Design of an intuitive and responsive remote control interface for robots

The Universal Robot Controller

Master Thesis Presentation by La Spada Luca
The 03 February 2016

Ijspeert Auke Jan - Master Project supervisor
Crespi Alessandro - Assistant
Estier Thomas - External expert
Outline

Introduction

Architecture

Results

Conclusion
Motivation

• Remote-controllers
  • Non-autonomous robots and fully autonomous robots
  • Lack of evolutions

• Ascertainment
  • Almost each robot has its dedicated remote-controller
  • Majority of people possess a mobile device (smartphone, tablet, etc.)

• One remote-controller to rule them all
  • Custom GUIs for each robot
  • Access to sensors data
Goal

• Developing a **versatile** remote-controller application
  • Run on various mobile devices
  • Compatible with various robots
  • Represent the same information differently

• Providing a framework to design GUIs
  • Targeting B2B
  • Reusability of components
  • Several layouts for the same robot
  • Intuitive & Responsive
Proof of concept

AmphiBot III
by BioRob

Absolem
by Bluebotics

ROVéo Mini
by Rovenso
Outline

- Introduction
- Architecture
- Result
- Conclusion
**Choices**

- **Android**
  - Reduce the complexity by supporting one OS
  - 80% of the market share worldwide

- **Hybrid Apps**
  - External: Native App
  - Internal: Web App

- **Web technologies** *(JavaScript, HTML5, CSS)*
  - Multi-platform
  - Flexibility
  - Intuitive & Responsive

**Native Apps**
- Single platform affinity
- Platform SDK
- Access to all native APIs

**Hybrid Apps**
- Cross-platform affinity
- Web technologies
- Runs locally
- Access to native APIs

**Mobile Web Apps**
- Cross-platform affinity
- Web technologies
- Runs on web server
Communications Protocol
AmphiBot III

- Android Application (URC)
- Amphibot
- ISM radio bands 866-868 MHz
Communications Protocol
ROVéo Mini

- Android Application (URC)
- SSH
- Telnet
- Arduino Yún
- RoveoMini

Architecture
Communications Protocol
Absolem

Diagram:
- Android Application (URC)
- Websocket using library roslibjs
- Absolem
Universal Robot Controller

Current Settings
Robot ip and port:
Set the robot ip in settings.
Driver:
Choose a driver in settings.
Interface:
Choose an interface in settings.
Internal Driver Manager

Drivers Manager

Available Drivers at myLocal

- puppet: An example of an awesome driver
- amphibot: A nice driver for amphibot
- dummy: A nice driver for local testing without robot
- nifti: A nice driver for nifti
- roveomini: A nice driver for roveomini

Installed Drivers

- dummy from myLocal: A nice driver for local testing without robot
Internal Settings

Settings

Choose your active driver:

myLocal://drivers/luk/dummy/

Choose the interface associated with the chosen driver:

myLocal://interfaces/luk/light-dummy/

Set the IP and port of your robot:

192.168.0.4  Test & Save

6789
Internal
GUI

7.77 V
Outline

Introduction

Architecture

Results

Conclusion
AmphiBot III

Results
ROVéo Mini
Absolem (1)
Absolem (2)

- Laser range finder
• Mobile device motion sensor
URC in action

Universal Robot Controller

Current Settings
Robot ip and port:
Driver:
Interface:

Set the robot ip in settings.
Set the robot port in settings.
Choose a driver in settings.
Choose an interface in settings.
Outline

Introduction
Architecture
Results
Conclusion
• Control a wide variety of robots

• Reusability widgets
  • Use existing JavaScript component

• Several interfaces for a robot
  • Debug
  • Consumer
  • Adaptability & Accessibility

• Easily portable to other support (iOS, Windows Phone, PC)
Improvement

• Create an UDP bridge

• Improve settings webpage

• Universal Robot Repository is a proof of concept