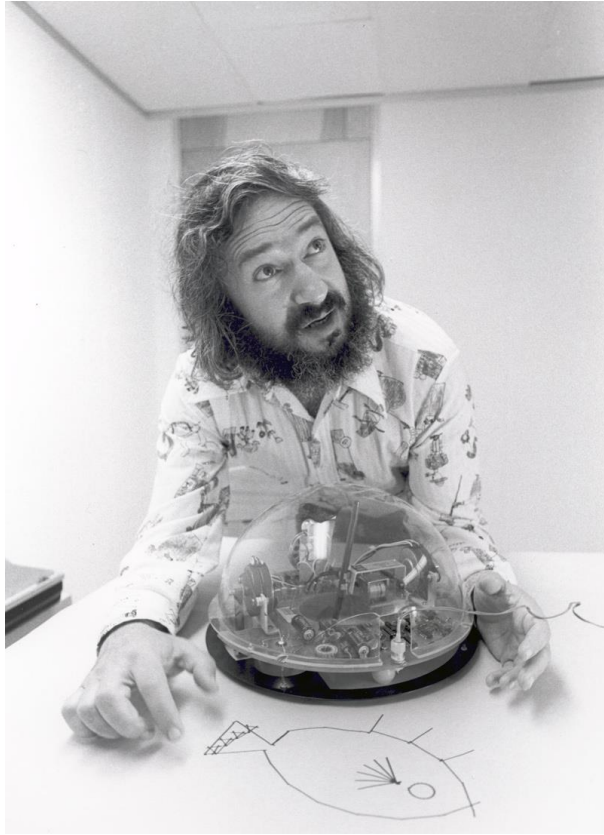


Miks õpetada informaatikat robotite peal?

Renno Raudmäe
2022

Miks õpetada informaatikat robotite peal?

- Ühendus füüsilise maailmaga
- Käelisi tegevusi tehes kinnistuvad asjad paremini ja pikemas ajaperioodiks
- See on lihtsalt äge!



“Better learning will not come from finding better ways for the teacher to instruct, but from giving the learner better opportunities to construct”
– **constructionism** –
Seymour Papert

MINDSTORMS Children, Computers, and Powerful Ideas

SEYMOUR PAPERT

Basic Books, Inc., Publishers / New York 1980

Miks õppida klaverit?



<https://www.findel-international.com/product/curricular/music/keyboards-and-pianos/digital-piano-with-bench-black/hc1656981>

Miks õppida klaverit?

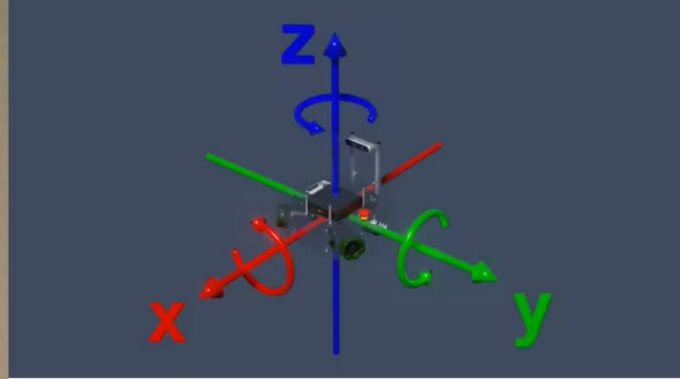
- Mitte ainult muusika
- Kahe ajupoolkera ja käte vaheline koostöö
- Matemaatika
- Abstraktne mõtlemine
- Peenmotoorika



<https://www.findel-international.com/product/curricular/music/keyboards-and-pianos/digital-piano-with-bench-black/hc1656981>

Hello World vs. Robot sõida

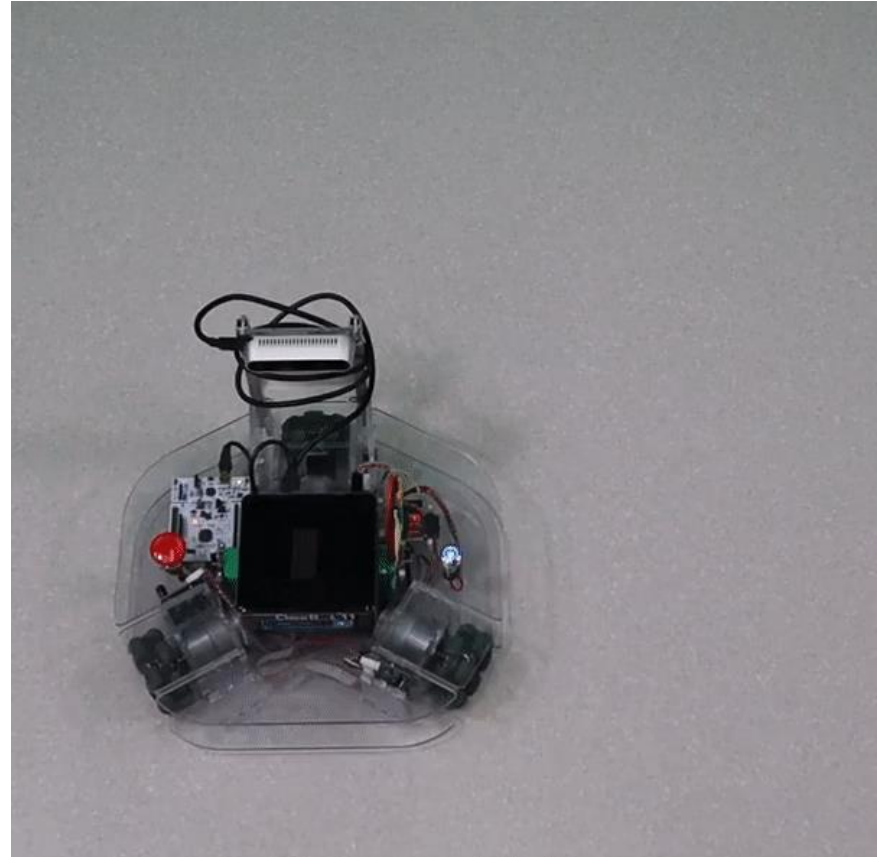
hello world



```
while not rospy.is_shutdown():  
    robot_vel = Twist()  
    robot_vel.linear.x = 0.0  
    robot_vel.linear.y = 0.1  
    robot_vel.linear.z = 0.0  
    robot_vel.angular.x = 0.0  
    robot_vel.angular.y = 0.0  
    robot_vel.angular.z = 0.0  
  
    velocity_pub.publish(robot_vel)  
    loop_rate.sleep()
```

