Accelerating progress in robotics through competitions

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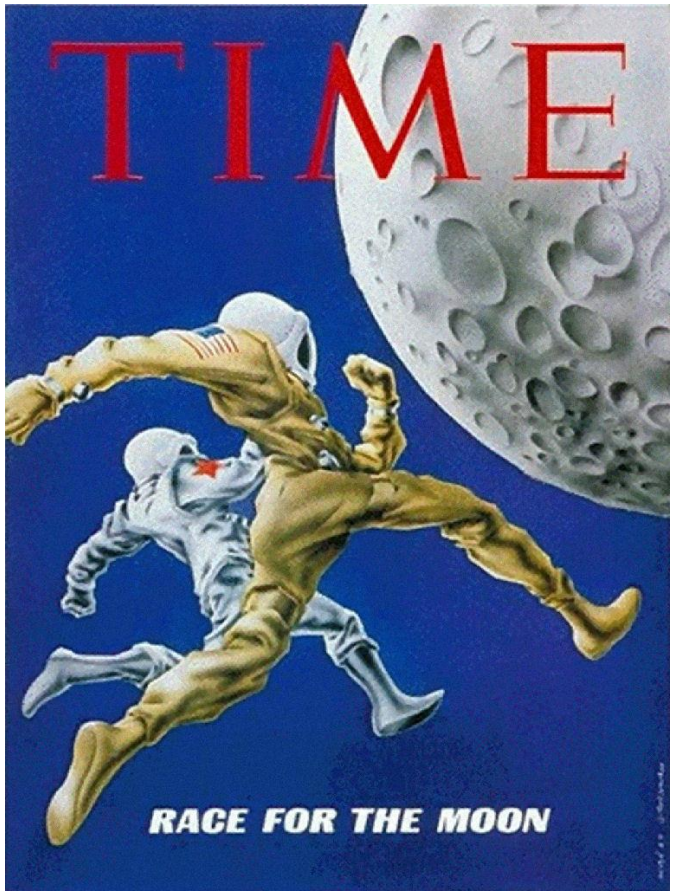
“by mid-21st century, a team of fully autonomous humanoid robot soccer players shall win the soccer game, comply with the official rule of the FIFA, against the winner of the most recent World Cup”

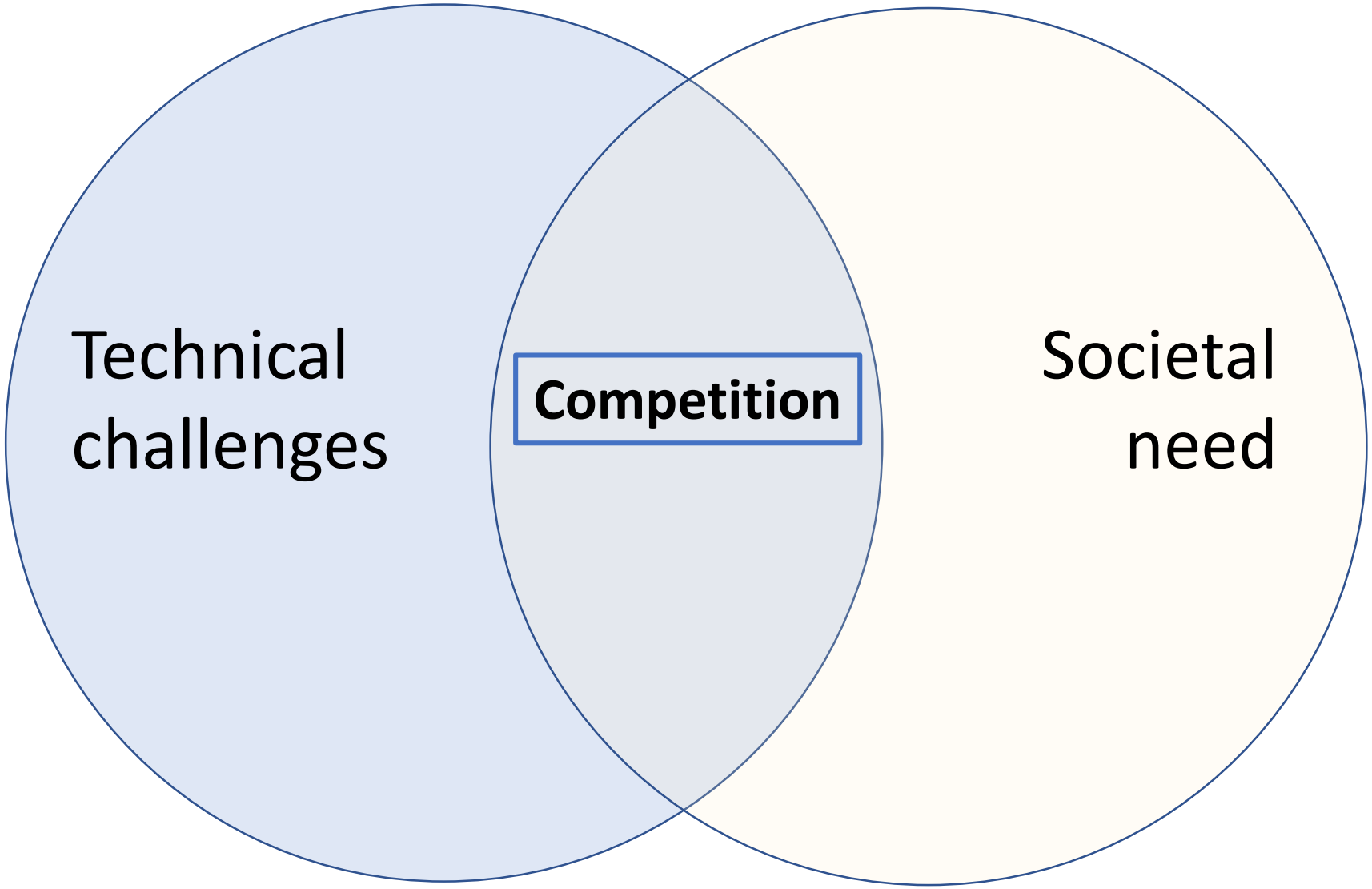
The Space Race (1960s)



