

# Kinematic Model Verification Platform: Quadruped Unitree Go1

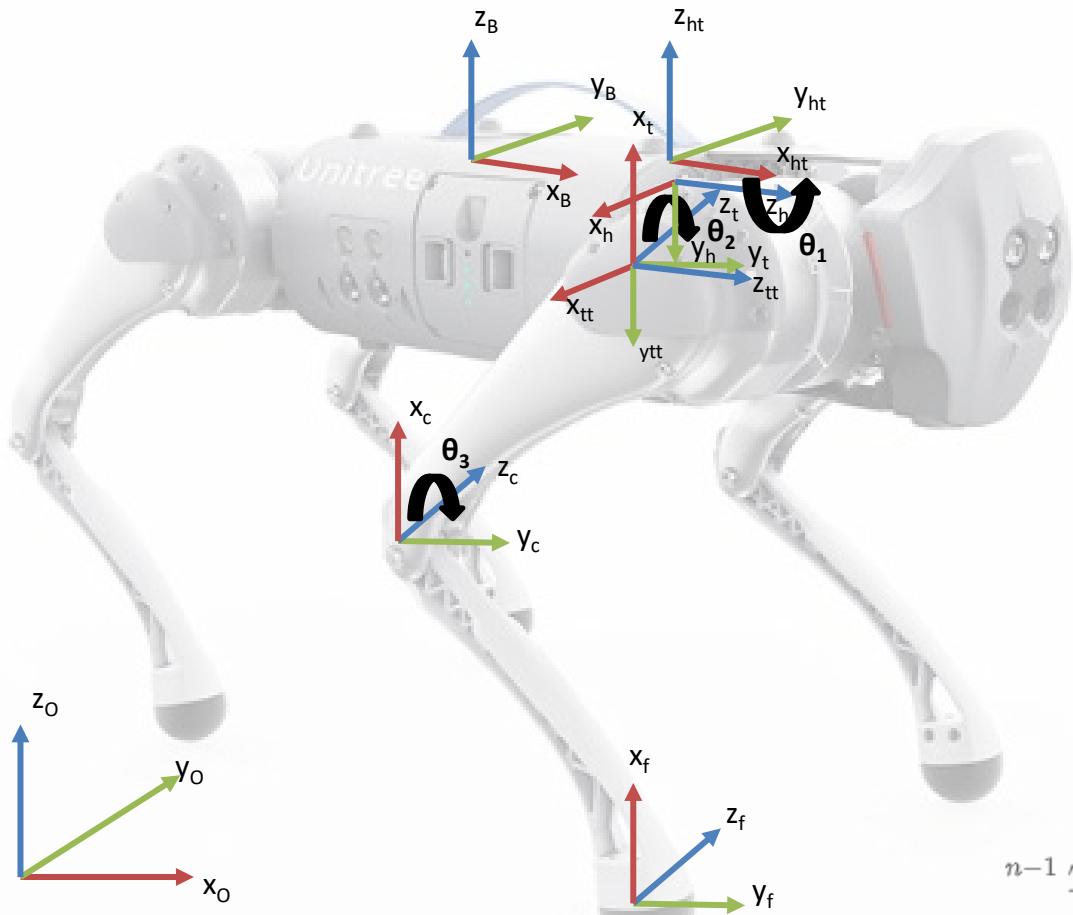
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## Unitree Go1 Quadruped Kinematic Model