Prindi 10x Hello world vs. Robot sõida ruutu

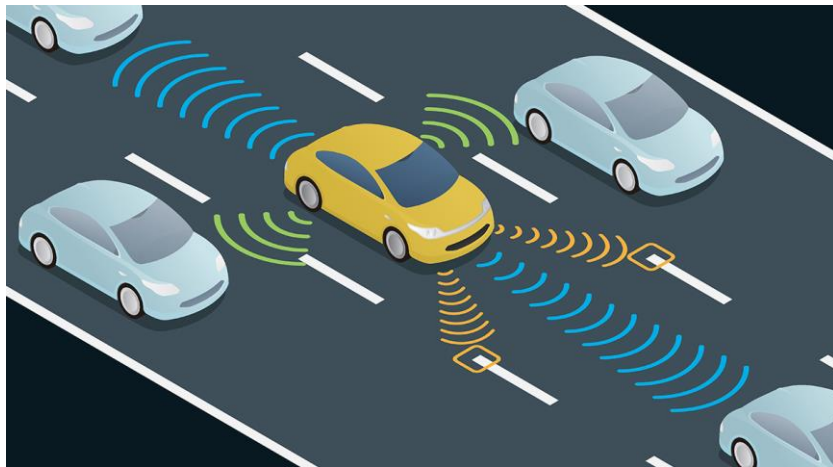
hello world
hello world
hello world
hello world
hello world
hello world
hello world
hello world
hello world
hello world
hello world



Informaatika ei ole ju ka ainult bitid ja baidid







Robotont







ROS



ROBOTONT

ROS



• Collaboration with  Open Robotics

Meie missioon

- Robootika haridus peaks olema ajakohane ja tulevikule orienteeritud
- Homne tehnoloogia peab olema õpetatud eile
- Me soovime
 - Populariseerida ja õpetada ROS-oskust nii ülikoolis kui gümnaasiumis
 - Pakkuda seadmeid kaasaegse robotika õppimiseks ja õpetamiseks

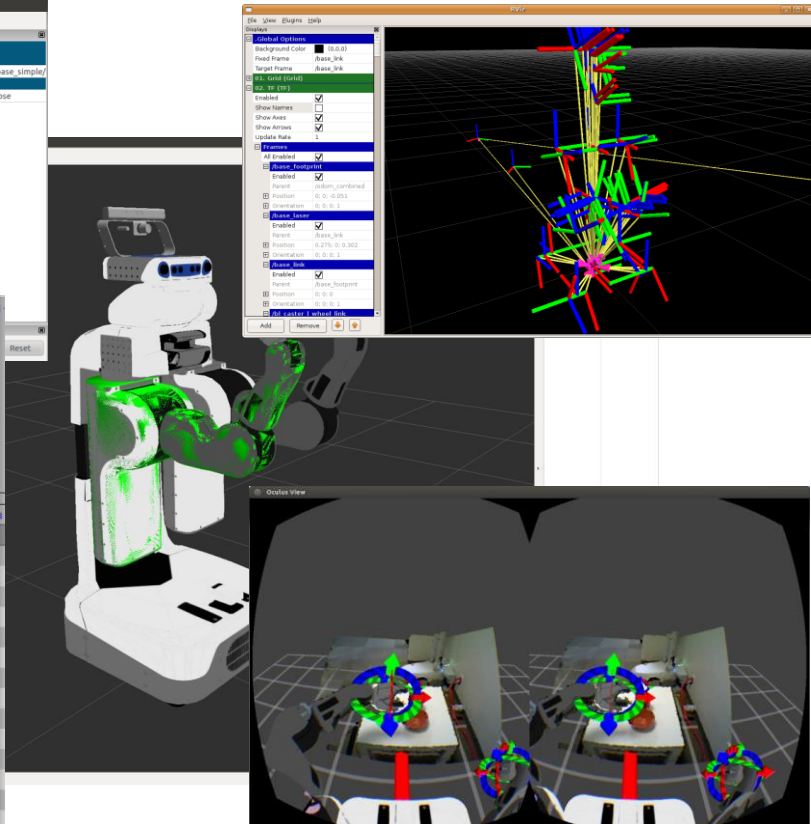
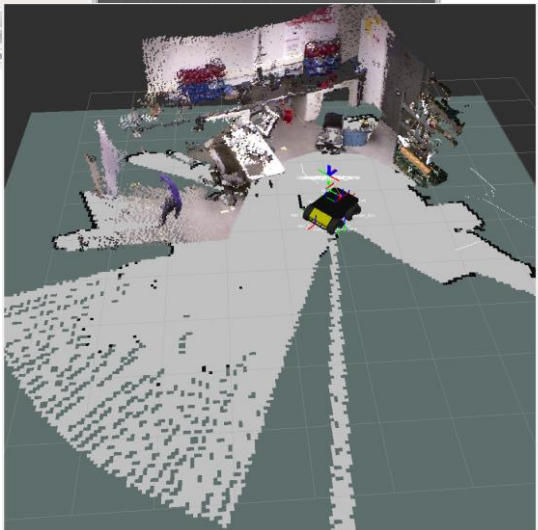
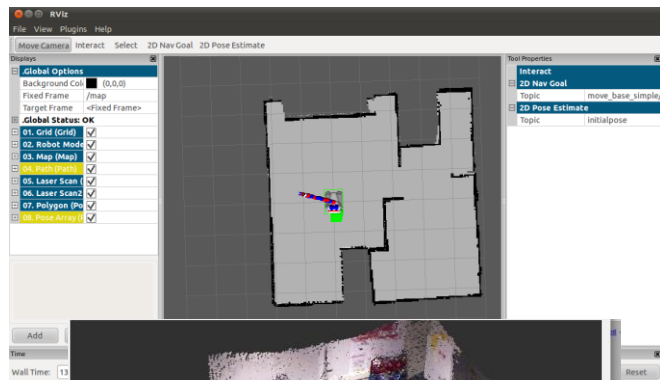
ROBOTONT