The Channel Tunnel (late 1980s)

DARPA Grand Challenge 2005

Motivations for competitions

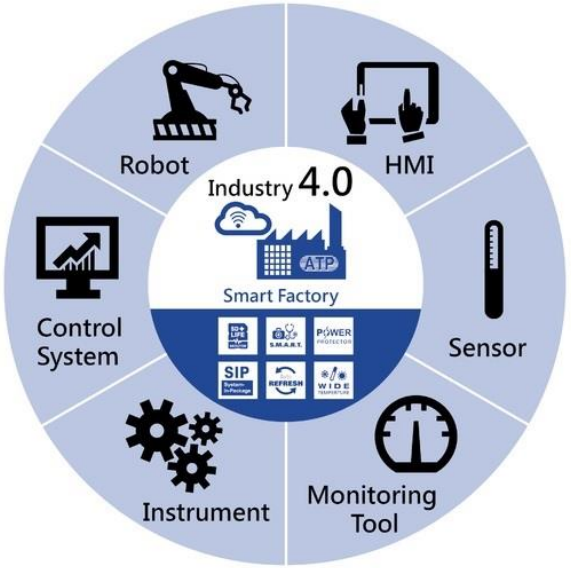


Some of the major obstacles

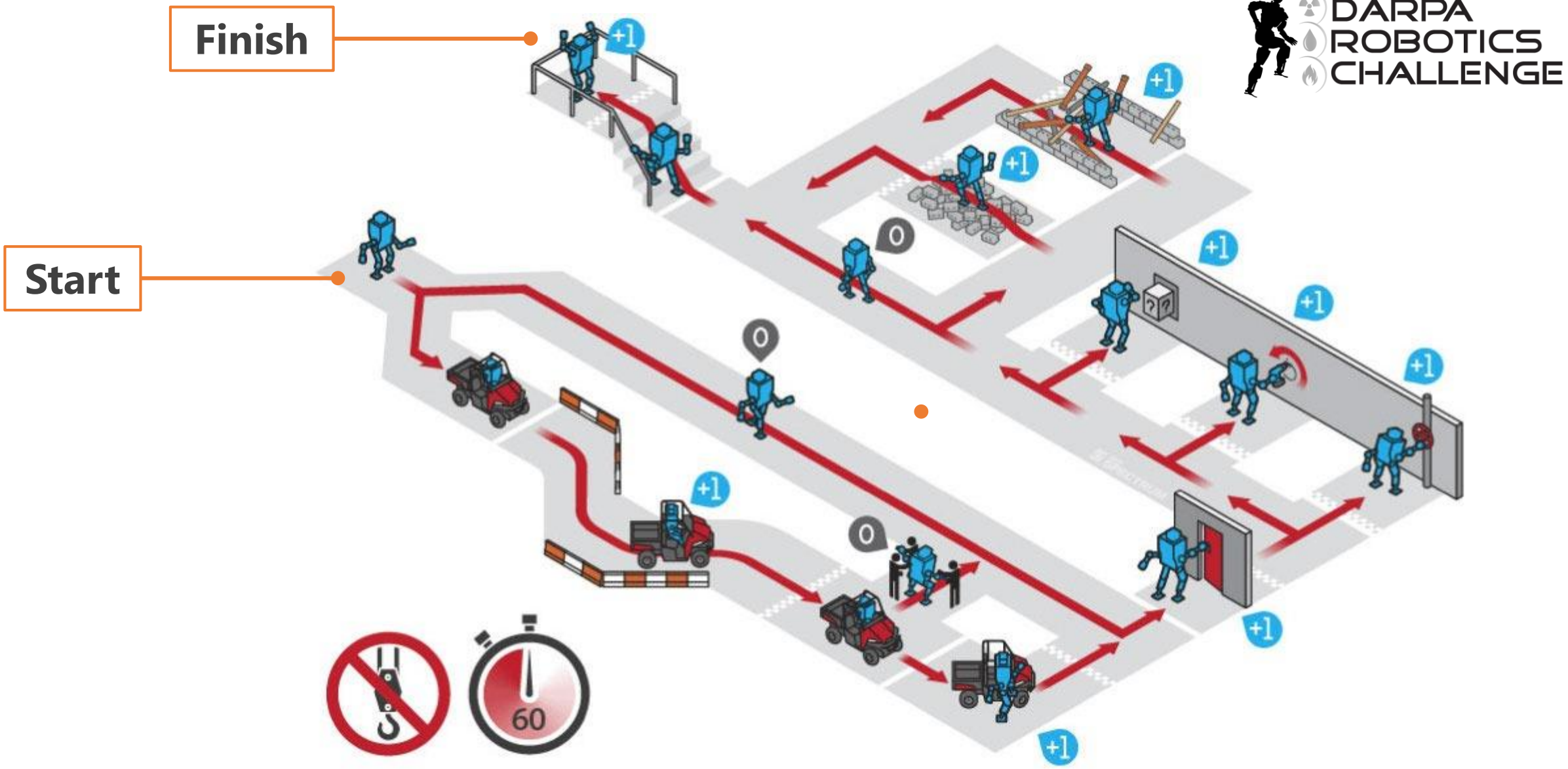
- Terrain adaptability.
- Manipulation.
- Environmental perception.
- Social interaction.
- Task planning.
- Semantic modelling.
- Safety.

