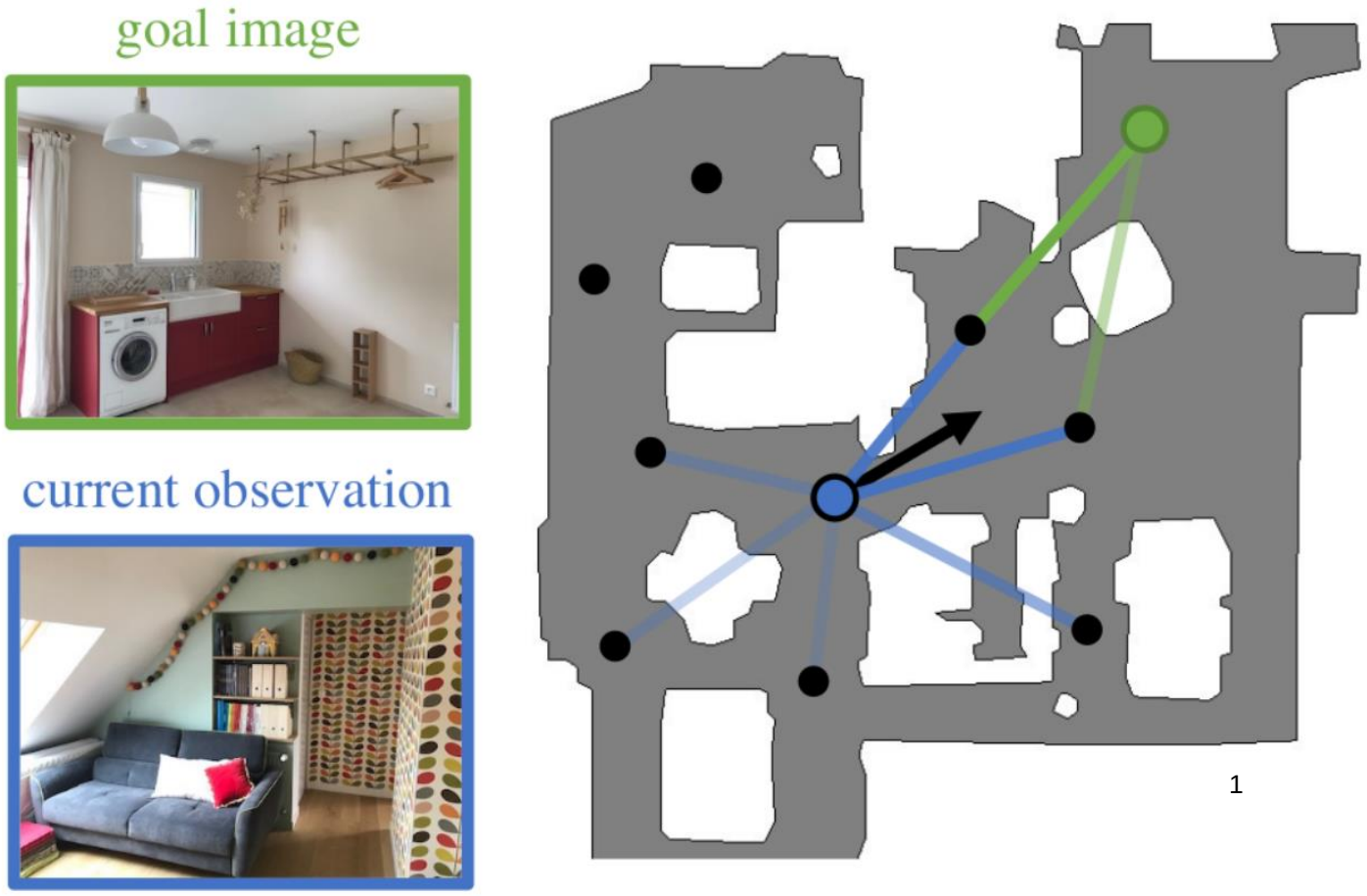
Outline

- Why?
- What's inside?
- What next?



