Nao 运动控制

> 本文是关于 Naoqi 的运动接口整理
>
> 核心目的为：完成基本的关节控制和姿态结算
>
> 需要按照本文顺序依次阅读官方手册，运行样例代码
>
> 所有样例代码都已经整理在文件夹 */Nao/sample-code* 中
>
> 注：暂时不确样例代码保能100%运行，有些功能貌似webots-nao还不支持

基础： Core 核心

核心 Module

- ALBehaviorManager
- ALConnectionManager（这个貌似virtual robot 不支持，所以没有再尝试进行实际的和电脑的连接）
- ALMemory

基本运动控制： Motion

核心 Module :

- ALPosutre：提供基本的动作 (predefined)
- ALMotion ：核心

ALMotion 的控制目标包括：

低层次

- stiffness： 0.0 is no torque / 1.0 is 100 percent torque
- angle : the angle of one joint
- trace： 只需要给定关键位置，就可以

高层次

- Locomotion (moveTo):

  can't promise anything, e.g. 无法保证机器人重心同一水平面

- [核心] Cartesian (末端位置控制) :

  其中涉及到的基本概念需要仔细看看

Appendix

A：各个关节名称表

Chains

The table below lists the chains and all the joints included in each chain:

Body is ...	**Head + LArm + LLeg + RLeg + RArm**				
The chain ...	**Head**	**LArm**	**LLeg**	**RLeg**	**RArm**
involves the joints ...	HeadYaw	LShoulderPitch	LHipYawPitch1	RHipYawPitch1	RShoulderPitch
	HeadPitch	LShoulderRoll	LHipRoll	RHipRoll	RShoulderRoll
		LElbowYaw	LHipPitch	RHipPitch	RElbowYaw
		LElbowRoll	LKneePitch	RKneePitch	RElbowRoll
		LWristYaw2	LAnklePitch	RAnklePitch	RWristYaw2
		LHand2	RAnkleRoll	LAnkleRoll	RHand2

Note

1 LHipYawPitch and RHipYawPitch share the same motor so they move simultaneously and symmetrically. In case of conflicting orders, LHipYawPitch always takes the priority.

2 These joints do not exist in the NAO - Body type "H21".

The group "Body" addresses all the joints of the robot (the number of joints depends on your NAO - Body type).

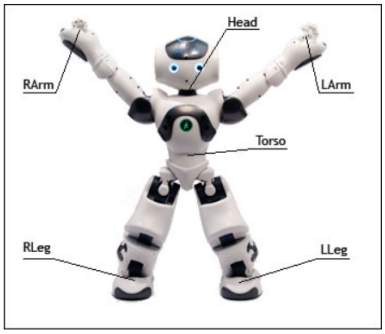
It is possible to get the list of joints available on your robot using the `ALMotionProxy::getBodyNames` method, described in the section: Case 2: Programmatic access to Joint Names.

链接：

http://doc.aldebaran.com/2-5/family/robots/bodyparts.html#nao-chains

B： 各个 Effector 名称

Effectors



These **Effector** names are identical to the **Chain** name except for "Torso".

Effector name	**Position**	**End transform**
"Head"	At the neck joint	Position3D(0.0, 0.0, 0.0)
"LArm"	Inside the hand	Position3D(HandOffsetX, 0.0, -HandOffsetZ)
"LLeg"	Below the ankle	Position3D(0.0, 0.0, -FootHeight)
"RLeg"	Below the ankle	Position3D(0.0, 0.0, -FootHeight)
"RArm"	Inside the hand	Position3D(HandOffsetX, 0.0, -HandOffsetZ)
"Torso"	A reference point in the torso	Position3D(0.0, 0.0, 0.0)

All the points are defined in relation of the **Torso** position and depend of your NAO - Version.

链接：

https://developer.softbankrobotics.com/nao-naoqi-2-1/nao-documentation/nao-technical-guide/nao-technical-overview/effector-chain#nao-effector

C： ALMath Module

一个和机器人运动学解算有关的工具库

模块核心为几个比较有用的类 (Rotation,Transform,Pose6D,etc)

- 官方文档： http://doc.aldebaran.com/2-4/ref/libalmath/overview.html

其他资料：

- Naoqi2.1 API 官方文档： https://developer.softbankrobotics.com/nao-naoqi-2-1/naoqi-developer-guide/naoqi-framework/naoqi-apis#naoqi-api