We can do some of these things in isolation reasonably well, under controlled conditions. How to integrate, generalise and make robust to environmental changes remains a the central challenge.

What are some of the major drivers?

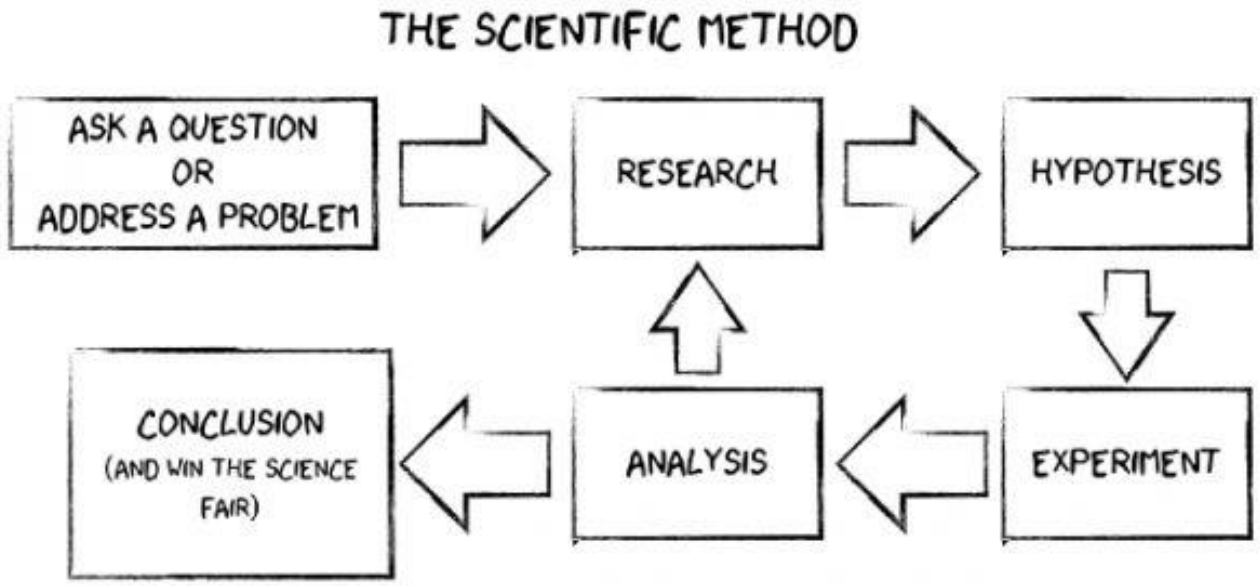


DARPA Robotics Challenge 2015



DARPA Robotics Challenge 2015

The Scientific method has limitations…



"You are completely free to carry out whatever research you want, so long as you come to these conclusions."

Competitions as Benchmarks

Benchmarks

Measuring the performance of a system or subsystem to solve a particular problem

Competitions

A more holistic approach measuring a system's overall ability.

	Experiments/Benchmarks	Competitions
Defined test environment	✓	✓
Performance metrics	✓	✓
Reproducibility	✓	
Repeatability	✓	

Software vs Robotics Competitions

Software competitions

- Less expense and effort
  - For organisers
  - For competitors
- Repeatability and Reproducibility
  - Everyone competes in identical simulation
  - High sample size, test ran many times