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Why?

- Motivations
  - Cooperation with companies
  - Support the local University
  - Find a new direction

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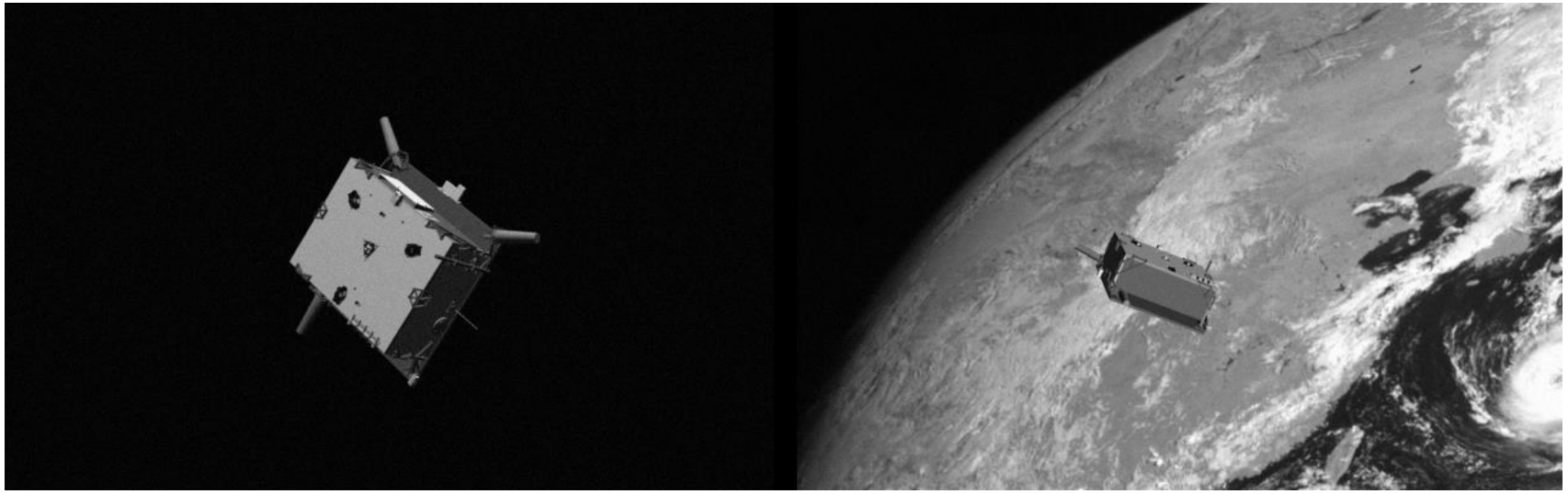

