



BIOLOGICALLY INSPIRED
ROBOTICS GROUP (BIRG)

Logic Systems Laboratory (LSL)
School of Computer and Communication Sciences
Swiss Federal Institute of Technology Lausanne

Winter Semester Project 2003/2004

Wireless Remote Control and Monitoring of an Aibo Robot

Lukas Hohl, semester 7
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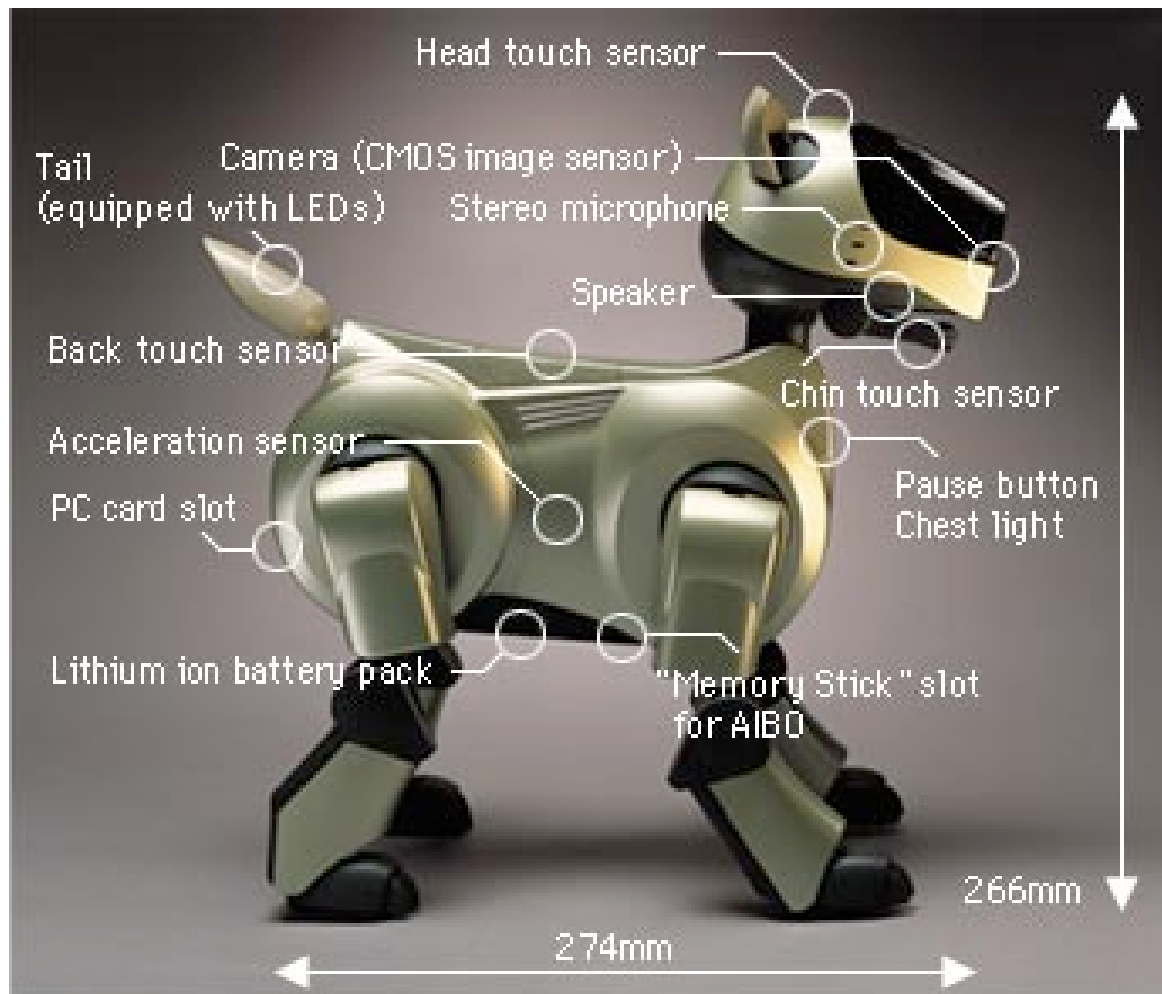