Robotics competitions

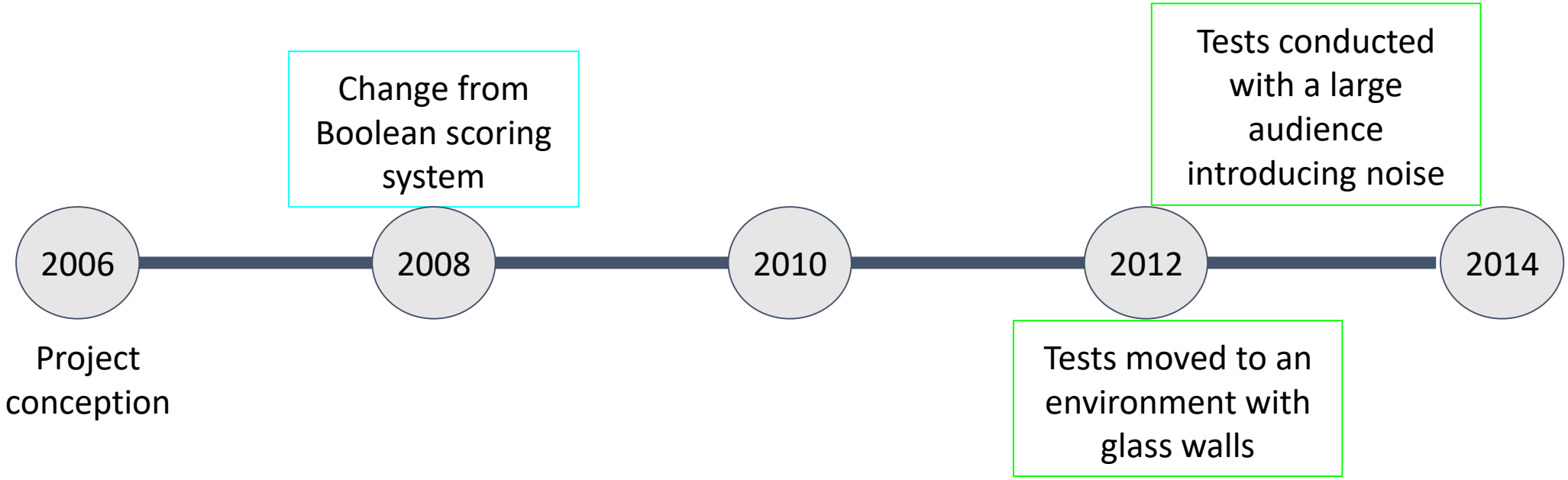
- Real world system and environment
- Holistic test
  - Tests integration
  - ad-hoc solutions less effective
- More attractive for the public and industry
  - Research and research group visibility
- Very difficult to reproduce
- Little attempt made to repeat

DARPA Robotics Challenge 2015

@Home Challenge

@Home Challenge

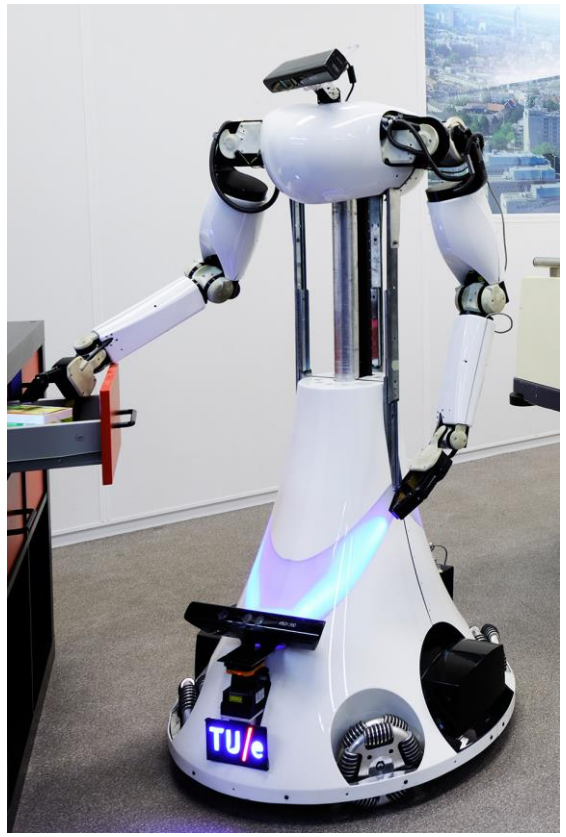
Evolution of RoboCup @Home



Follow Me	Followee chosen by teams and marked	Followee Unknown	Space Unknown	Predefined Interference	Crowded environment