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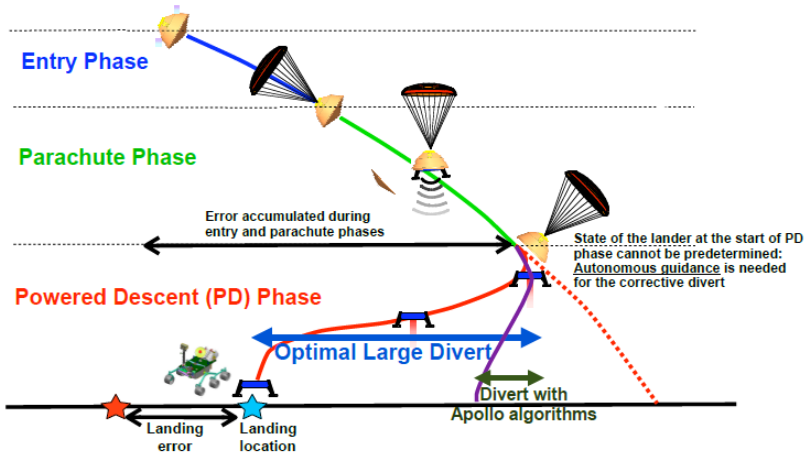
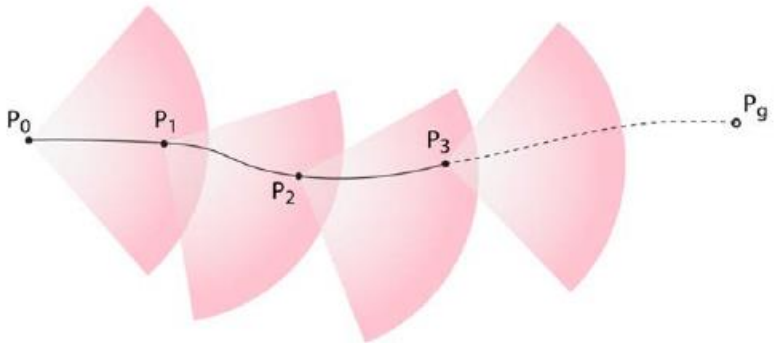
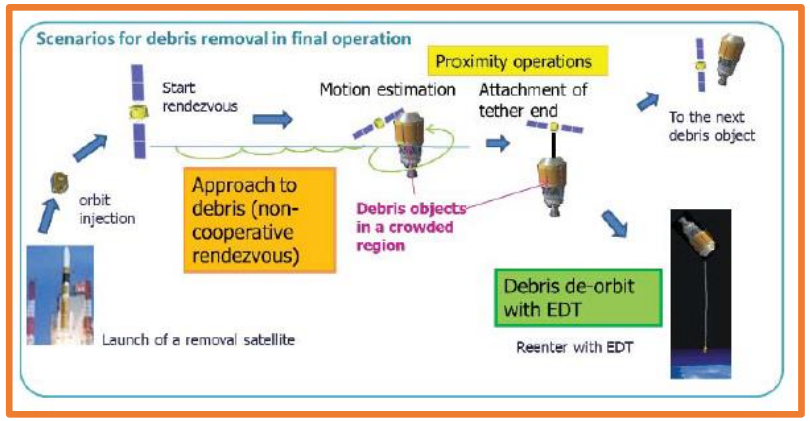
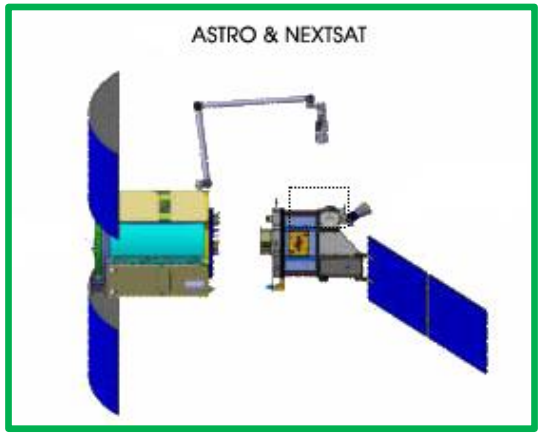
Space application

- RDL (rendez vous, descent, landing)
- OOS (on-orbit servicing)
- ADR (active debris removal)
- FF (formation flying)
- PVN (planetary vehicle navigation)