Introduction

Sony Aibo ERS-210(A)



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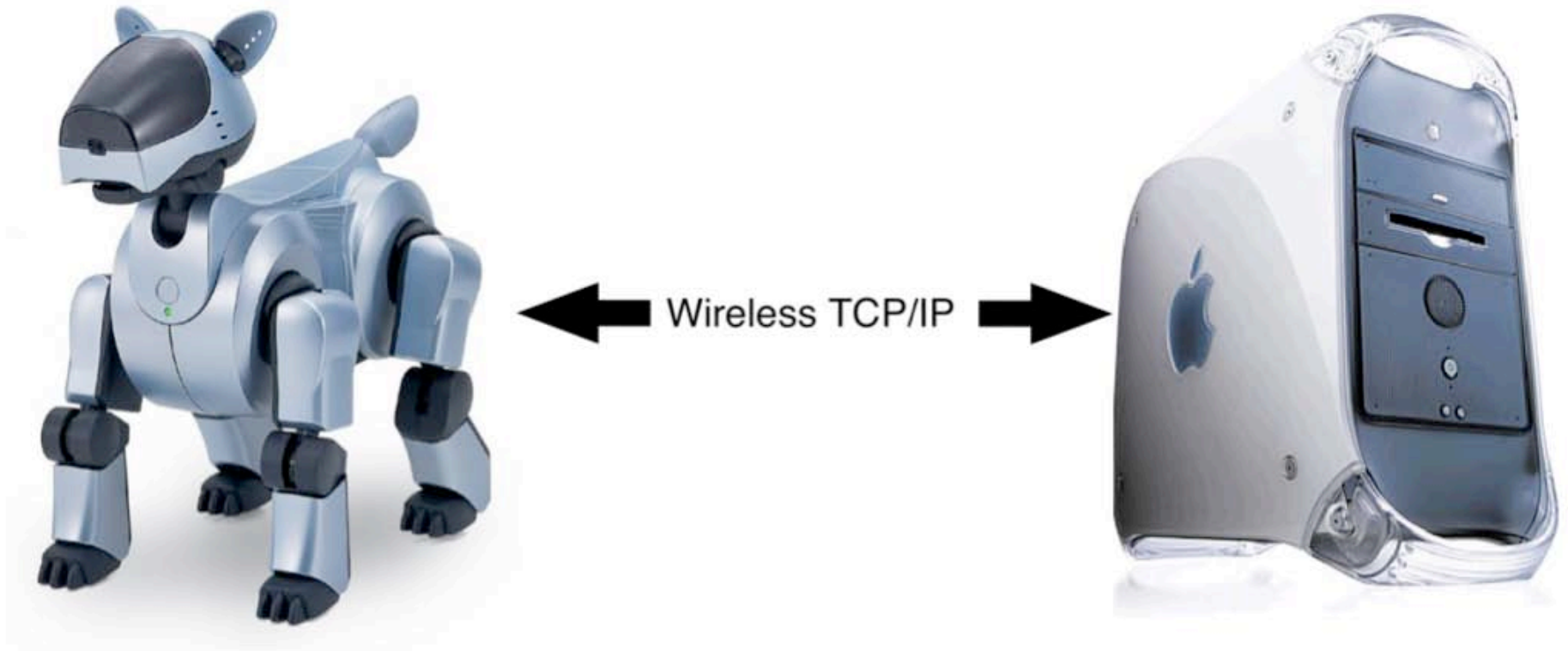


System Overview

Client – Server architecture
Wireless TCP/IP communication



Client – Server



Aibo

Communication Protocol

Aibo Remote Control



Communication Protocol

Access to robot components
Message types & Accepted Commands
MTN files



Access to components

Sensor identifiers

Identification		Value		
Name	<i>sensorID</i>	min	max	Unit
Head sensor (back)	5	0	0.980665	N
Head sensor (front)	6	0	0.980665	N
Chin switch	7	0	1	binary
PSD (Position Sensing Device)	8	0	0.90	m
Left fore leg paw	14	0	1	binary
Left hind leg paw	24	0	1	binary
Right fore leg paw	34	0	1	binary
Right hind leg paw	44	0	1	binary
Thermo sensor	53	n/a	n/a	°C
Back sensor	54	0	1	binary
Acceleration y-axis	61	-19.6133	19.6133	m/s ²
Acceleration x-axis	62	-19.6133	19.6133	m/s ²
Acceleration z-axis	63	-19.6133	19.6133	m/s ²



Messages & Commands

Setting values (position, speed, ...)