Evolution of RoboCup @Home

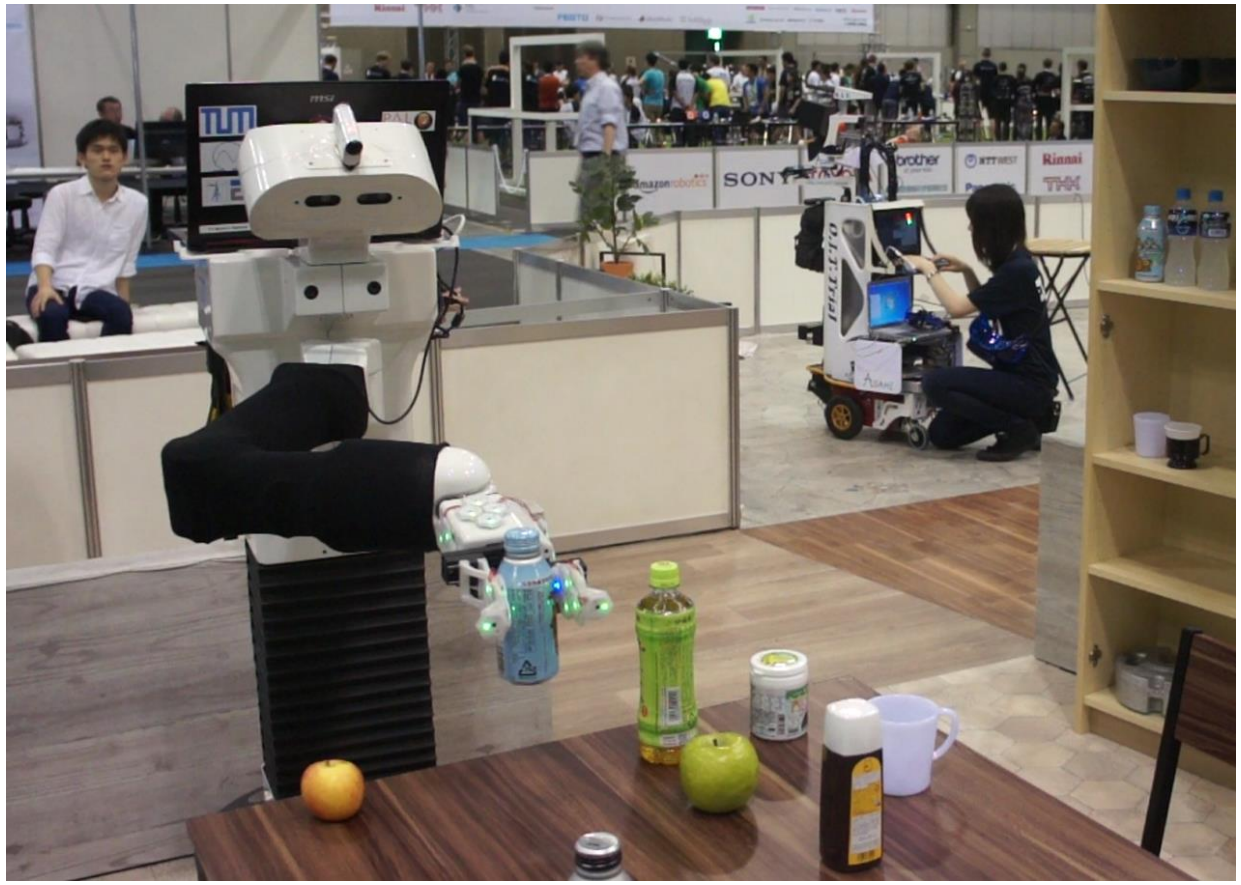
Standard Platform League



Open Platform League

@Home Challenge: Functional Benchmarks

1. Object Perception

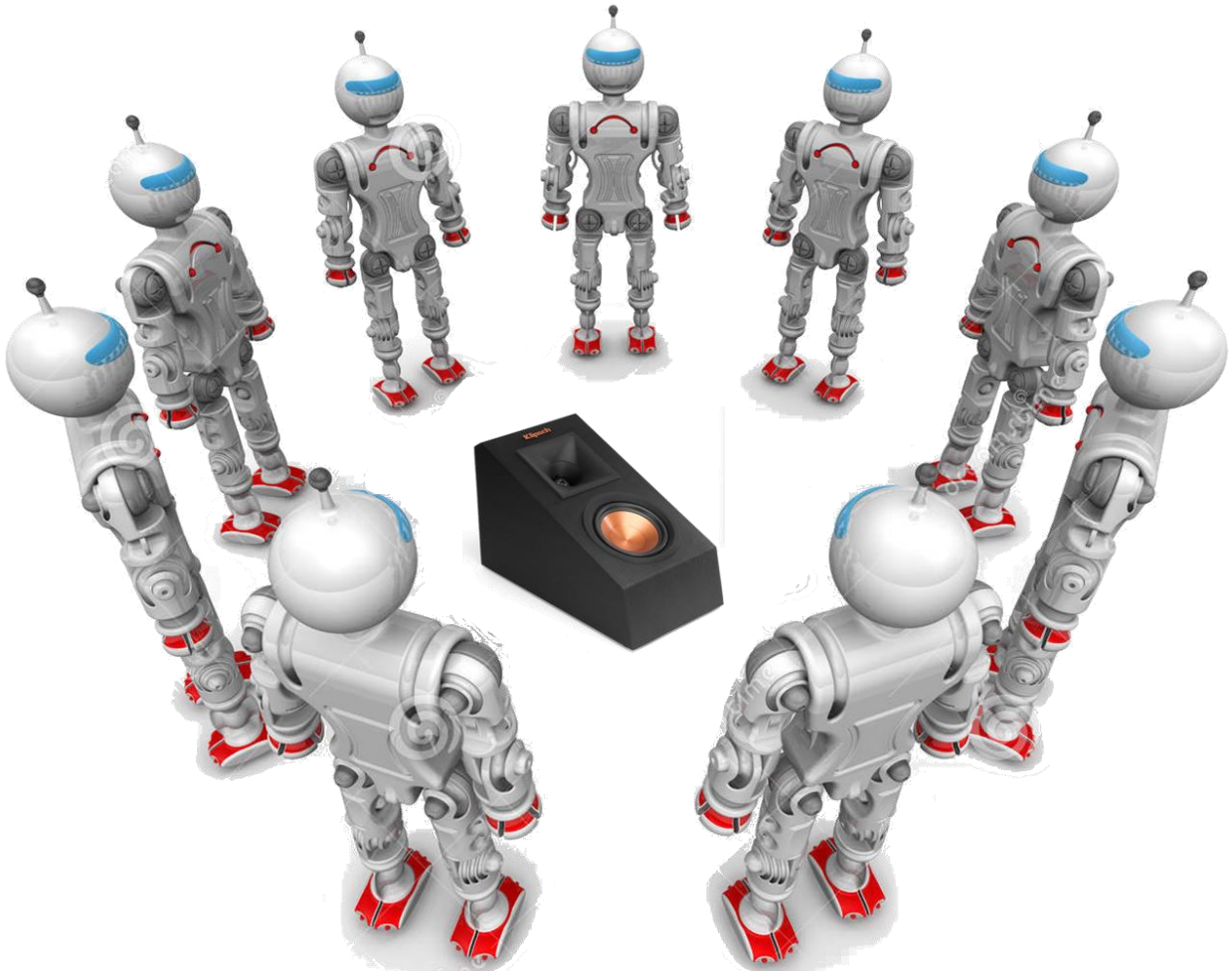