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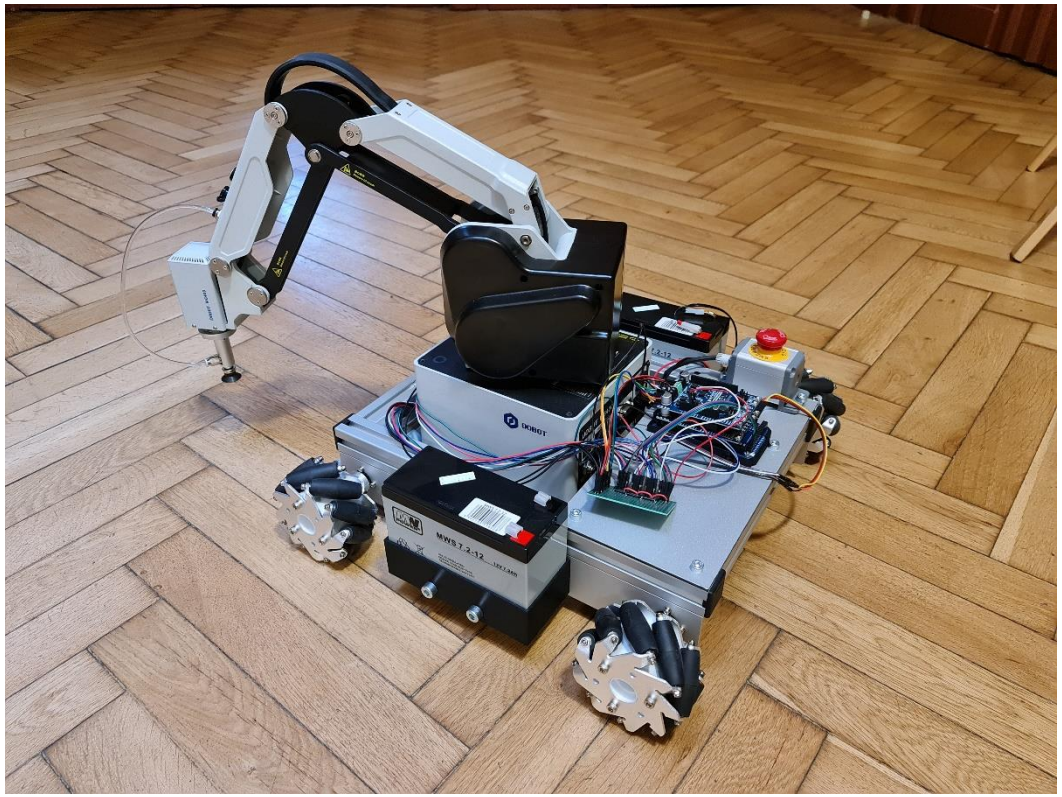

