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PETROZAVODSK STATE UNIVERSITY

Robotic and Smart Service for People with Disabilities

by Sergey Zavyalov, Anton Kogochev, Lyudmila Shchegoleva

Presenter: Lyudmila Shchegoleva
Petrozavodsk State University
Petrozavodsk, Russia
schegoleva@petrsu.ru

Presenter

Lyudmila Shchegoleva

Doctor of Science,

Professor of Institute of Mathematics and Information Technologies of Petrozavodsk State University

Petrozavodsk, Russia

schegoleva@petrsu.ru

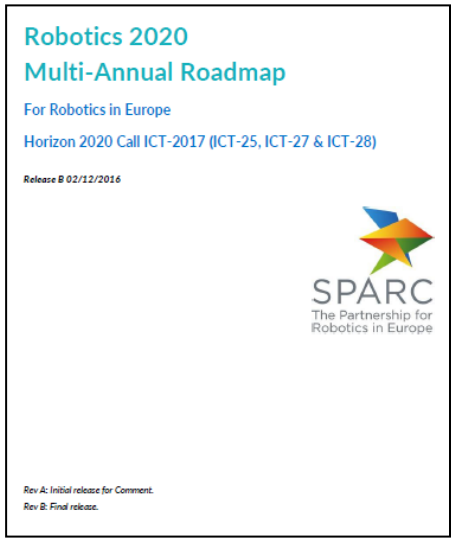
https://www.rscf.ru/news/maths/iskusstvennyy-intellekt-dlya-chelovechestva/

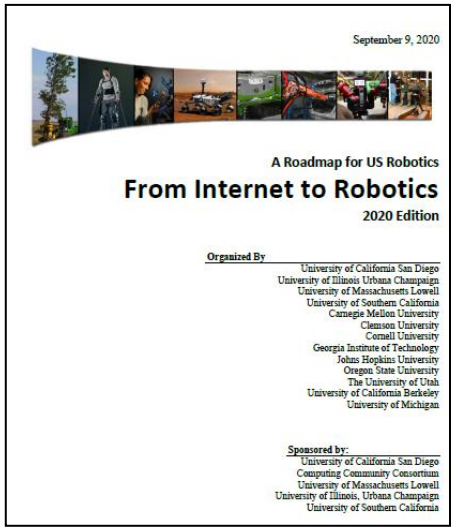
The problem

To develop a robotic system designed for monitoring and telecommunications for the elderly and people with disabilities, as well as to help them perform manipulations with various objects

https://ru.dreamstime.com/

Actuality


Robotics 2020
Multi-Annual Roadmap
For Robotics in Europe
Horizon 2020 Call ICT-2017 (ICT-25, ICT-27 & ICT-28)
Release B 02/12/2016
SPARC
The Partnership for Robotics in Europe
Rev A: Initial release for Comment.
Rev B: Final release.


September 9, 2020
A Roadmap for US Robotics
From Internet to Robotics
2020 Edition
Organized By
University of California San Diego
University of Illinois Urbana Champaign
University of Massachusetts Lowell
University of Southern California
Carnegie Mellon University
Clemson University
Cornell University
Georgia Institute of Technology
Johns Hopkins University
Oregon State University
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University of California San Diego
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University of Massachusetts Lowell
University of Illinois, Urbana Champaign
University of Southern California

- The world's population is aging. More and more staff are needed to support and care for the elderly and people with disabilities
- People can be replaced with robotic devices:
  - SPARC (2015) Robotics 2020 Multi-Annual Roadmap—For Robotics in Europe.
  - A Roadmap for US Robotics From Internet to Robotics 2020 Edition