@Home Challenge: Functional Benchmarks

1. Object Perception
2. Navigation

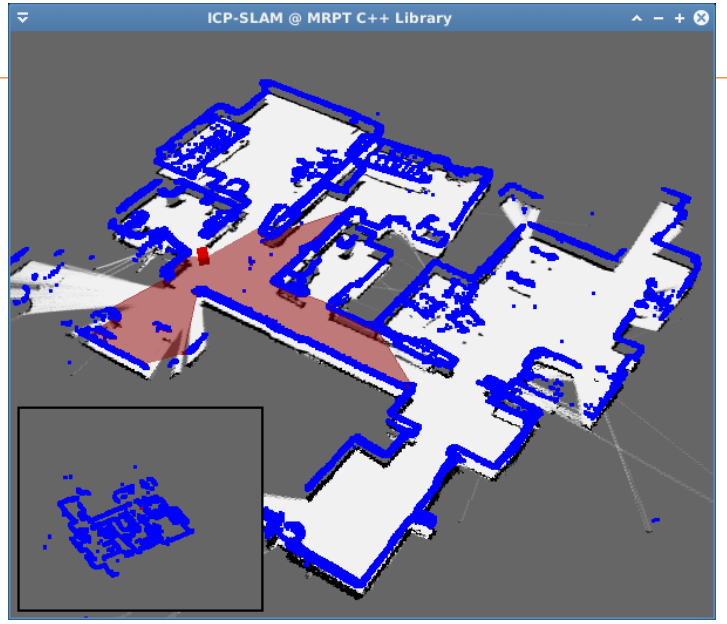
@Home Challenge: Functional Benchmarks

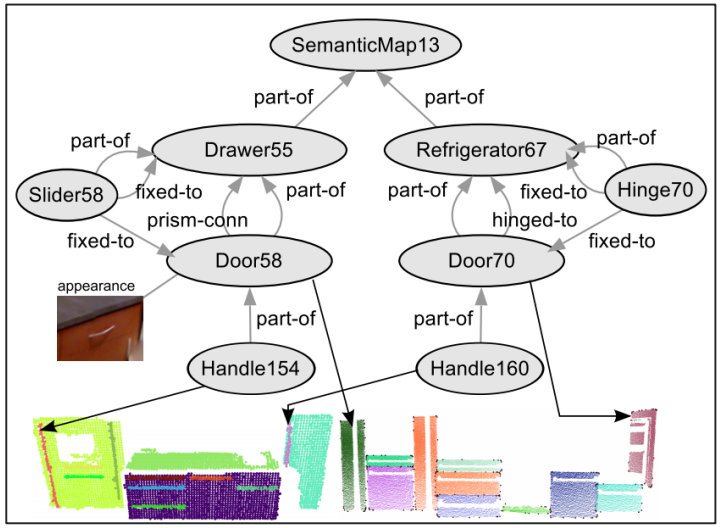
1. Object Perception
2. Navigation
3. Speech understanding