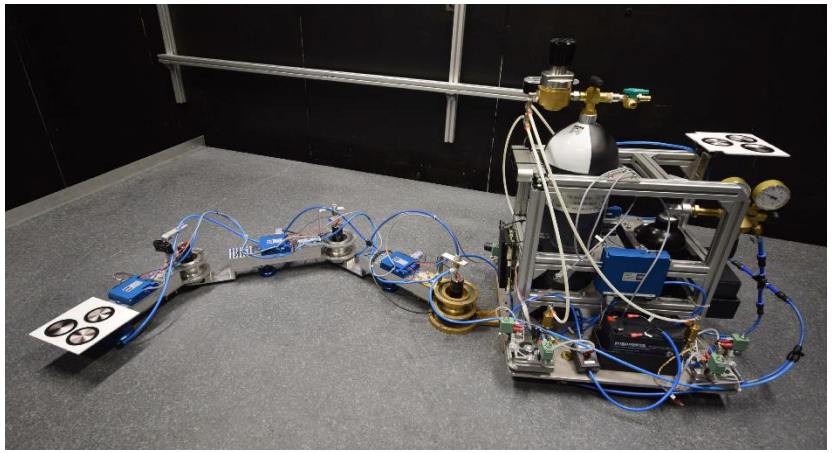

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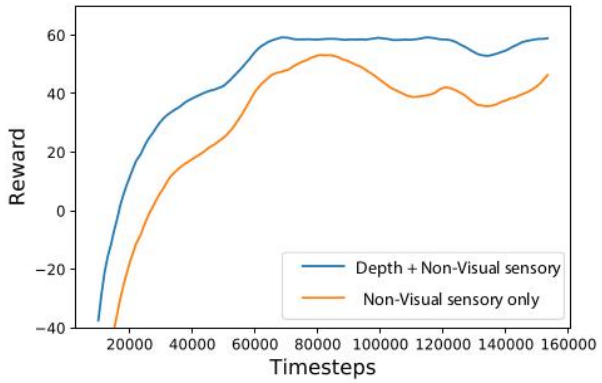
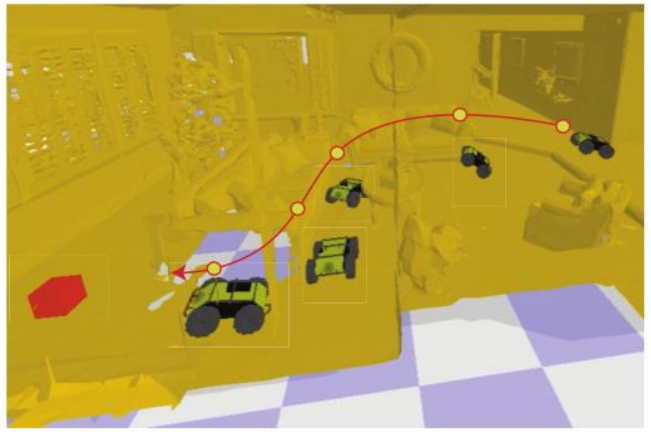
“Regular” applications

- Every autonomously moving object
  - Vacuum cleaner ↔ car
- Hazardous environment guide





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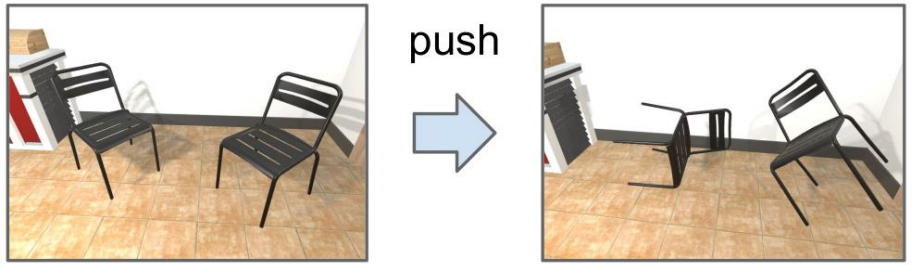
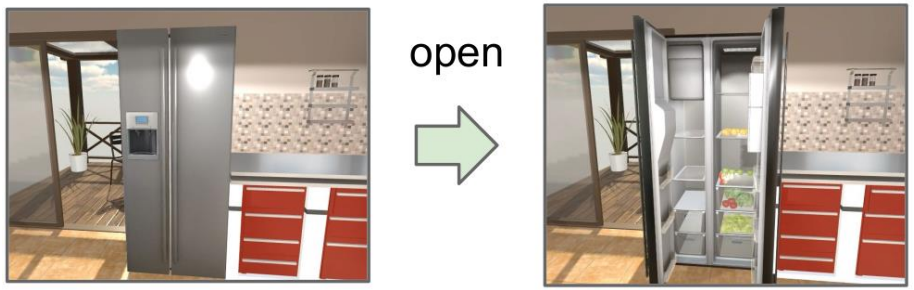
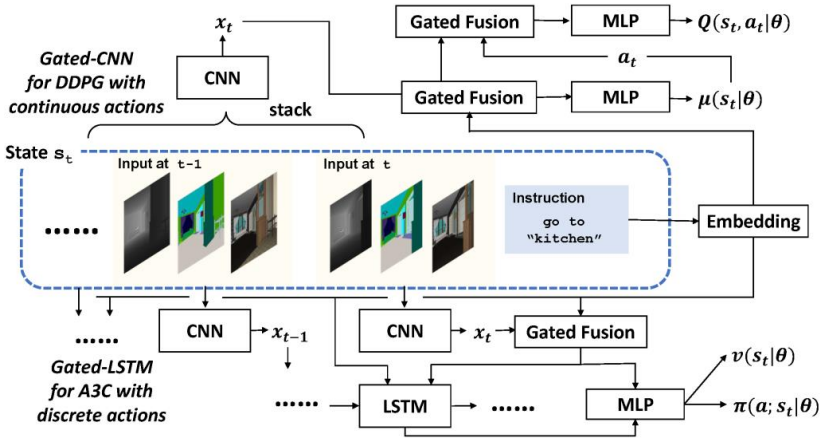
What's inside?

