Aibo Simulation in Webots and Controller Transfer to Aibo Robot

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• Remote Control
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Introduction

Sony Aibo ERS-210(A)
Remote Control System
Webots 4
Sony Aibo ERS-210(A)
Aibo Simulation in Webots and Controller Transfer to Aibo Robot
Remote Control System

Aibo

Communication Protocol

Aibo Remote Control

Wireless TCP/IP
Aibo Simulation in Webots and Controller Transfer to Aibo Robot
Webots 4
System Overview

Integration of Remote Control System into Webots
Simulation controlled by GUI and Controller
Real Aibo controlled by GUI and Controller
Controller Cross-Compilation
Aibo Simulation in Webots and Controller Transfer to Aibo Robot
Simulation

Webots Model
Graphical User Interface
Controller Program
Webots Model

- Tail block
- Left rear leg block
- Right rear leg block
- OPEN-R bus connector
- Left front leg block
- Head block
- Right front leg block
Graphical User Interface
Controller Program
Controller Program
Remote Control

Graphical User Interface
Controller Program
Graphical User Interface
Controller Program

- Callback mechanism for simulated devices
- Under construction
- Sensor reading: Simulated value set to last measurement received
- Commands: Message sent to Aibo if difference in target value
- Limited by Communication Protocol
Cross-Compilation

OPEN-R Objects
Cross-Compilation
Webots Controller Program vs. Aibo Programming Scheme
OPEN-R Objects

- `main()`: Controller
- API Translation: Controller
- LEDs & Plungers: Controller
- Joints & MTN: JointMover
- Remote Control: RCServer
Cross-Compilation

- Sony’s OPEN-R Cross-Compiler
- Links intermediate files and compiled sources
- Creates binary to be put on Memory Stick
- Upload in Webots via GUI possible
DeviceTag led_1 = robot_get_device("PRM:/r1/c1/c2/c3/11-LED2:11");
// ...

led_set(led_1, touch_sensor_get_value(touch_sensor));
led_set(led_2, (distance_sensor_get_value(distance_sensor)<200));
// ...

MTN* mtn = mtn_new("WWFWD.MTN");
mtn_play(mtn);
// ...

if (mtn_is_over(mtn)) servo_motor_off(leg_left);
// ...

servo_set_position(leg_right, servo_get_position(leg_left));
// ...
Webots vs. Aibo

Infinite loop contrary to Aibo Programming Scheme

Run function allows selective execution
• Webots executes `run` in infinite loop
• Aibo uses LED period for timing
• Aibo executes `run` in method handling ready notification after LED command execution
• Aibo sends new LED command vector message to robot immediately after `run`
• Implicit infinite loop on Aibo by continuous reception and sending of messages
Outlook

Other Aibo Models
Other Aibo Models

- ERS-220 almost identical to ERS-210
- Remote Control System ported to ERS-7
Modifications…

• Webots Model
• Webots Model Nodes
• Webots Controller Programming Interface
• Graphical User Interface
• Communication Protocol
• OPEN-R Objects on Aibo
How to learn more?

- Project Page @ BIRG (http://birg.epfl.ch/)
  - Report
  - ScreenShots
  - Presentation
- http://www.cyberbotics.com/
  - Webots
  - Movies
Thank you for your attention!