 ROS.org



Robot Operating System



RGB sügavuskaamera

Ubuntu Linux
Robot Operating System (ROS)

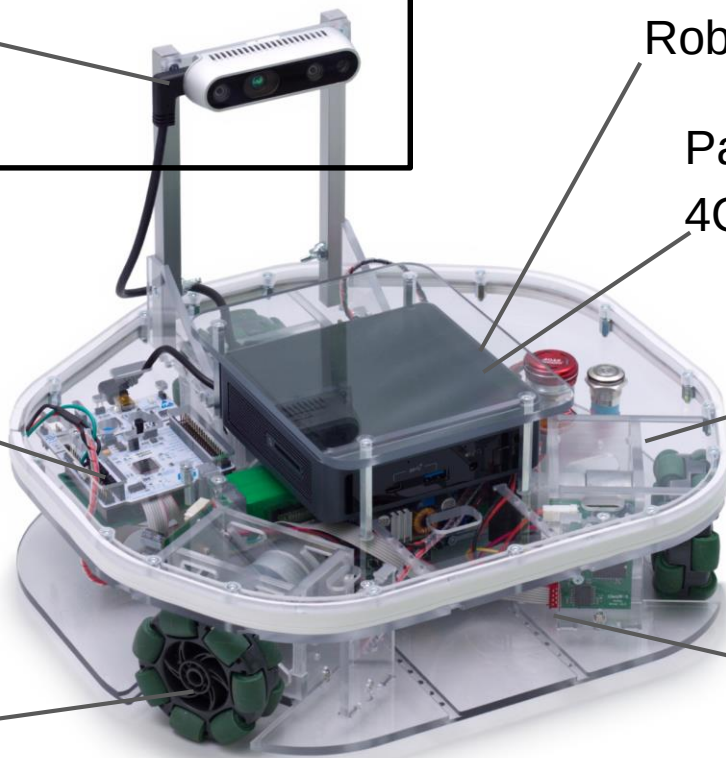
Pardaarvuti intel NUC i5
4GB RAM

Laiendatav riistvara

Läbipaistev ja
vastupidav kere

Topeltrullikutega
omnirattad

Modulaarne disain



RGB sügavuskaamera

Ubuntu Linux

Robot Operating System (ROS)

Pardaarvuti intel NUC i5

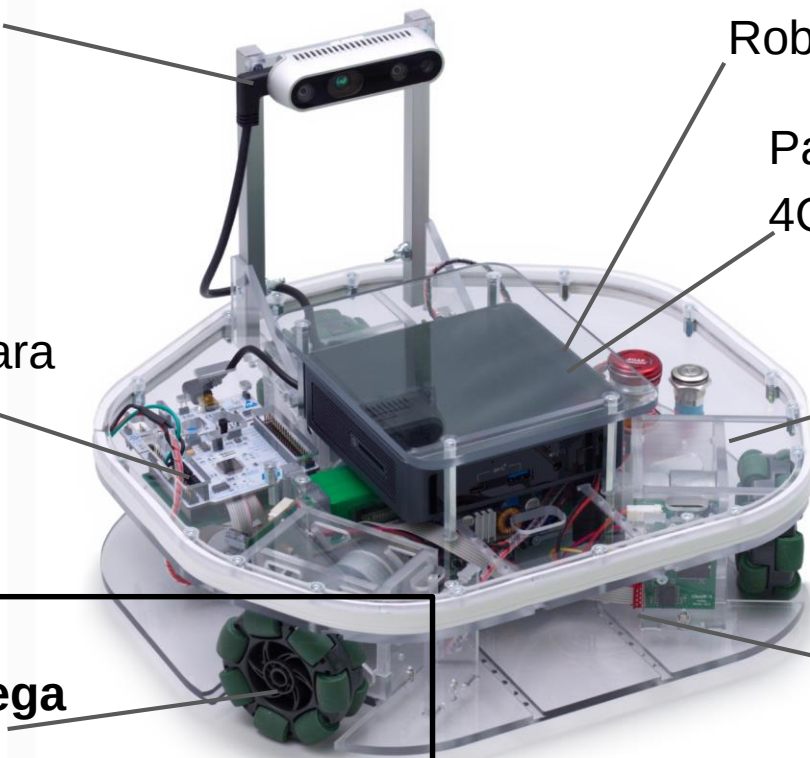
4GB RAM

Laiendatav riistvara

Läbipaistev ja
vastupidav kere

**Topeltrullikutega
omnirattad**

Modulaarne disain



RGB sügavuskaamera

Ubuntu Linux
Robot Operating System (ROS)