- Visual navigation algorithms
- Learning environments/scene databases
- Hardware
  - Cameras
  - Calculation units







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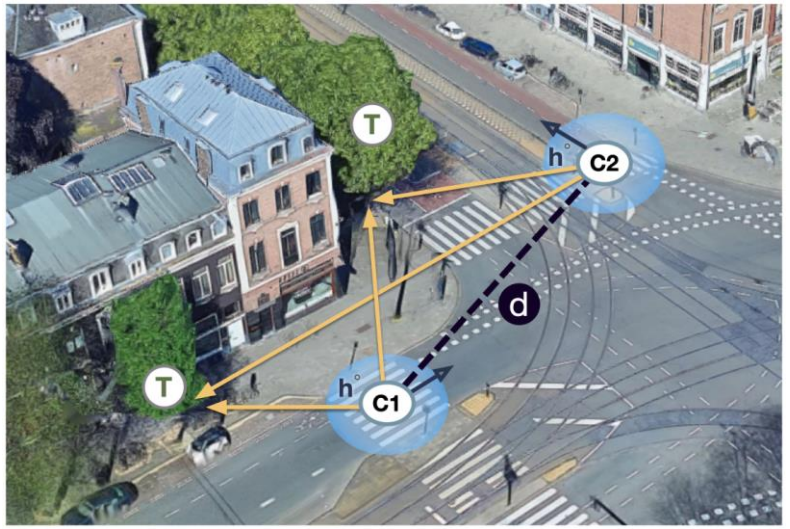
Visual navigation algorithms

- Presentation of the latest and the most effective algorithms:
  - Exploration algorithms
  - Obstacle detection algorithms
  - Comparison of performance



- Based on the articles published in 2020 – 2022
  - Mostly algorithms, which are supported with a github repository

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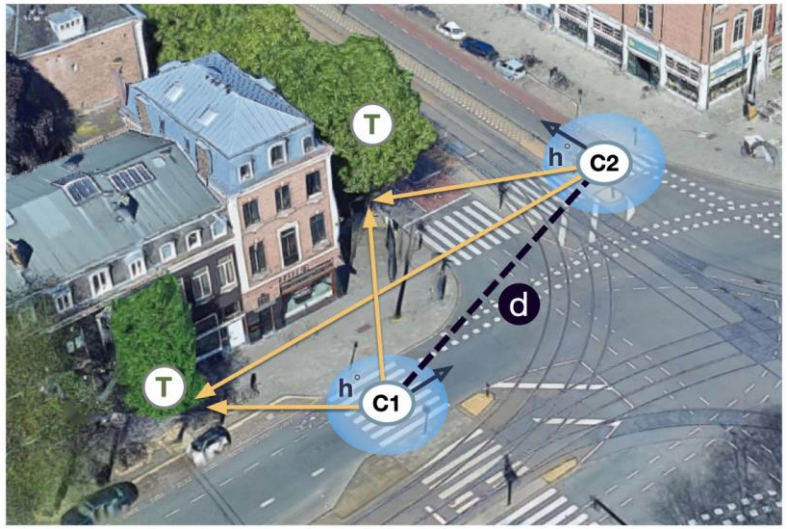

- Based on the articles published in 2020 – 2022
  - Mostly algorithms, which are supported with a github repository
    - Problem with the comparison

