Modular Snake ROS

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Introduction, Lola-OP™ Robot

Figure: 16-DOF Lola-OP™, Modular Snake Robot

http://www.km-robota.com
http://www.robotsource.org
Figure: 16-DOF Lola-OP™, structure
Parameterized gaits

\[ \theta(n, t) = \begin{cases} 
O_o + A_o \sin \left( \frac{n}{\lambda_o} + \omega_o t \right), & n \text{ odd} \\
O_e + A_e \sin \left( \frac{n}{\lambda_e} + \omega_e t + \delta \right), & n \text{ even} 
\end{cases} \]  

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Scripted Gaits.
Introduction

Figure: 16-DOF Lola-OP™, Controller Mapping
Figure: Simulation and Control Framework Architecture.
Introduction. The Robot and the Framework Architecture

Introduction. Control Interfaces - Front-ends

Figure: Scripted and parameterized Gaits Front-ends.
Introduction. Physics Simulator Examples
Introduction. The Robot and the Framework Architecture

Introduction. Log File and Real-Time Plotting

Figure: Plotting Capabilities
Introduction Architecture implemented with ROS

Figure: Message Passing Protocol Converter implemented in ROS
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2. Interfacing the robot

3. Representing the robot - URDF

4. High Level Tools

5. Conclusions
Interfacing the Robot. The lola_opmiddleware_package

lola_opmiddleware_package features:
- What we need to interface... just Dynamixel AX-12 actuators?
- ... `<depend package = "dynamixel_controllers" / >` ...
- More Dependences (letting the door open)
- Writing and Reading from the robot (establishing the Topic/s)
- Qt interfaces → ROSlaunch
- Yes, it can be On-board too

Let’s look a simple Demo ...
1. Introduction. The Robot and the Framework Architecture

2. Interfacing the robot

3. Representing the robot - URDF

4. High Level Tools

5. Conclusions
Figure: Fully Featured/Robust Lola-OP™ URDF
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High Level Tools

High Level Tools. Rviz visualization

Figure: Lola-OP™ in Rviz, Open loop gait controller
Figure: Using TF to implement the *Floating Body Frame of Reference* in Snake Robots
High Level Tools. Remote Operation

Take the control, write the message, send it, move the real robot, gather info, send it back, decode it, Rviz and visualize what is going on.

- As simple as Bagfiles...
- TCP/IP, from LAN → to Internet
- What about Real Time ??

Let’s look another simple Demo ...
Conclusions

- Integration with Lola-OP\textsuperscript{TM} Robot Architecture (each block as a ROSnode)
- High Level Tools aid, Open issues to explore
- What about MoveIt ?? (ROSCon2014...Maybe?)
Questions?

Thank you!