

How we can test a robot – home helper

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THEORY AND PRACTICE OF SOFTWARE TESTING
TAPOST 2018

The Ultimate Test Automation
19th International Conference



Daria Lashkevich

Testing experience - 9 years

ISTQB Test Manager Advanced level certificated

Was working as test manager in companies:

- Sitronics Telecom Solutions,
- Nvision Group,
- Sberbank-Technology

Present time:

- QA Team Lead/AI Engineer

in Innovation Core Team Accenture Latvia



Who is NAO?

Nao – anthropomorphic robot

Parameters:

Height 58 cm

Weight 4.3 kg

Sensors and pre-installed software:

2 cameras

4 microphones

Sonar

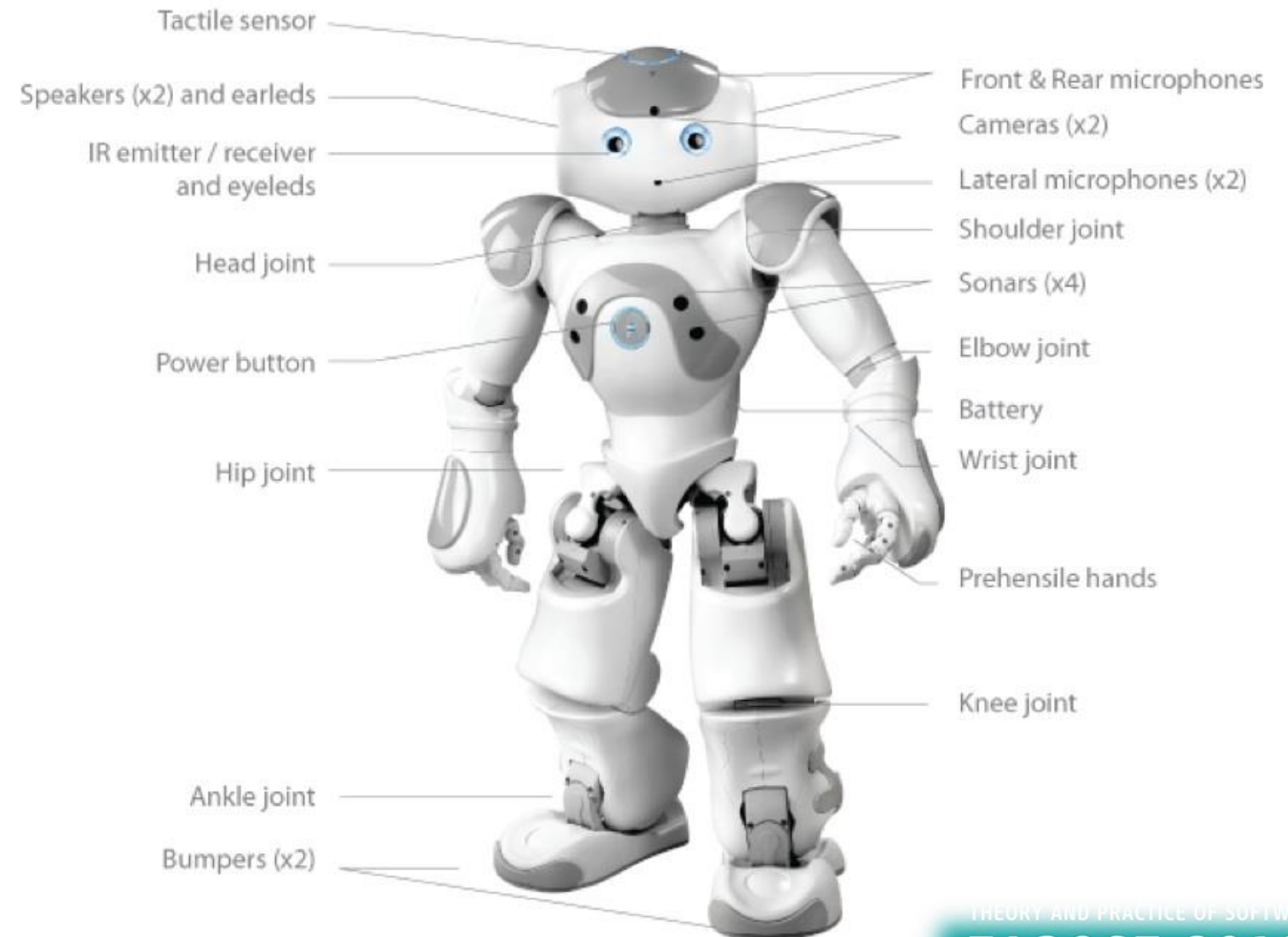
Vertical position saving

Speech recognizing

Face recognizing

Working time without charging:

Around 60 min



The target

To develop a robot – home helper, who can:

- Act based on trigger words
- Navigate in the room himself
- Pick up things from the floor
- Bring things to a person



How to test it?

➤ Unit testing:

Testing every module of code separately

System integration testing:

Full algorithm automation testing in a virtual world

System testing:

End-to-end process testing in the real world

Non-functional testing:

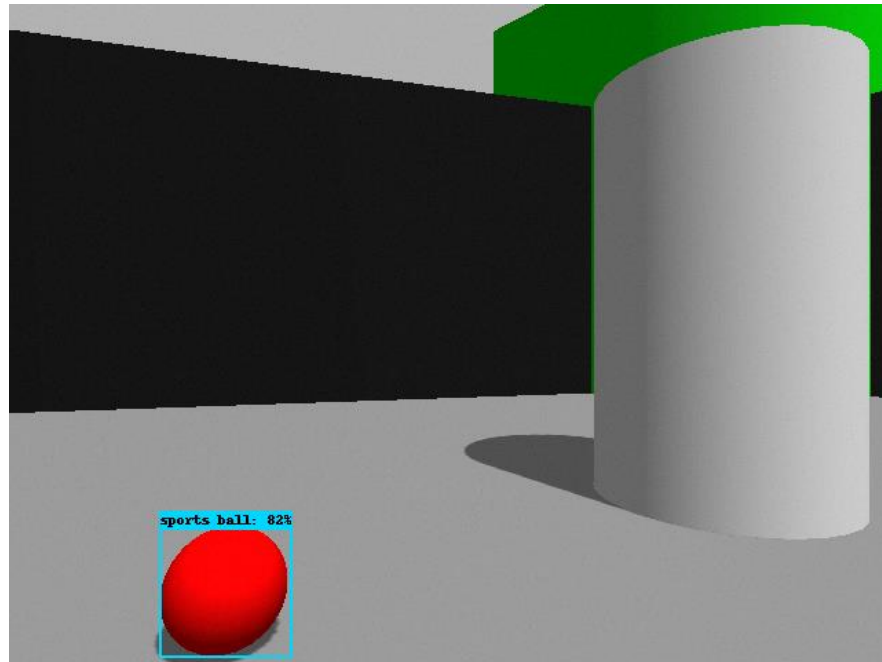
Performance, external noise



Testing of self-navigation in the room:

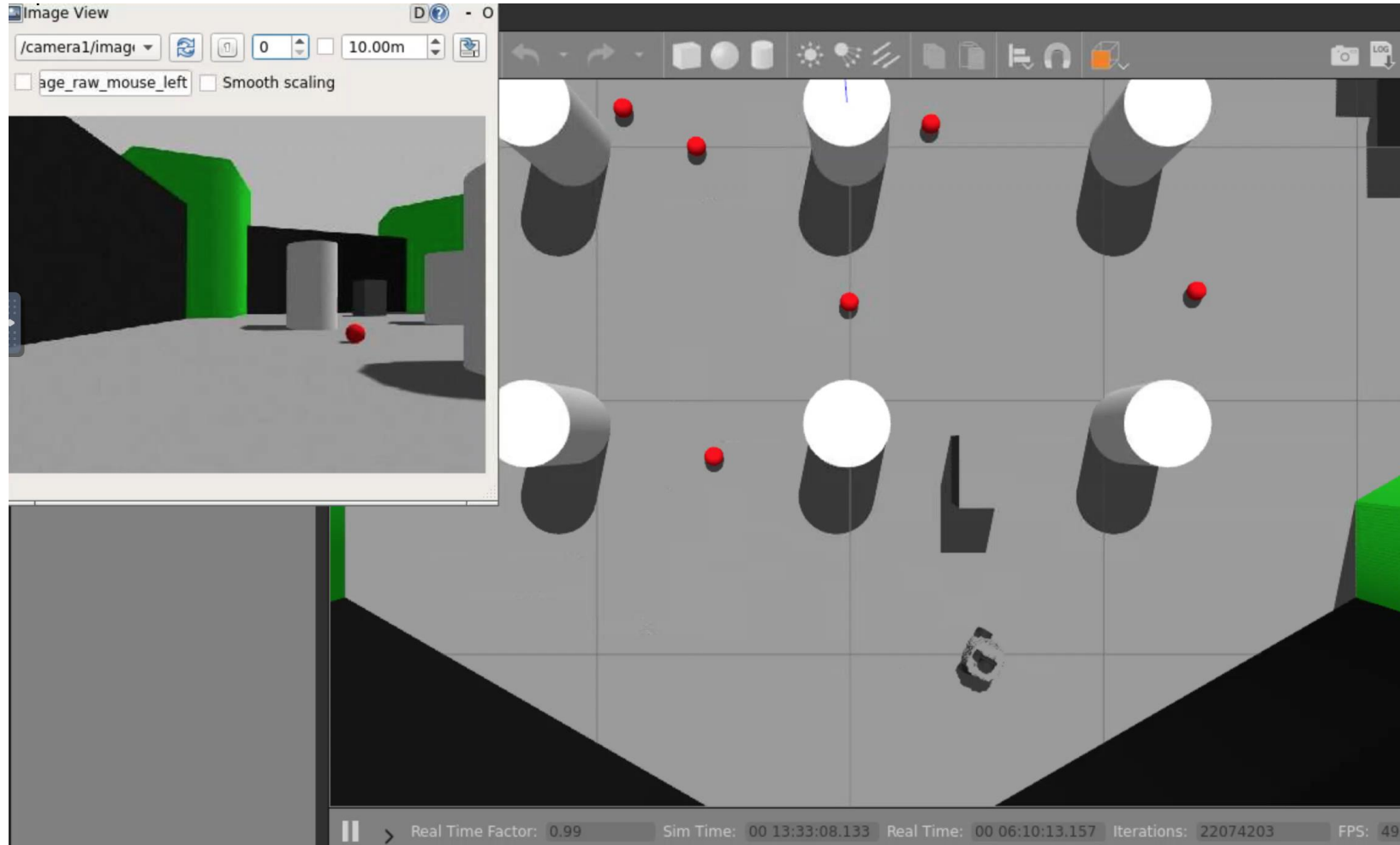
Problems:

- Virtual world is much simpler than a real world



Testing of self-navigation in the room:

Auto test approach: robot reinforcement learning



Testing of self-navigation in the room:

Problems:

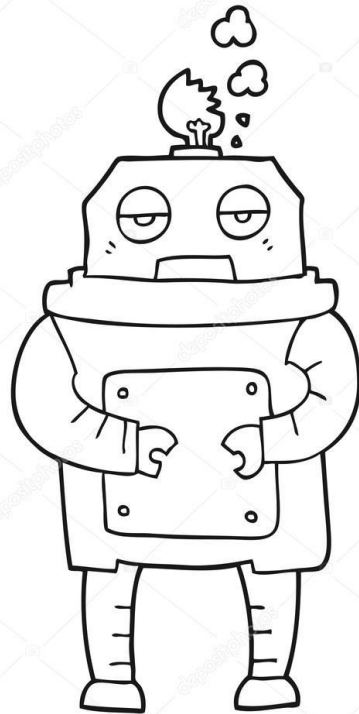
- Long distance – bad image quality



Testing of self-navigation in the room:

Problems:

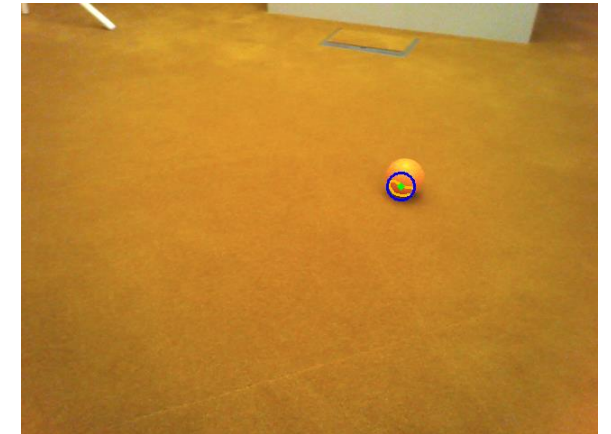
- Small capacity of Nao processor ([Intel Atom](#) @ 1.6 GHz)



Testing of self-navigation in the room:

Problems:

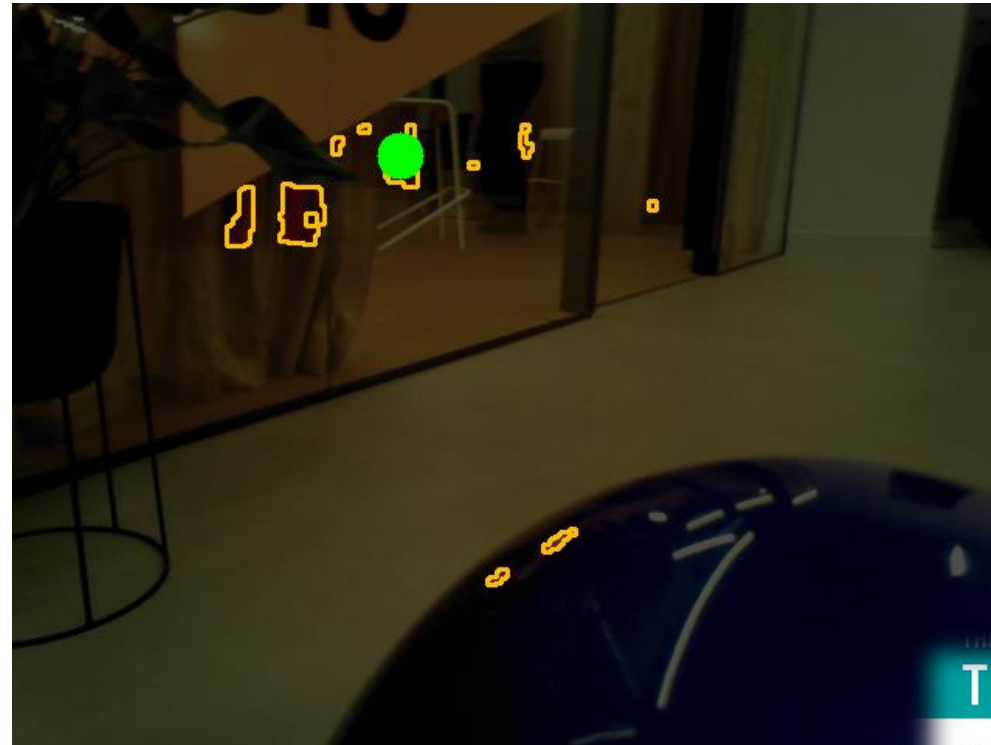
- “Invisible” orange ball on the floor which has the same color



Testing of self-navigation in the room:

Problems:

- Find a fake target



Testing of self-navigation in the room:

Problems:

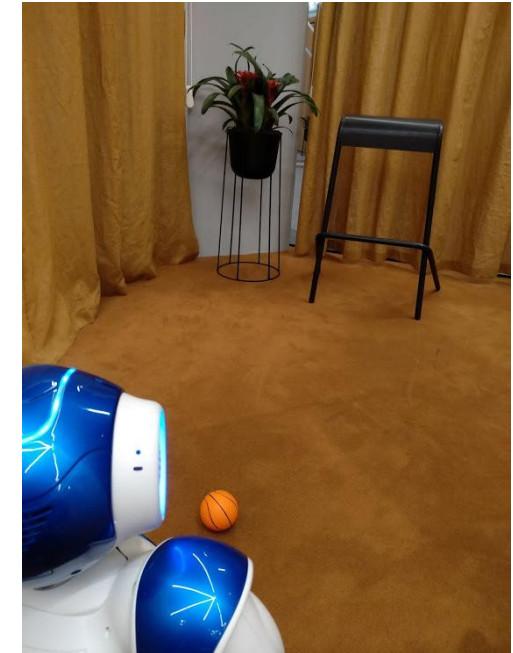
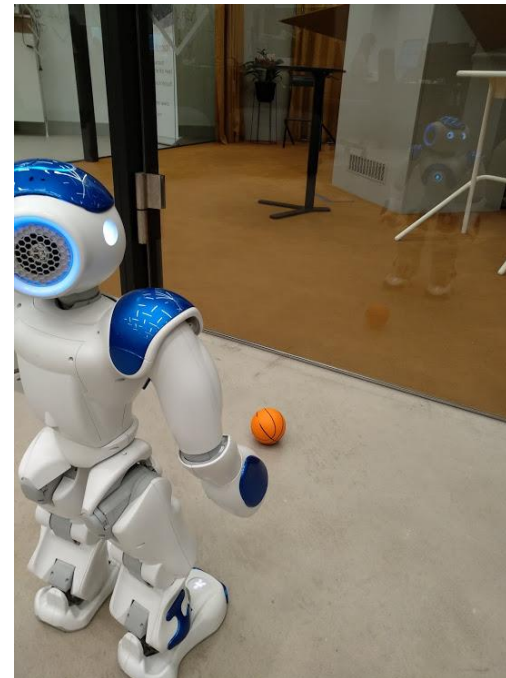
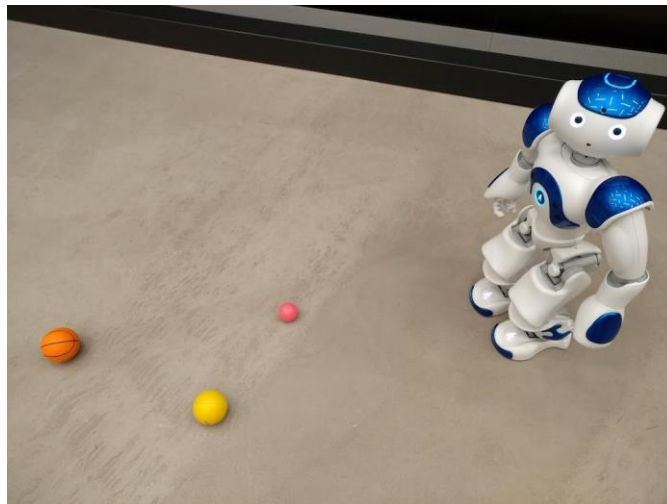
- A mirror reflection— it's an other world



Testing of self-navigation in the room:

Practical solutions:

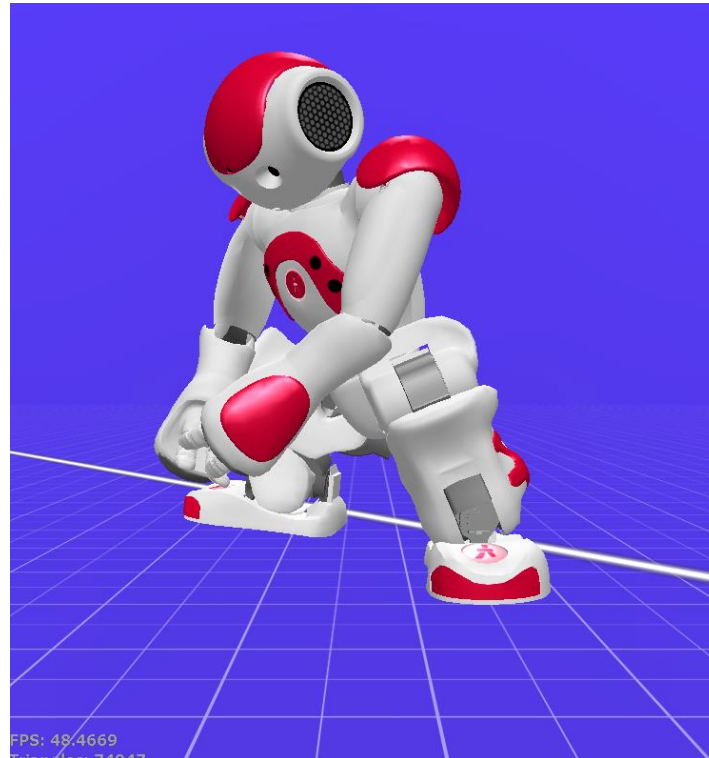
- Separate testing for every object type (round first)
- Mirror detection - detect an your twin
- Same color for ball and background - look for a shadow



Testing of things picking up:

Problems:

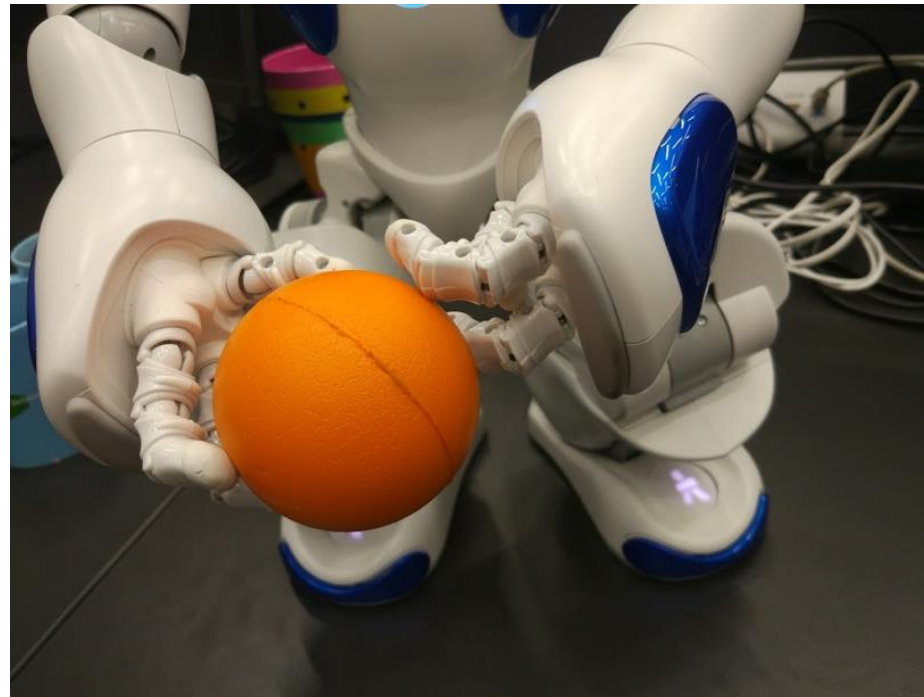
- Keeping balance in a virtual world - not a guarantee keeping balance in the real world



Testing of things picking up:

Problems:

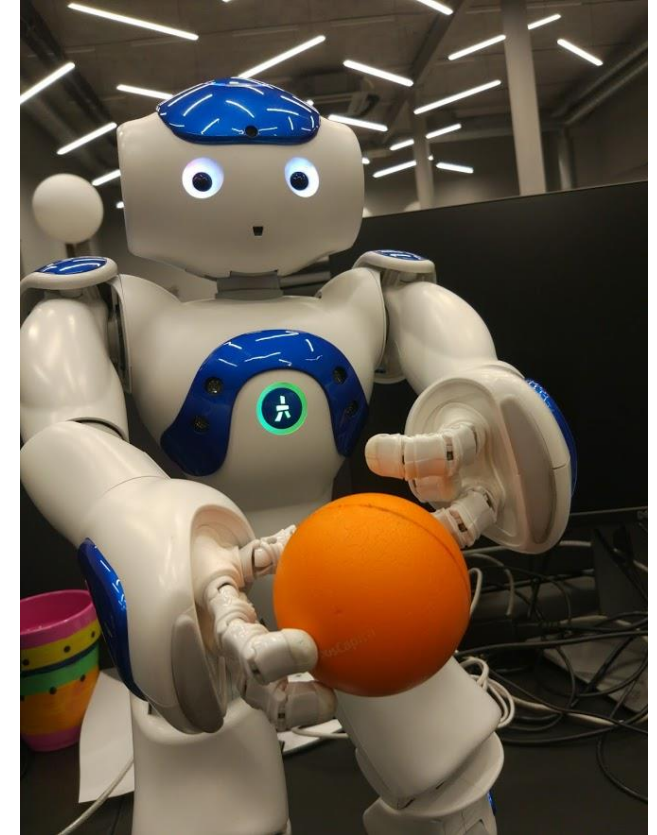
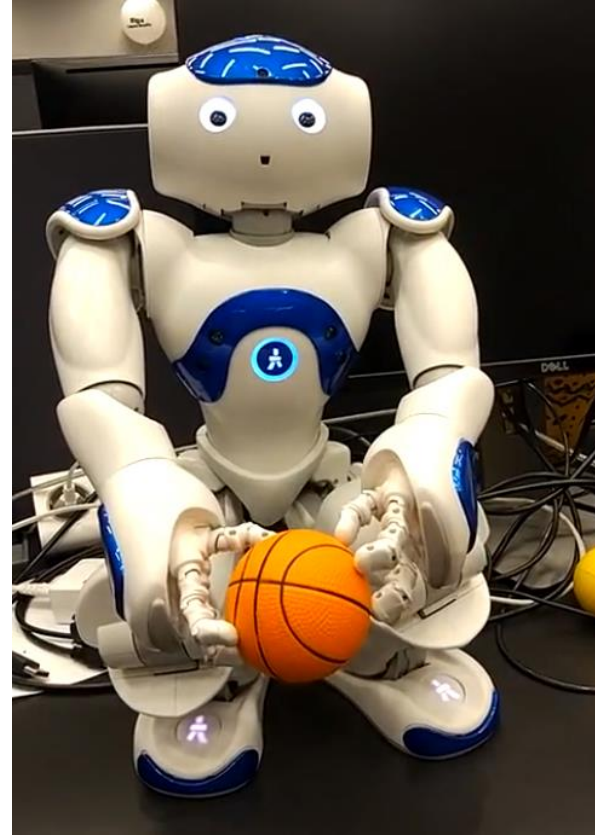
- How pick up an object – depends on mass and form



Testing of things picking up:

Problems:

- Keep the object – check it's position



Testing of things picking up:

Practical solutions:

- In the one hand a virtual world first, in the other hand – the real world
- Object assessment before picking up
- Object tracking after picking up
- Object position check

