Table of Contents

- Sonar
- Lidar
- Localization and navigation
- Motor controller
- Joystick
- Social interaction
- Speech
- Speech recognition

Skylab

- Setup Skylab
- Python scripts
- Webserver
- Functions of the webserver
- Skylab servers
- ROS installation on Ubuntu VMs in Skylab
- DNS,DHCP, pfSense & Ubuntu

Radeffect App

- Radeffect App

Lessons learned

- Todo & Advice
- Lessons Learned

Archive

- Previous Groups
- Research Archive

Welcome

Project Willy

- History of Willy
- Project Willy
- Publicity
- Sponsors

Getting started

- Development Guide
- Driving Willy
- Documentation

Build of Willy

- Design history
- Requirements
- Design reference
- Physical build
- Hardware

Robotic Operating System

- Introduction to ROS
- ROS Tutorials
- Multi master

Architecture

- Software Architecture
- Hardware Architecture
- Skylab Architecture
- ROS topic design

Hardware nodes

- sensor node
- si node
- power node
- WillyWRT

Components

- ROS master
- New ROS master on Lubuntu
- Brain
- Sonar
- Lidar
- Localization and navigation
- Motor controller
- Joystick
- Social interaction
- Speech
- Speech recognition

Skylab

- Setup Skylab

1. History of Willy

1.1. The birth of an idea

In 2015 a 'waste competition' was organized at a primary school, with the aim to provide the pupils of this primary school with a solution to the question 'how to keep the Grote Markt in Zwolle clean'. Eventually, six students won this competition with their idea to keep the Grote Markt clean with the help of a 'cleaning robot (Willy)'. An important aspect of Willy had to be that he would be able to interact with bystanders and thus influence them on their waste behavior. For example, Willy might point out to people that it would be better to deposit waste in a waste bin instead of throwing it on the floor; this would enable Willy to influence people positively. In short, Willy must be able to act in a corrective as well as a preventive (i.e. interaction) manner.

The primary school contacted the township of Zwolle to see if the 'Willy concept' could be realized. The township of Zwolle reacted positively to the Willy concept and then looked into whether it could involve a partner who could take on Willy's realization.

Eventually the township of Zwolle found 'The Art of Robotics (TAoR)'; a foundation that works to increase the awareness of robot technology in today's society. ' The team of TAoR responded enthusiastically to this proposition and subsequently made a plan on how they could best realize Willy. Ruud van der Burg contacted Hogeschool Windesheim on behalf of TAoR with the proposal to see if it would be possible to let students (of different disciplines) work at Willy. Windesheim has agreed to this, with which the realization process of Willy started.

Welcome

Project Willy

- Localization and navigation
- Motor controller
- Joystick
- Social interaction
- Speech
- Speech recognition

Skylab

- Setup Skylab
- Python scripts
- Webserver
- Functions of the webserver
- Skylab servers
- ROS installation on Ubuntu VMs in Skylab
- DNS,DHCP, pfSense & Ubuntu

Radeffect App

- Radeffect App

Lessons learned

- Todo & Advice
- Lessons Learned

Archive

- Previous Groups
- Research Archive

2. The Willy Project

2.1. Project background and progress

In order to be able to actually realize Willy, the development process has been chopped into various iterations, with the result that different training disciplines would start working on the creation of Willy.

2.1.1. First iteration

In principle, students from IPO (Industrial Product Design) worked on a graphic design of Willy, which would make it clear what Willy should look like. They have also been involved in making technical drawings with regard to the frame to be realized and other design aspects.

2.1.2. Second iteration

The students (mechanical engineering), of the second iteration, have occupied themselves with the realization of a moving chassis for Willy. In the end they decided that the undercarriage of an electric wheelchair would be the best option and so they purchased and prepared this for further developments.

2.1.3. third iteration

During the third iteration, HBO-ICT students have been working on realizing the autonomous functionality of Willy. An important characteristic of Willy is, that he must be able to function completely autonomously on the Grote Markt in Zwolle (this is a further feature of functionality that Willy should also be able to function in buildings). This meant in the first instance that the project group had to deal with determining the right kind of sensors. Without sensors it would be impossible to recognize objects and therefore avoid them. These sensors eventually had to be linked to Willy's Operating System (ROS). This project group has also been involved in writing an algorithm, which Willy will be able to drive a fixed pattern within a defined area.

2.1.4. fourth iteration

The start of the fourth iteration started roughtly. With the mixed intrests of the productowner of Willy (owner of the IP) TAoR and HBO-ICT Windesheim the project collaboration came to a halt and Windesheim purchased the IP of Willy. The new productowner has set new and diffrentgoals. Two teams during this iteration worked on the autonomous navigation on building T5 and the other team worked on social interaction for Willy. Another main/side goal is the transference of the current project phase, to make sure that the following iteration has a running start.