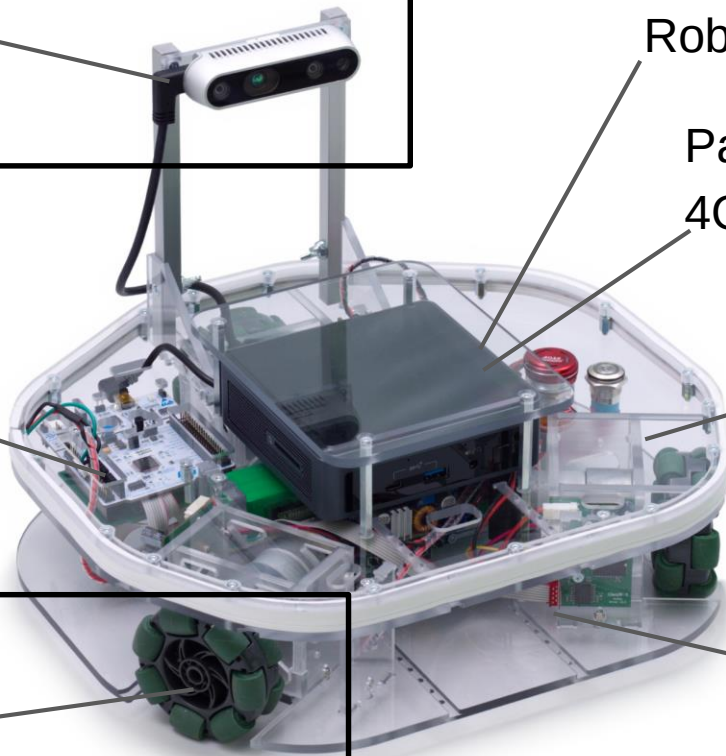
Pardaarvuti intel NUC i5
4GB RAM

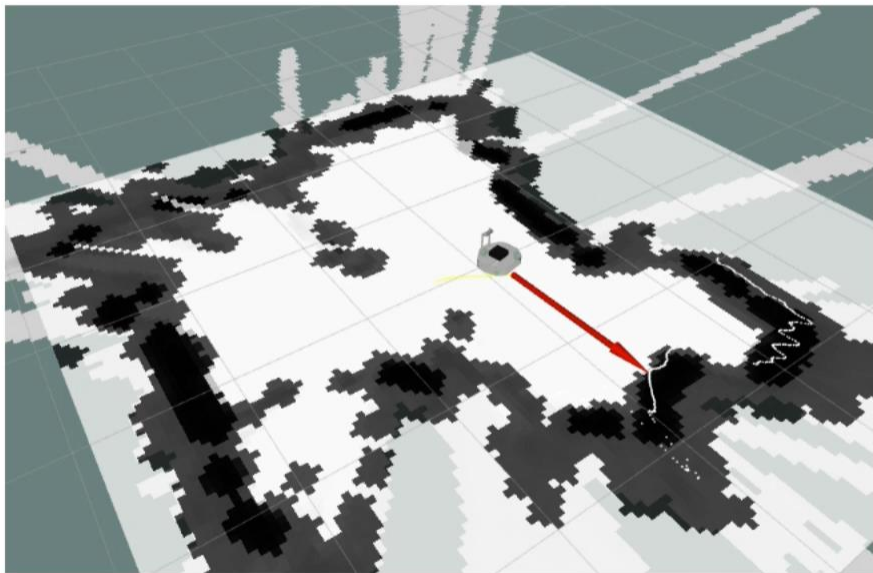
Laiendatav riistvara

Läbipaistev ja
vastupidav kere

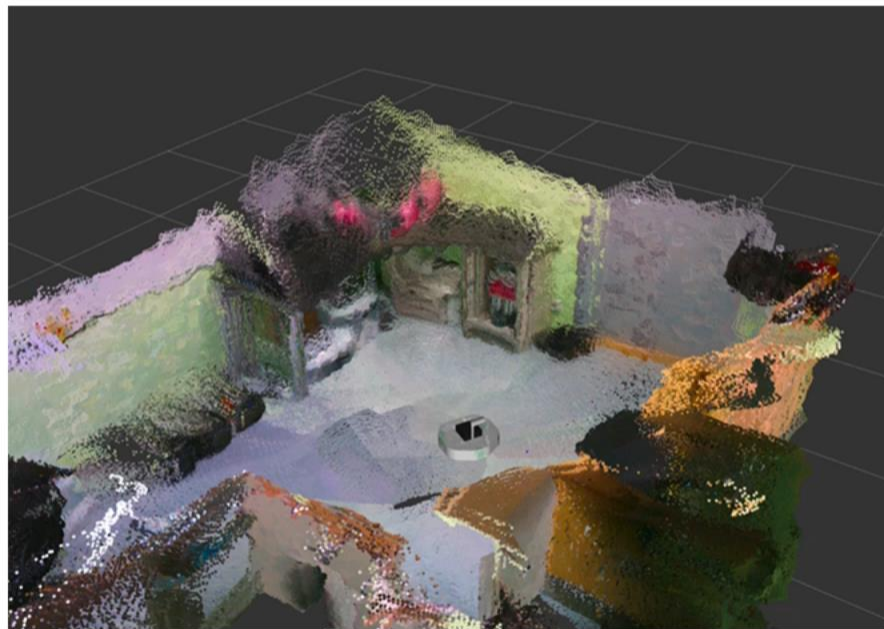
**Topeltrullikutega
omnirattad**

Modulaarne disain





2D kaardistamine



3D kaardistamine

RGB sügavuskaamera

Ubuntu Linux
Robot Operating System (ROS)