@Home Challenge: Task Benchmarks

1. Getting to know my home





@Home Challenge: Task Benchmarks

1. Getting to know my home
2. Welcoming visitors
3.

@Home Challenge: Task Benchmarks

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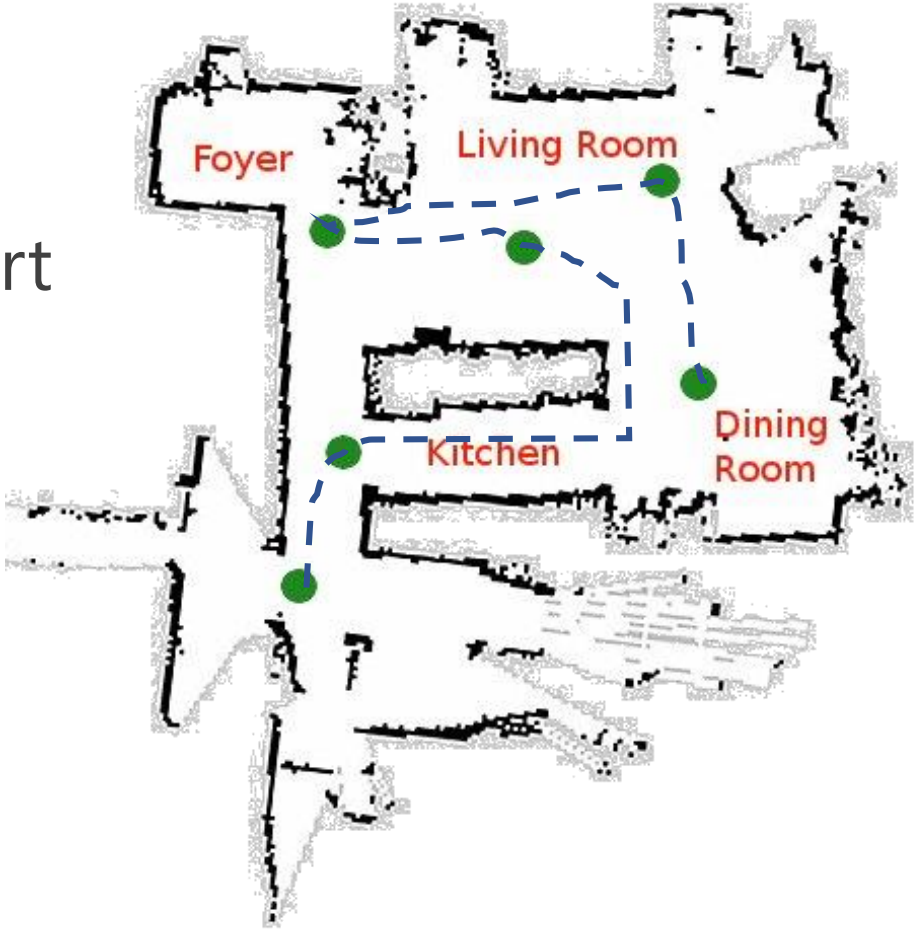
3. Catering for granny Anne’s comfort