Welcome

Project Willy

- History of Willy
- Project Willy
- Publicity
- Sponsors

Getting started

- Development Guide
- Driving Willy
- Documentation

Build of Willy

- Design history
- Requirements
- Design reference
- Physical build
- Hardware

Robotic Operating System

- Introduction to ROS
- ROS Tutorials
- Multi master

Architecture

- Software Architecture
- Hardware Architecture
- Skylab Architecture
- ROS topic design

Hardware nodes

- sensor node
- si node
- power node
- WillyWRT

Components

- ROS master
- New ROS master on Lubuntu
- Brain
- Sonar
- Lidar
- Localization and navigation
- Motor controller
- Joystick
- Social interaction
- Speech
- Speech recognition

Skylab

- Setup Skylab
- Python scripts
- Webserver
- Functions of the webserver
- Skylab servers
- ROS installation on Ubuntu VMs in Skylab
- DNS,DHCP, pfSense & Ubuntu

Radeffect App

- Radeffect App

Lessons learned

- Todo & Advice
- Lessons Learned

Archive

- Previous Groups
- Research Archive

3. Publicity

3.1. Stentor

Jesse Bouwman got in touch with a redactor of the Zwolse courant de Stentor. After some email contact we planned a meeting to have an interview about Willy and the background of Willy. Joep Boerboom came and we have had some nice conversations about Willy and the future of our robot. The article and the photo of Willy can be found on the website of de Stentor:

`https://www.destentor.nl/zwolle/studenten-windesheim-maken-pratende-schoonmaakrobot~aa713925/`

3.2. Windesheim newspaper Win'

After the article from de Stentor we got response from the Win' newspaper by email. The Win' crew read our article and they became intrested to write something about Willy too. After some email contact we planned a meeting and gave an interview. Also the photograph took some pictures of our Willy. The article can be read on the following web page.

`https://www.hogeschoolkrantwin.nl/2018/05/17/afvalrobot/`

Welcome

Project Willy

- History of Willy
- Project Willy
- Publicity
- Sponsors

Getting started

- Development Guide
- Driving Willy
- Documentation

Build of Willy

- Design history
- Requirements
- Design reference
- Physical build
- Hardware

Robotic Operating System

- Introduction to ROS
- ROS Tutorials
- Multi master

Architecture

- Software Architecture
- Hardware Architecture
- Skylab Architecture
- ROS topic design

Hardware nodes

- sensor node
- si node
- power node
- WillyWRT

Components

- ROS master
- New ROS master on Lubuntu
- Brain
- Sonar
- Lidar
- Localization and navigation
- Motor controller
- Joystick
- Social interaction
- Speech
- Speech recognition

Skylab

- Setup Skylab
- Python scripts

- Webserver
- Functions of the webserver
- Skylab servers
- ROS installation on Ubuntu VMs in Skylab
- DNS,DHCP, pfSense & Ubuntu

Radeffect App

- Radeffect App

Lessons learned

- Todo & Advice
- Lessons Learned

Archive

- Previous Groups
- Research Archive

4. Sponsors

This document contains a list of all the companies sponsoring Willy.

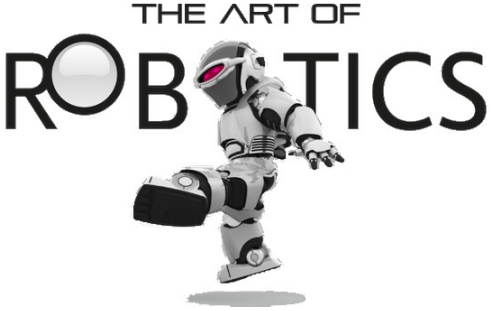
4.1. Windesheim

Windesheim provides students and financial support for the project.

Windesheim

4.2. The Art of Robotics

The art of Robotics foundation is the product owner, financial support and a way of getting new sponsors.



4.3. Sick

Sick provided the project with a very expensive LIDAR sensor. Sick provided this in cooperation with our product owner.

SICK

Sensor Intelligence.

4.4. Multibat

The battery company Multibat showed via our product owner interest in our project. After a conversation with the company they proposed a deal. Multibat now provides six batteries to us.

MULTIBAT

ACCU'S & INDUSTRIE BATTERIJEN

4.5. Automaterialenland

When the batteries were sponsored by Multibat, there were unfortunately no cables to connect the batteries. Then we got Automaterialenland as contact to provide free cables.

4.6. Koers Polyestertechniek

Our product owner found a company for us to create the outer plating with. After creating a foam

mold, we drove it to Koers in Nieuwleusen and made the outer skin of Willy from fiberglass.

[image]

4.7. Multimate Vollenhove

Multimate provided the project with building materials and small accessories.