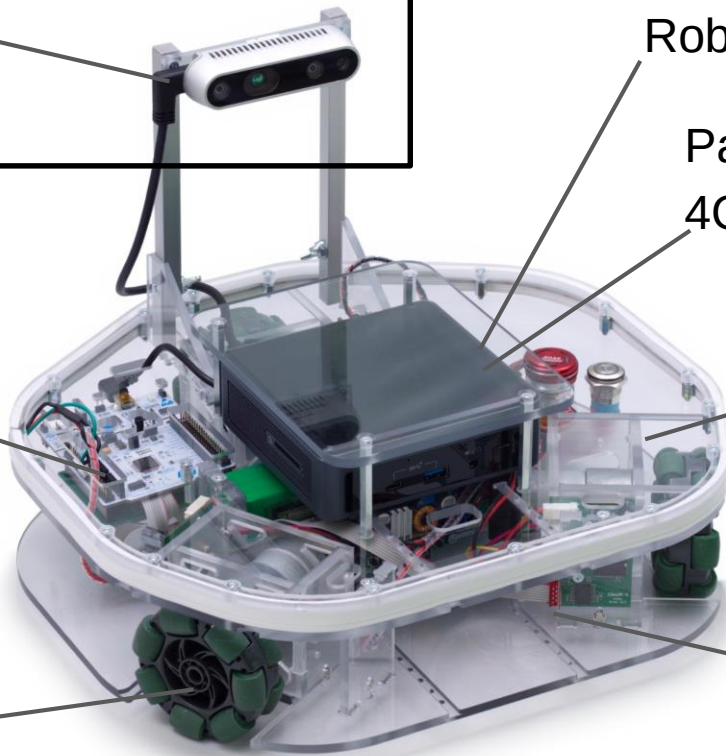
Pardaarvuti intel NUC i5
4GB RAM

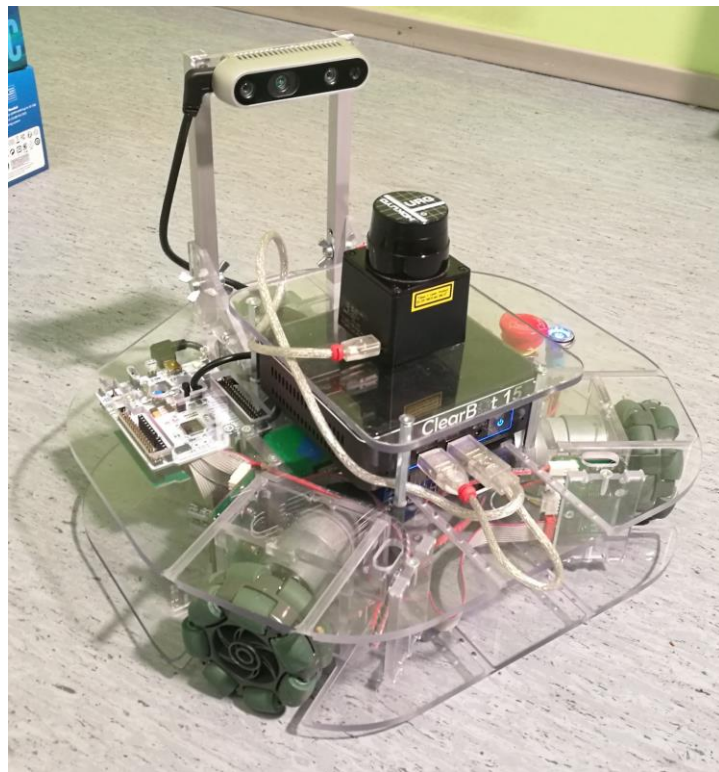
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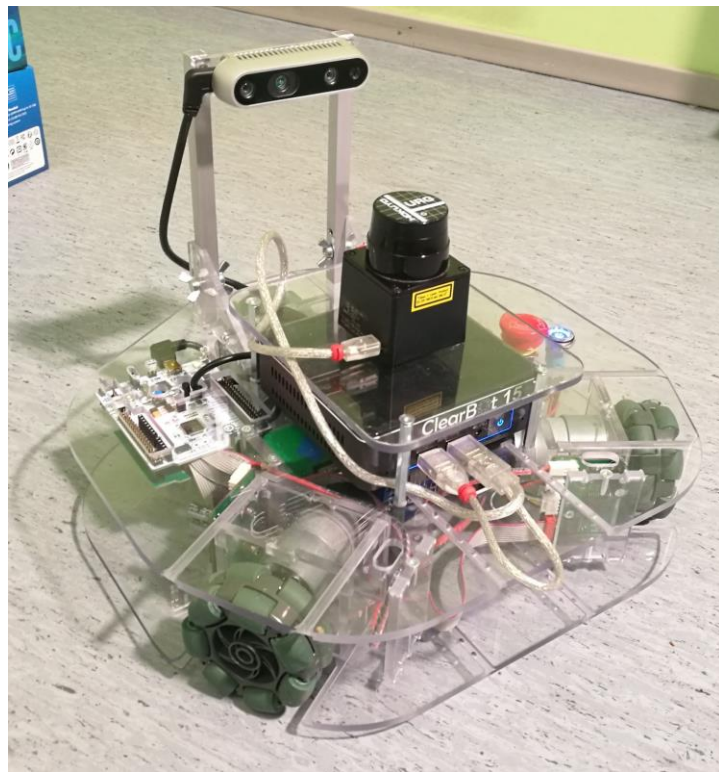
Läbipaistev ja
vastupidav kere