BasicSetCommand			BasicAnswer		
char	uchar	short	char	uchar	short
command	identifier	value	command	identifier	value
S	0 sensorID miscID	zero / non-zero	s	0 sensorID miscID	OFF / ON
J	0 jointID	Angular Position	j	0 jointID	Angular Position
V	0 jointID	Angular Velocity	v	0 jointID	Angular Velocity
A	0 jointID	Angular Acceleration	a	0 jointID	Angular Acceleration
L	0 ledID	zero / non-zero	l	0 ledID	OFF / ON
K	0 plungerID	zero / non-zero	k	0 plungerID	OFF / ON
Q R	ignored	ignored	q r	0	0



MTN files

- Joint positions and other command data
- key frames

- Upload (also other file types)
- Delete (also other file types)
- Playback



Protocol overview

- Inspired by command line interface
- Request always implies answer
- Access to LEDs, Plungers, Joints, Sensors, Battery status, MTN key frame and positions
- Get and set single or multiple values (position, speed, acceleration, ...)
- File handling
- MTN file playback

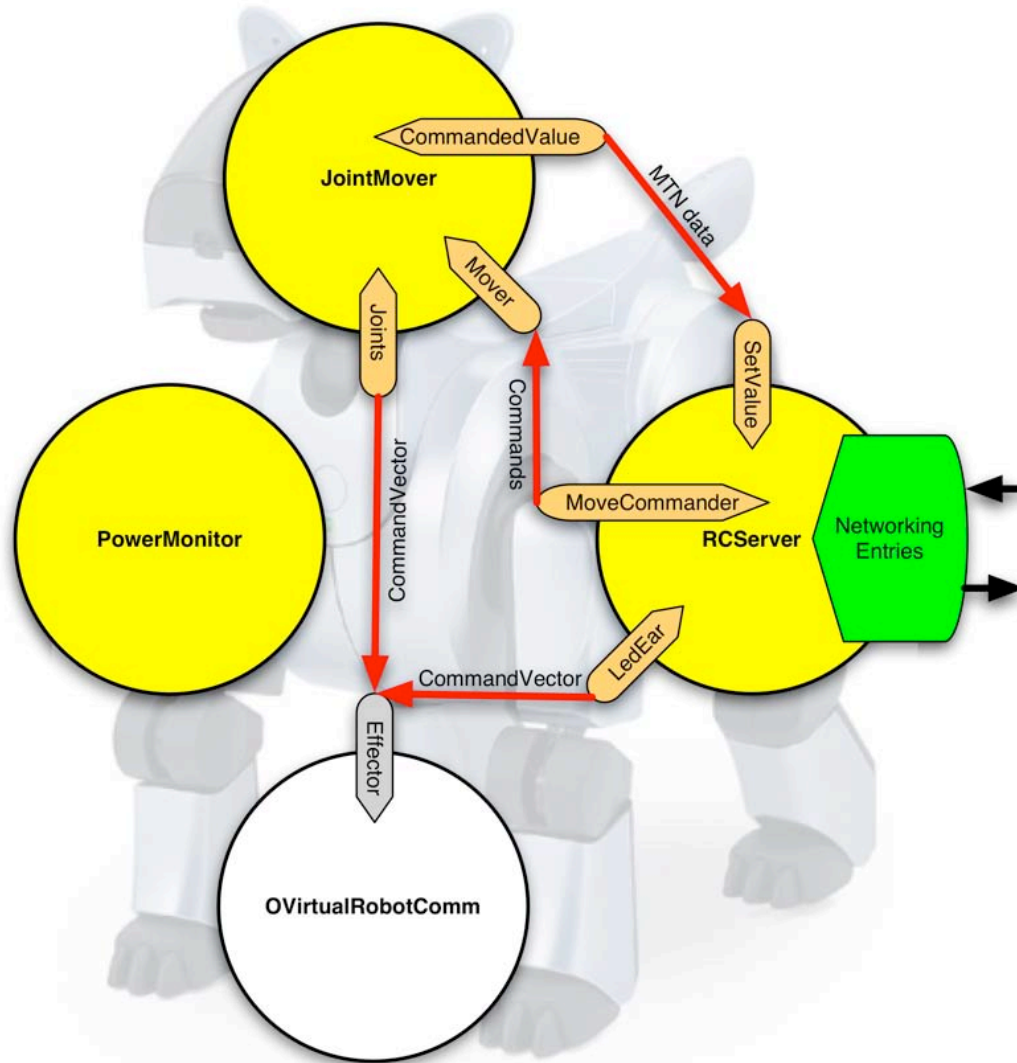


Aibo

Remote Control
RCServer
JointMover



Remote Control

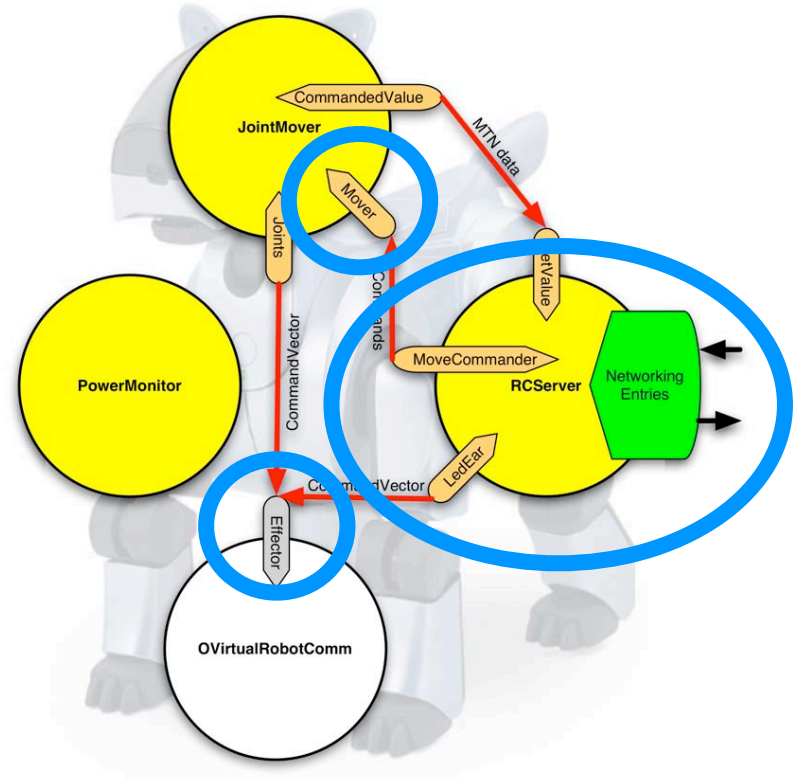


- OPEN-R SDK
- Modularized software (objects)
- System services = objects (IPStack)
- Inter-object communication
- Entry points
- Concurrency