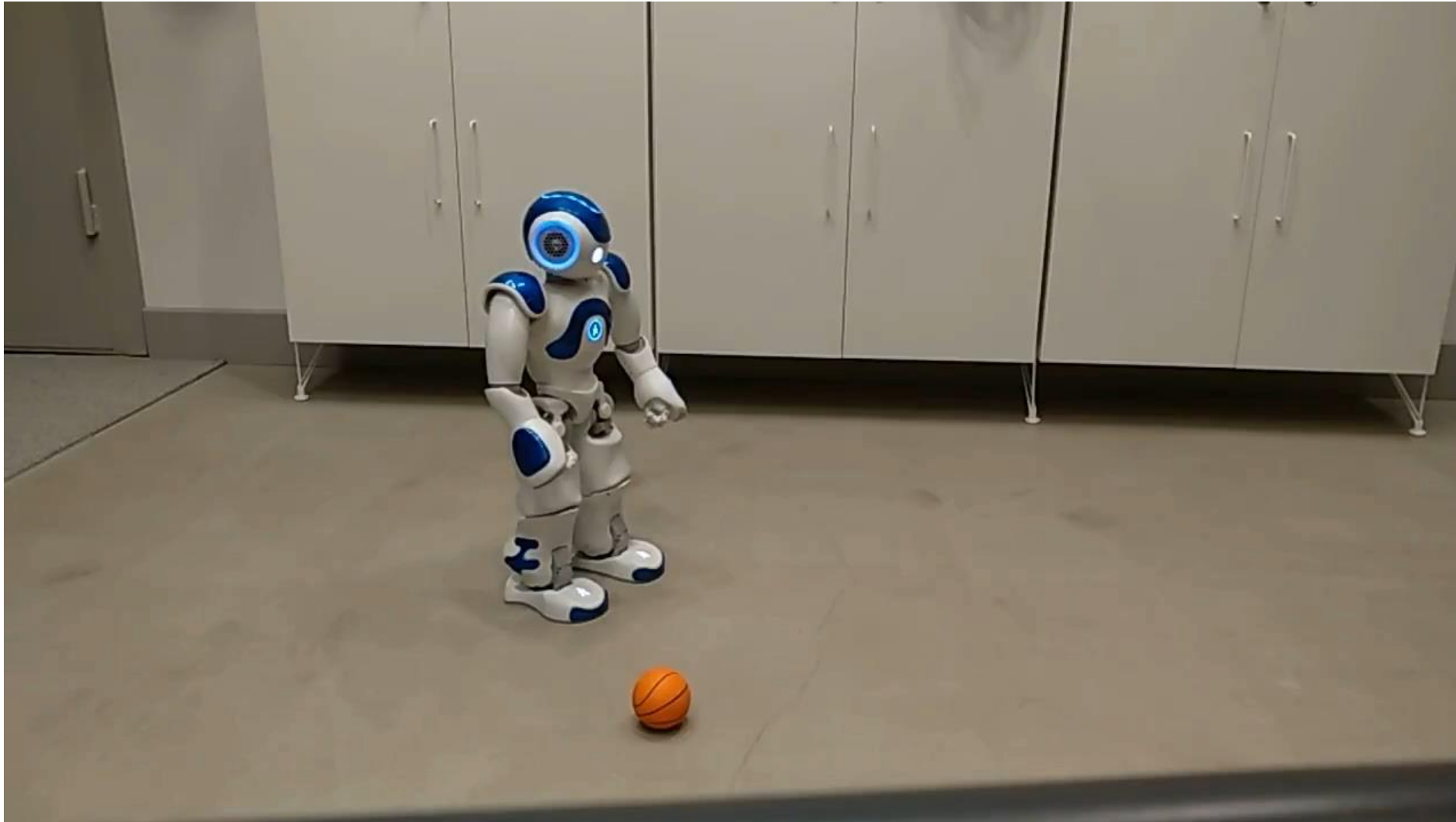


Lesson learned

- Split negative and positive test-cases
- Find a virtual world which so close to reality
- Knowledge transfer from virtual world to real world
 - it's the weakest place
- In some cases it's easier to test manually than using automation



Successful example



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Questions?

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