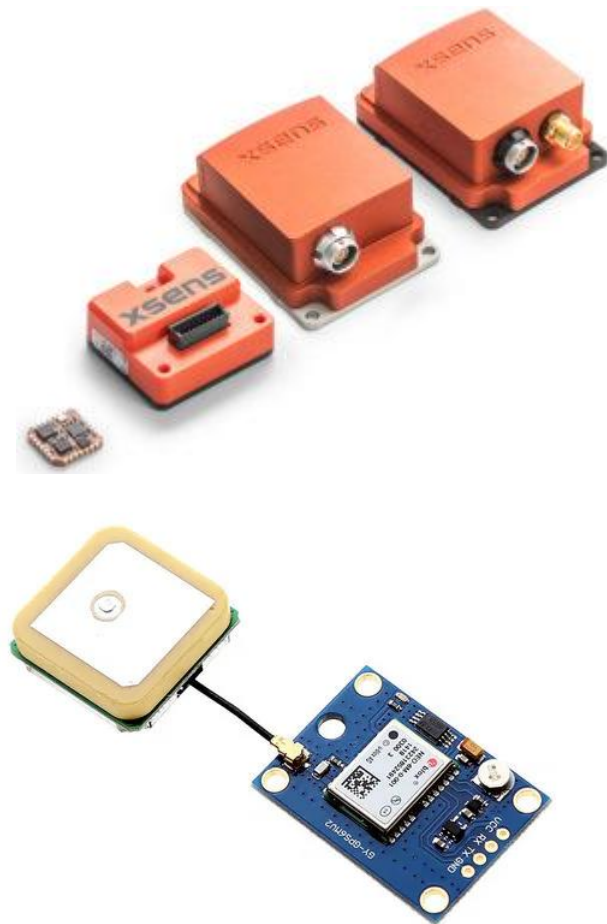
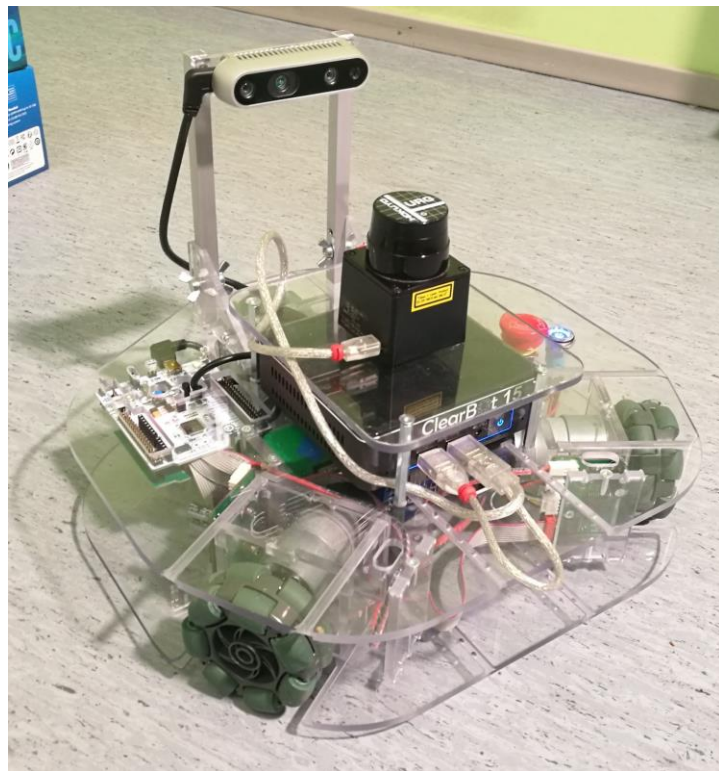
Topeltrullikutega
omnirattad