RCServer

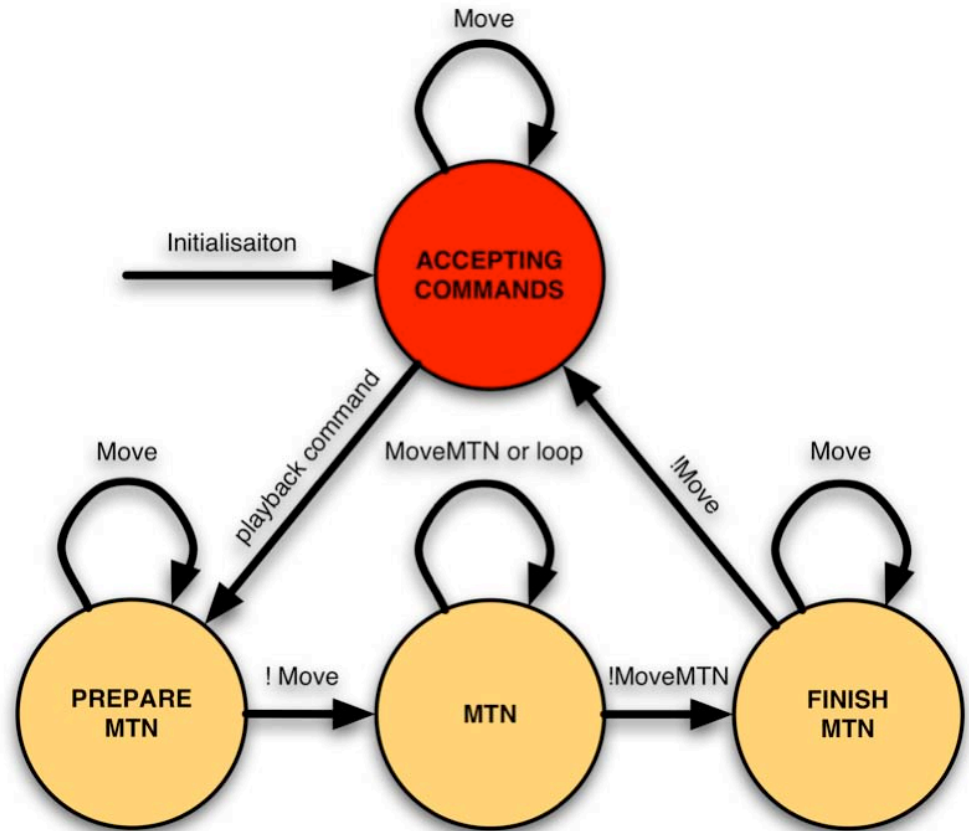
- Networking
- Command interpretation
- Sensor reading
- LED and Plunger control
- Shutdown & Reboot
- File handling
- Delegation of Joint commands to JointMover





JointMover

- Individual Joints
 - Acceleration
 - Constant speed
 - Deceleration
- MTN file playback
 - Sony's algorithm
- CommandVector to OVirtualRobotComm