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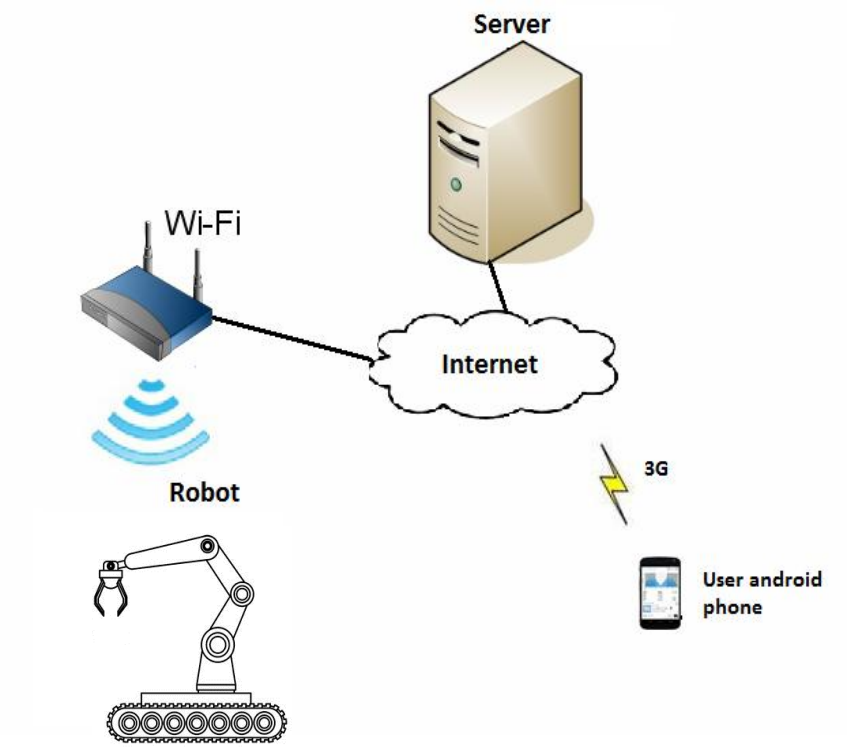
Robotic system's tasks

- To create the route of the platform movement
- To create the trajectory of the manipulator movement
- To grab objects
- To communicate with guardian



https://www.rscf.ru/news/maths/iskusstvennyy-intellekt-dlya-chelovechestva/

Implementation of artificial intelligence

- Avoiding dynamically appearing obstacles, recognizing their shape and gaining experience in circumventing them, and possibly moving them to free the passage;
- Knowing how to capture objects with different shapes
- Detection abnormalities in the patient's behavior and deciding whether to trigger an alarm

Database of typical motion and interaction patterns can be accumulated by the robots themselves and transferred to a shared knowledge base.

AGROBOT E-Series

The robotic harvester for careful strawberry harvesting

Features:

- Computer vision
- Object recognition
- The targeting an object
- Gentle grabbing
- Human security

https://www.youtube.com/watch?v=4Ody1SNv_pk

Robot Robear

The robot can lift a patient out of bed and put him in a wheelchair.
It is equipped with sensors that allow it to avoid colliding with medical staff, patients, furniture and fit into doorways.

Features:

- Route planning
- Obstacle avoidance
- Manipulation
- Gentle grabbing

https://www.youtube.com/watch?v=J3edDaPSdY4

https://www.rscf.ru/news/maths/iskusstvennyy-intellekt-dlya-chelovechestva/

Hypothesis

- Expensive components of a robot can be replaced with cheaper, but less accurate ones
- The artificial intelligence methods for can correct inaccurate manipulator movements

The approach: to investigate the trajectories of the manipulator using tracking with a video camera and teach the manipulator to adjust the speed and angle of rotation of the motors in its joints by analyzing the video image

S. S. Pchelkin et al., ”On Orbital Stabilization for Industrial Manipulators: Case Study in Evaluating Performances of Modified PD+ and Inverse Dynamics Controllers,” in IEEE Transactions on Control Systems Technology, vol. 25, no. 1, pp. 101-117, Jan. 2017, doi: 10.1109/TCST.2016.2554520

Thanks for your attention

Petrozavodsk State University
Petrozavodsk, Russia