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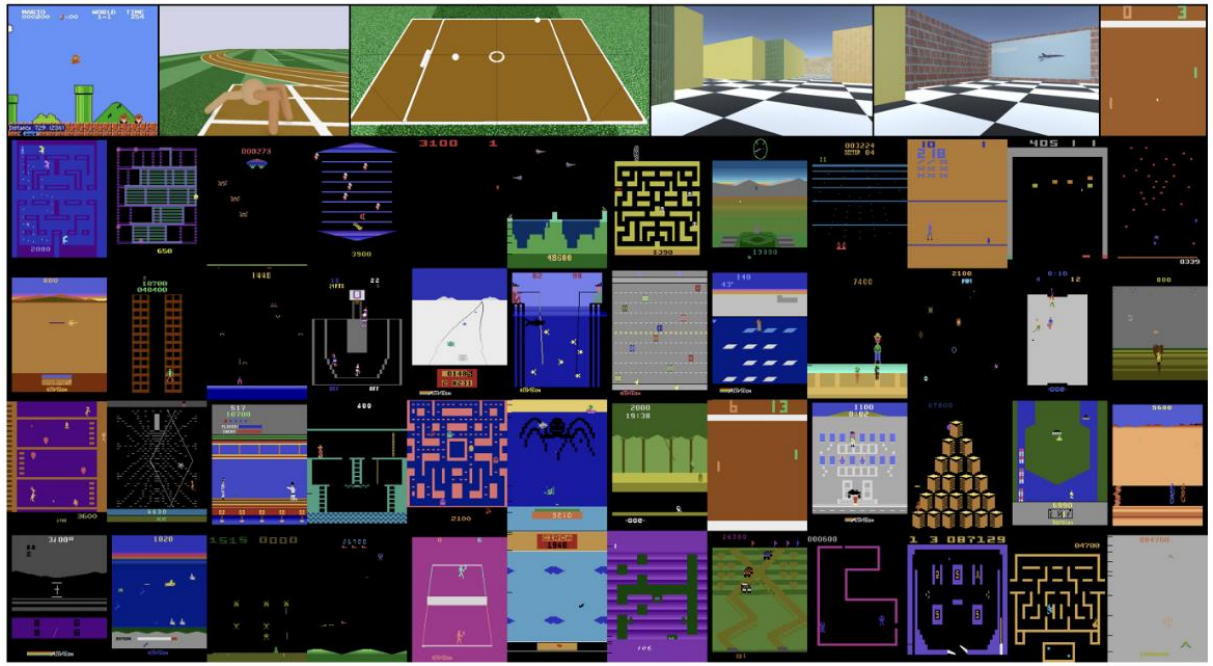
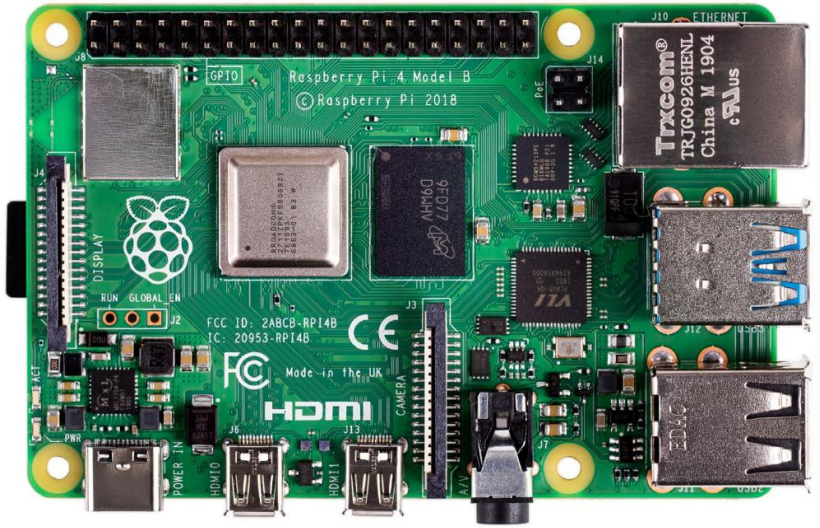
Learning environments