Aibo Remote Control

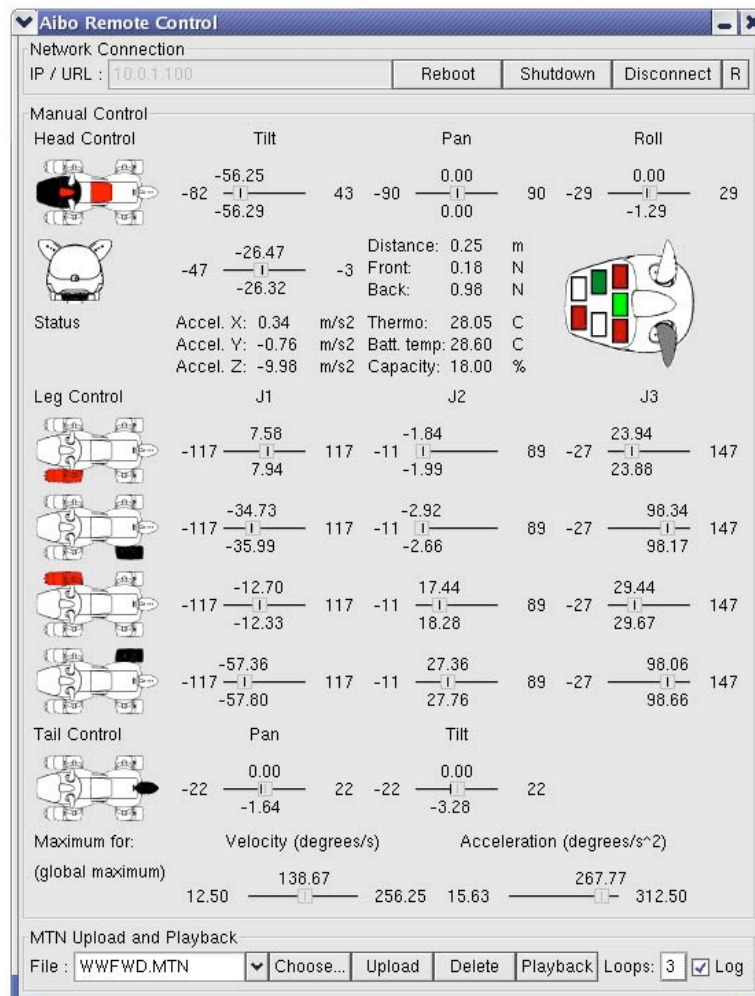
Client software

Concept

Outlook



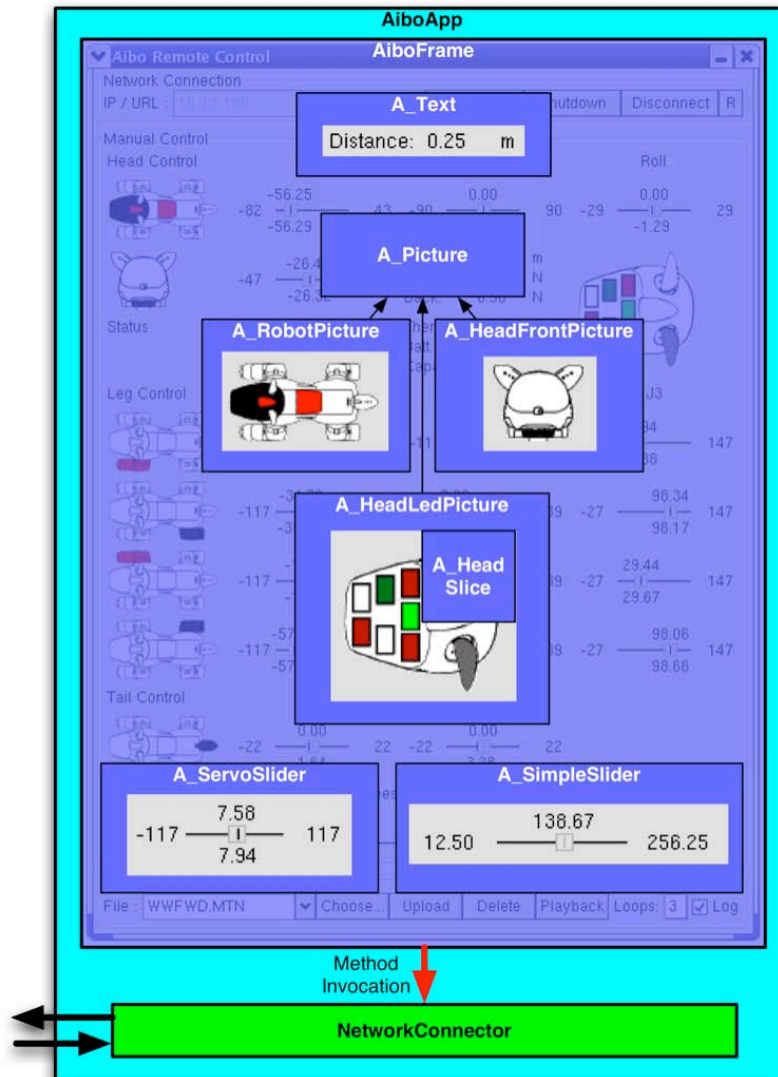
Client software



- wxWindows
- Binary sensors:
robot pictures
- Non-binary sensors:
textual display
- LEDs and Plungers:
head picture
- Joints: sliders
- MTN: sliders & logfile



Concept



- AiboApp
- Networking:
NetworkConnector
- Interface:
AiboFrame
- Interface invokes
methods for
network access



Outlook

- Integration into “Webots”
 - <http://www.cyberbotics.com/>
- Real vs. simulated Aibo
- Controller cross-compilation



How to learn more?

- Project page @ BIRG
 - Report
 - QuickStart Manual for Aibo ERS-210
 - ScreenShots
- OPEN-R (English)
 - <http://openr.aibo.com/openr/eng/index.php4>
- wxWindows
 - <http://www.wxwindows.org/>



Thank you for your attention!