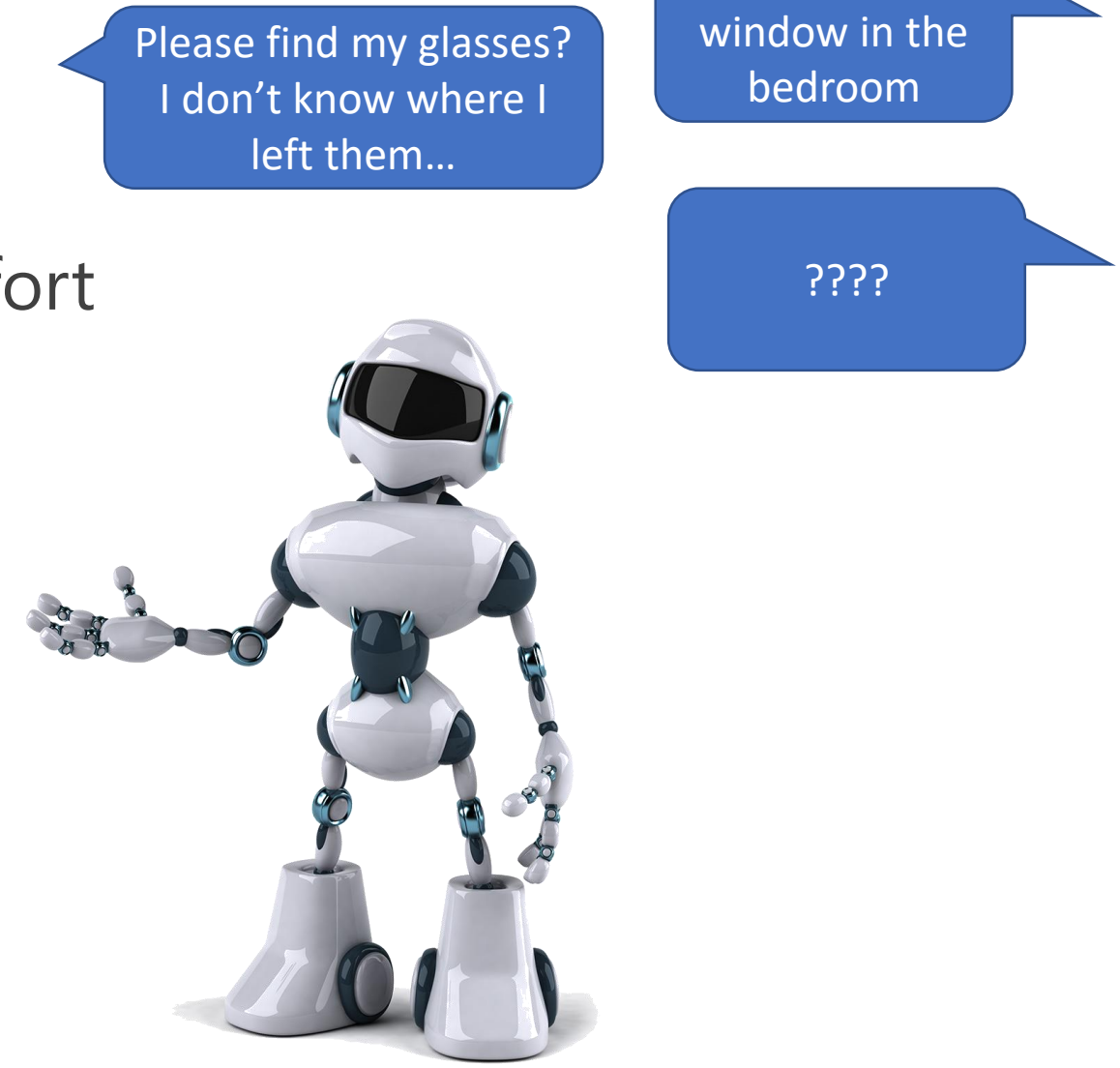
@Home Challenge: Task Benchmarks

1. Getting to know my home
2. Welcoming visitors
3. Catering for granny Anne’s comfort
4. Visiting my home



@Home Challenge: Task Benchmarks

1. Getting to know my home
2. Welcoming visitors
3. Catering for granny Anne's comfort
4. Visiting my home
5. General purpose service robot



How are Ireland doing…

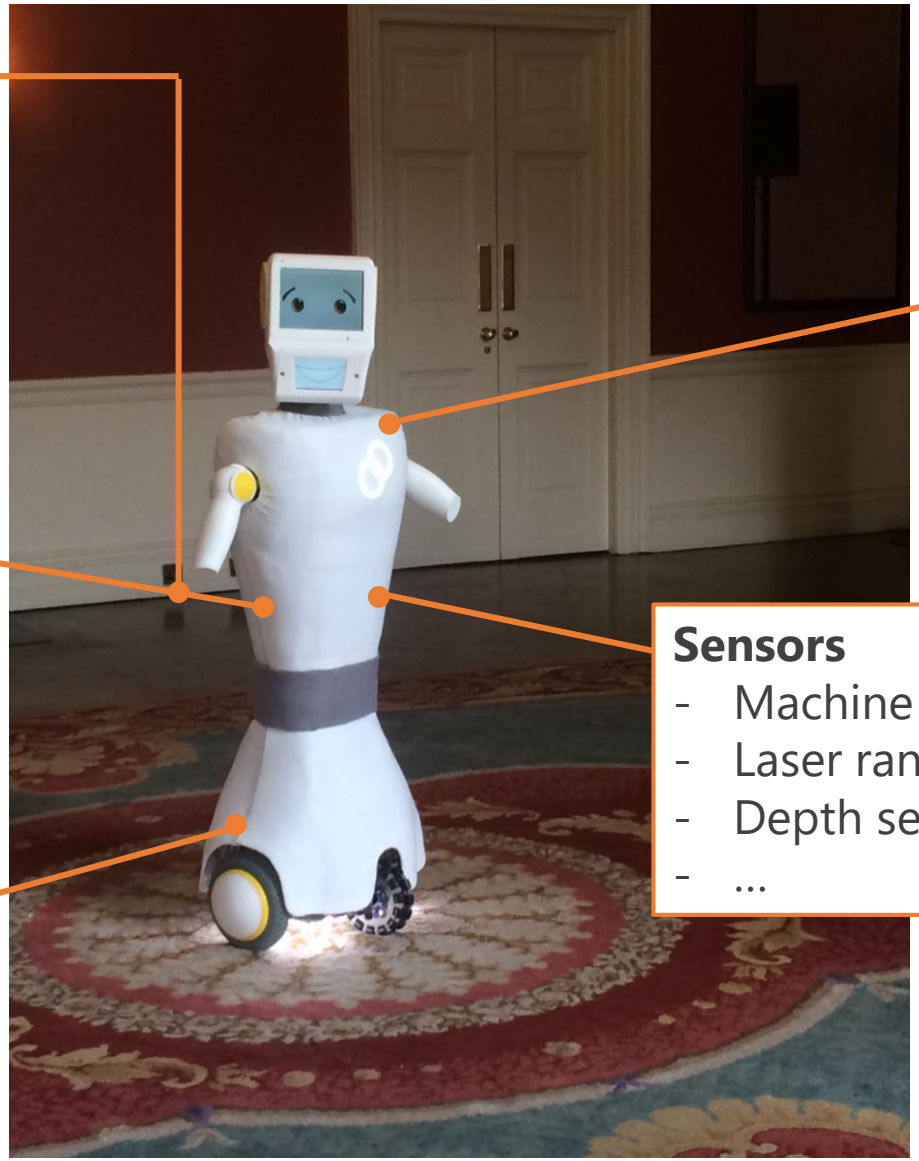
Maynooth University
National University of Ireland Maynooth

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Our robot

On-board PCs
- Env. Perception.
- Navigation.
- Planning.
- SLAM.
- Motion Planning.

Embedded H/ware
- Motor control
- Sensor processing
- Systems checking
- Communication



Sensors
- Machine vision
- Laser rangefinding
- Depth sensors
- …

Our goal

Next 12 months

- Qualify for European Robotics League @ Home

Next 12-24 months

- Compete for title at European Robotics League @ Home
- Qualify for European Robotics Legue @ Home

Next 2-5 years

- Become RoboCup @Home champions

Can you help?

We need:

- Team members
- Lab space
- Equipment
- Funding
- Publicity

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That's all folks

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