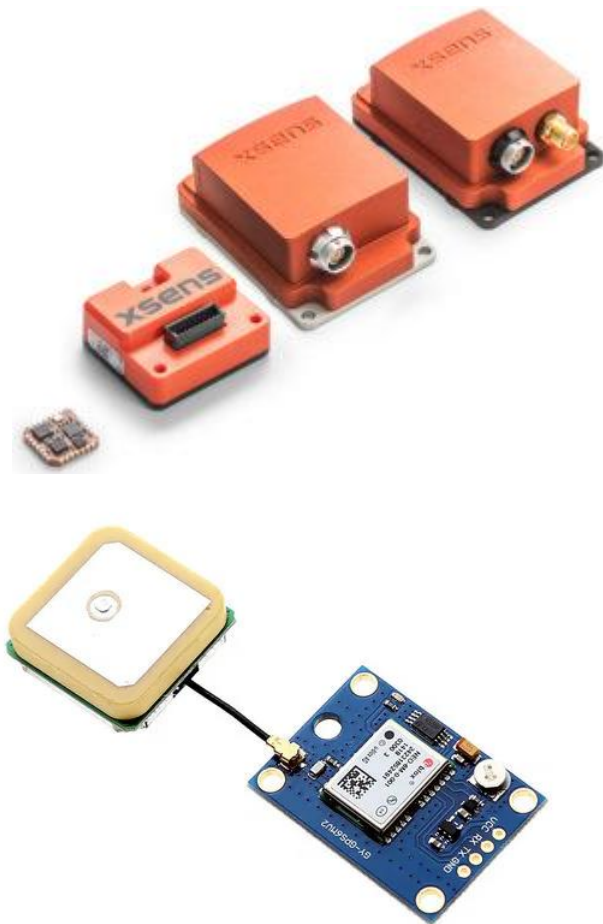
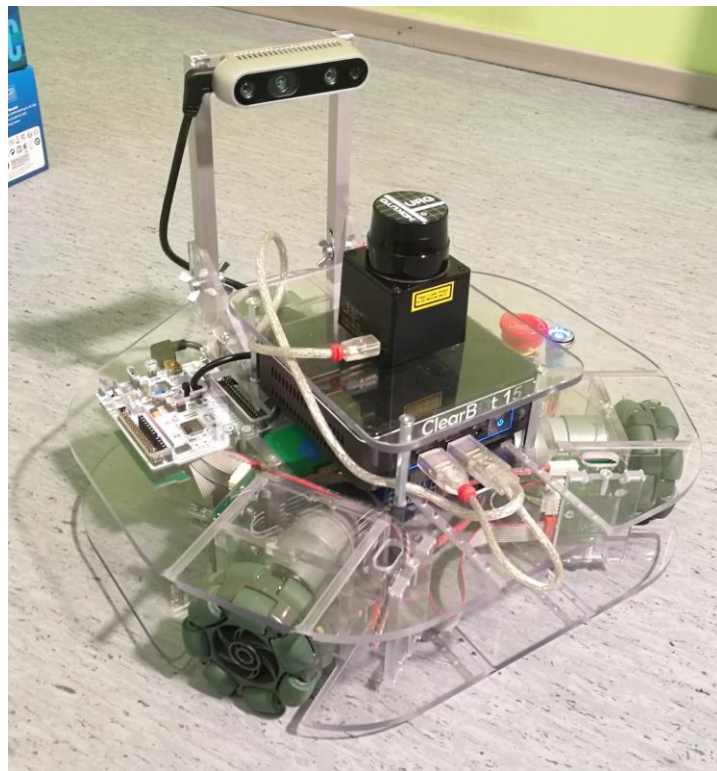
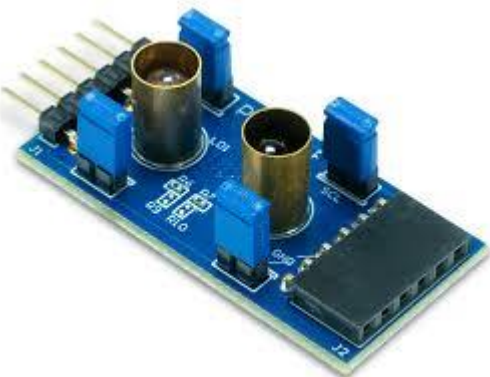
Modulaarne disain











RGB sügavuskaamera

Ubuntu Linux

Robot Operating System (ROS)