- The latest or the most widespread environments
- Section including quality and application
  - Virtual and real images
  - Indoor and outdoor
  - Simple and realistic texture
- The biggest section
  - Useful for developers
  - Performance comparison



Hardware

- Description of visual hardware and supporting sensors
- Short overview of single-board computers
- Overview of stereo camera sets with parameters
  - Description of software and compatibility



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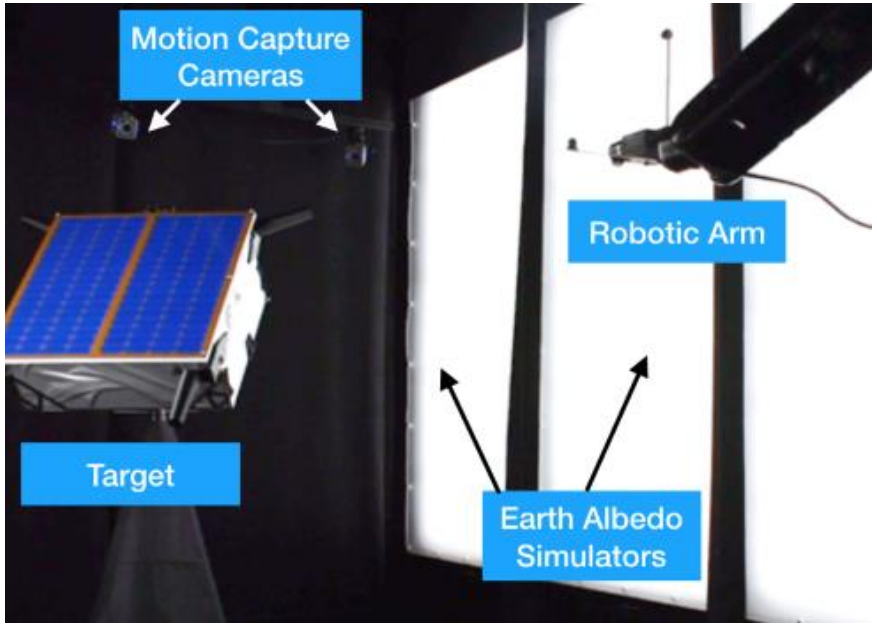
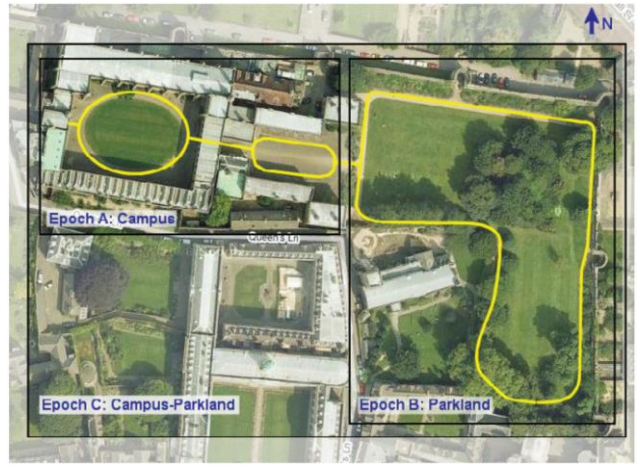
Benefits

- Companies
  - Free knowledge
  - Lower investment risks
  - Cost reduction
- University
  - New students
- Region
  - Innovation indicator

New direction

- Building vision system
  - Rover
  - Manipulator
- Creating a scene database for space applications
- New way of algorithms testing





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Conclusions

- Free, organized knowledge
- Money saving
- Attract investors
- New project
- Innovation indicators

Gazeta Lubuska
Sobota-niedziela, 23-24.04.2022

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POZAZIEMSKO I INNOWACYJNIE

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Thank you

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