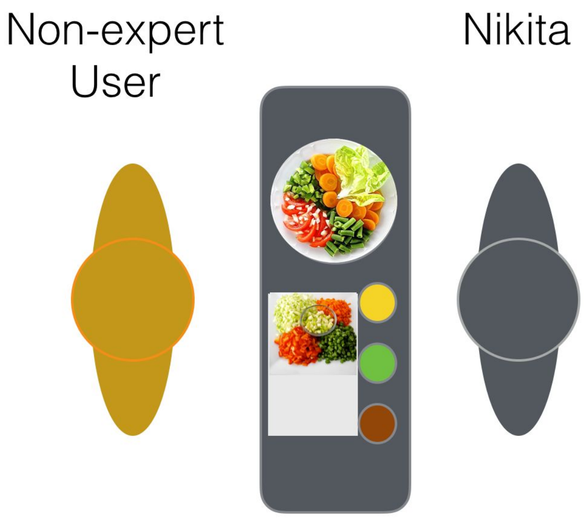
It is expected that within the near future robotic applications will be integrated into many everyday jobs, domestic environments and, therefore, into general society. Robotics can be considered as a part of the cyber-physical system (CPS) as it is a mechanism, controlled and monitored by computer-based algorithms using physical and software components that are deeply intertwined, each operating on different spatial and temporal scales. These mechanisms exhibit multiple and distinct behavioural modalities and interact with each other in a myriad of ways that change with context.

More specifically, CPS can be applied to social robotics, which is the study of how to best integrate robots through several different fields, including perception, control, planning, and behaviour. One particular area of society, which has been facing difficulty is the social care sector as the number of workers is decreasing, while the number of those, who require assistance is increasing. This problem, occurring world-wide, needs to have a solution soon. Social care is an area that would benefit from having robotic applications and it is the aim of our robotics group to demonstrate the advantages of robotics.

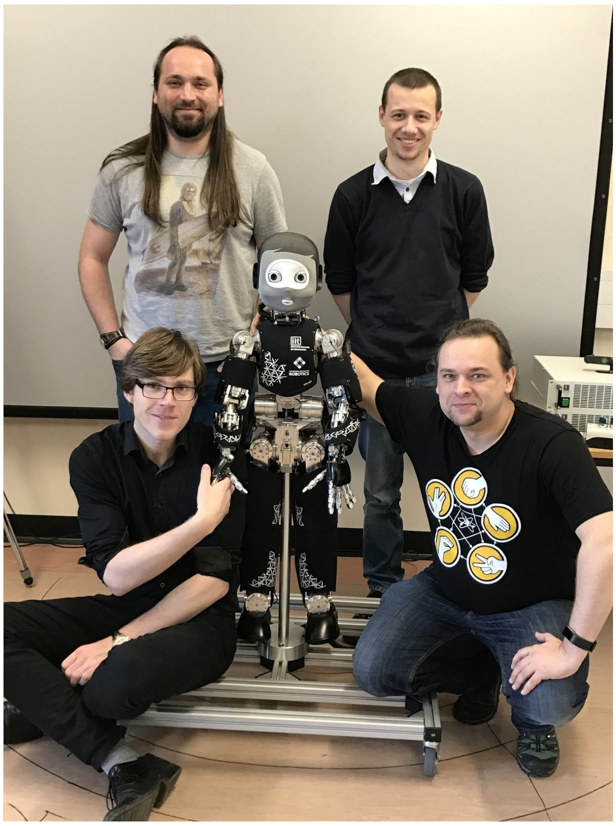
Within a given environment, robots are expected to integrate on a psychological and physical level with human users as well as being able to perceive, navigate, and adapt to be able to accomplish routine tasks. The greatest difficulty for the robotic agent, however, are the non-expert users that occupy the same environment, demanding the robot to be able to interact and behave more akin to humans. Therefore, this robotic group's main aim is to demonstrate the potential of the social robotics to be deployed in a changing real-world environment, which is inhabited by non-experts.

The particular scenario that we will investigate with our iCub robot, Nikita, is how to assist a user in food preparation, as this setup fulfills the requirements stated above. For our demonstration, Nikita will be working in an environment with non-expert users in a common task. To do so, Nikita will need to communicate with humans and to fill the communication gap to ensure that the user interaction is safe and as natural as possible. The main features of the system will be the use of state of the art techniques, including Machine Learning for the perception and understanding of user's needs, flexible manipulation system that will allow Nikita complete manipulation tasks using prior demonstrations, and the internal beliefs will continuously influence Nikita's dynamics and action execution. This will result in Nikita being able to understand user's request and communicate its own state more akin to a human partner, thus, creating a more natural work-flow between the robot and the user. Additionally, designing Nikita's software stack as a modularized, component-based architecture, will allow the reuse of individual parts. As a result, the system will act as a foundation for other challenges, faced by the social robot community.

Setup description



Team



List of requirements:

- Nikita robot
- Table
- Chair for user
- Ingredients
- Kitchenware
- Power outlet (x4) around 1 kW in total
- Laptop

Safety

Considerable space with a table in between will separate the robot from the user and one of the group members will be holding the emergency stop button during the demo, closely observing robot movements.