Pardaarvuti intel NUC i5

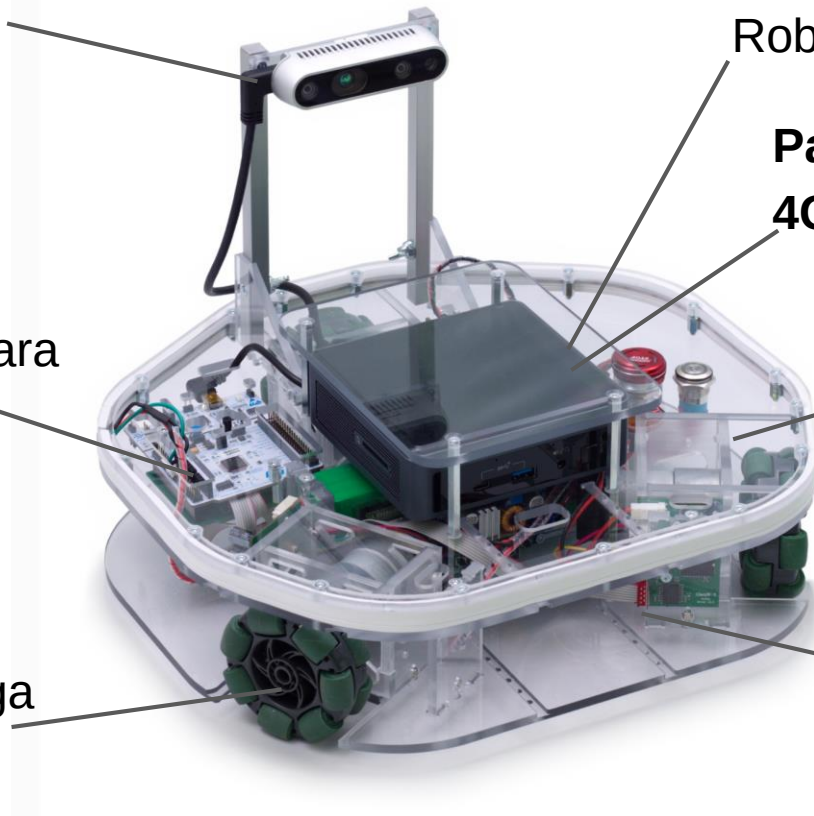
4GB RAM

Laiendatav riistvara

Läbipaistev ja
vastupidav kere

Topeltrullikutega
omnirattad

Modulaarne disain



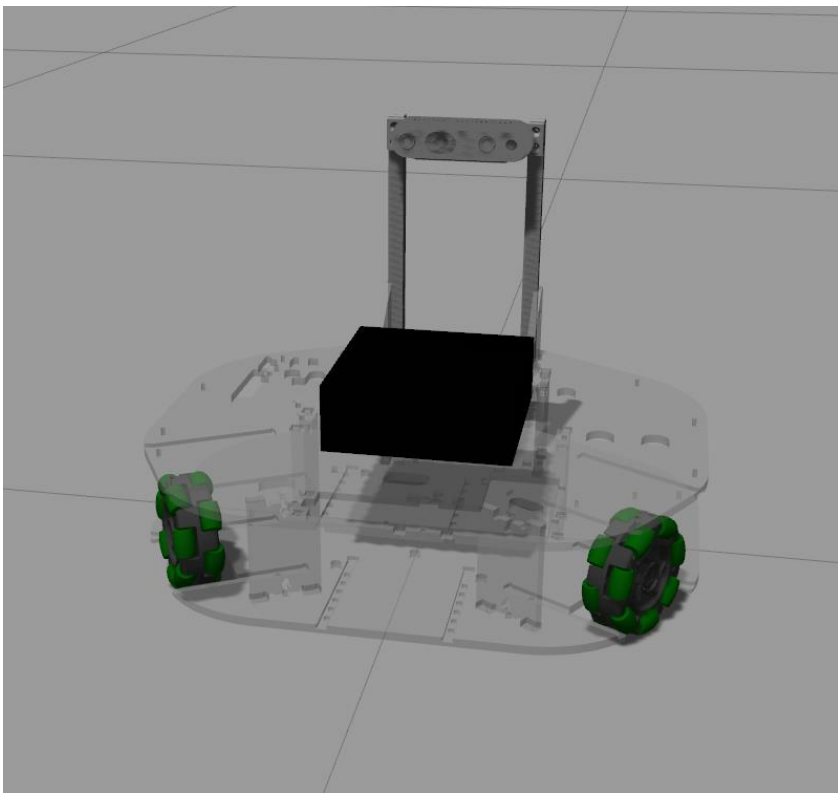
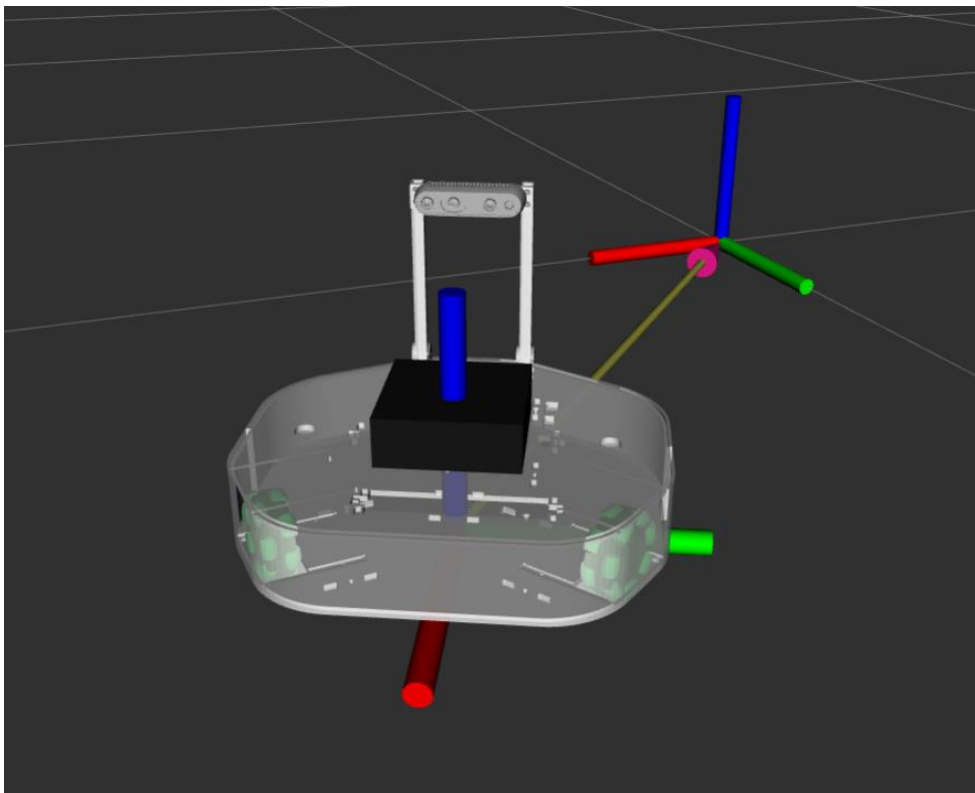


```
ont.py  
master may not be  
887) open VIDEOIO(V
```

```
ont.py  
887) open VIDEOIO(V
```

```
ont.py
```







TARTU ÜLIKOOL

robotont | avatud robotiplatvorm hariduses, teaduses ja tööstuses

robotont

Kastutusjuhendid

Õppematerjalid

Tehniline dokumentatsioon

Publikatsioonid

Õppematerjalid

ROS koolitus õpetajatele

Robotont generatsioon 2 praktikumi juhendid

Robotont Generatsioon 1 õppematerjalid

robotont.ut.ee

Meeskond



KARL KRUUSAMÄE, PhD



VEIKO VUNDER, PhD



ALVO AABLOO, PhD



RENNO RAUDMÄE, MSc

ROBOTONT



Rohkem infot

robotont.ut.ee

[robotont.github.io](https://github.com/robotont)



Kokkuvõtteks

- Programmeerimine robotitel on äge ja kinnistab õpitud paremini
- Oleme viinud ka läbi ühe eduka programmeerimise kursuse TÜ Narva Kolledžis
- **"LOTI.05.080 Robotite programmeerimine ROS vahenditega (3 EAP)"**

Sisu

1. Linux, käsurida ja roboti Robotont kasutamine
2. Roboti juhtimine, tsükkel, funktsioon
3. Roboti andurid, tingimuslause
4. Roboti asukoht, AR-siltide rakendusi
5. Robotiga 2D kaardistamine
6. Robotiga 3D kaardistamine
7. Robotite juhtimine, erinevad regulaatorid
8. Robotsimulatsioon