### Front Right Leg

$$T_b^0 = \begin{bmatrix} R_{zyx} & pb^T \\ 0 & 1 \end{bmatrix}$$

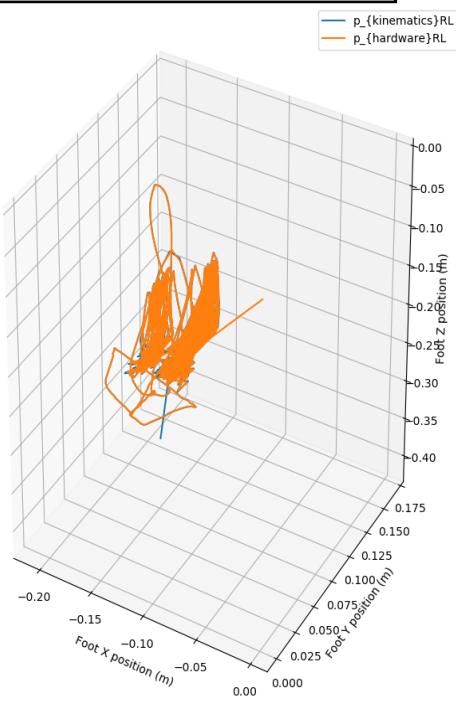
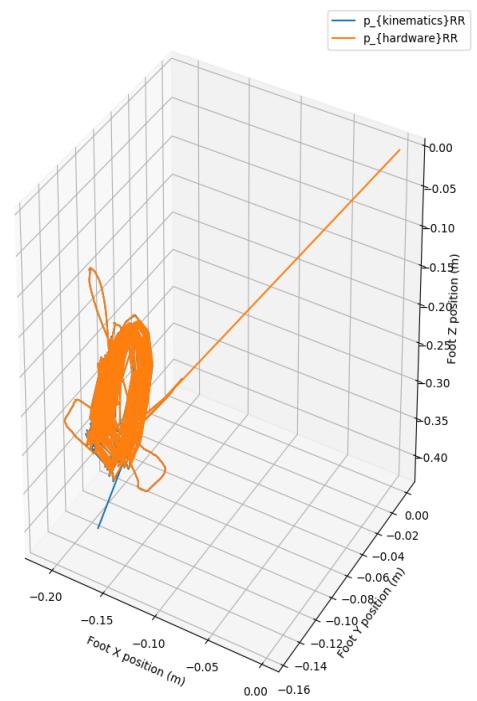
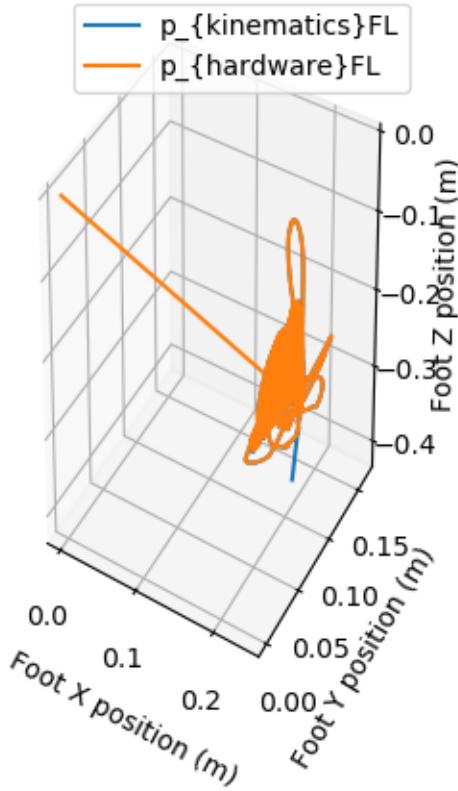
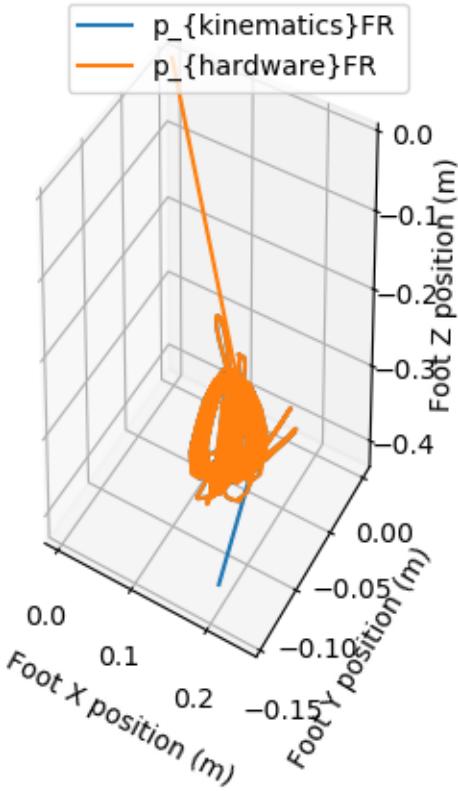
No	$\Theta_n$	$\alpha_n$	$r_n$	$d_n$
1 (B->ht)	0	0	0.1881	0
2 (ht->h)	$-\pi/2$	$-\pi/2$	0.04675	0
3 (h->tt)	0	0	0.08	0
4 (tt->t)	$-\pi/2$	$\pi/2$	0	0
5 (t->c)	0	0	0.213	0
6 (t->f)	0	0	0.213	0

$${}^{n-1} T_n = \left[ \begin{array}{ccc|c} \cos \theta_n & -\sin \theta_n \cos \alpha_n & \sin \theta_n \sin \alpha_n & r_n \cos \theta_n \\ \sin \theta_n & \cos \theta_n \cos \alpha_n & -\cos \theta_n \sin \alpha_n & r_n \sin \theta_n \\ 0 & \sin \alpha_n & \cos \alpha_n & d_n \\ \hline 0 & 0 & 0 & 1 \end{array} \right] = \left[ \begin{array}{c|c} R & T \\ \hline 0 & 0 \\ 0 & 0 \\ 0 & 1 \end{array} \right]$$

## Unitree Go1 Quadruped

## Kinematic Model Verification with Hardware Data

Codebase: [https://github.com/ARMLabCUICAR/Quadruped\\_Locomotion\\_Model\\_Based\\_DRL.git](https://github.com/ARMLabCUICAR/Quadruped_Locomotion_Model_Based_DRL.git)



Parameter Foot Position MSE	Front Right (FR)	Front Left (FL)	Rear Right (RR)	Rear Left (RL)
X	$2.3 \times 10^{-5}$	$2.3 \times 10^{-5}$	$2.3 \times 10^{-5}$	$2.3 \times 10^{-5}$
Y	$1.05 \times 10^{-5}$	$1.05 \times 10^{-5}$	$1.05 \times 10^{-5}$	$1.05 \times 10^{-5}$
Z	$10^{-4}$	$10^{-4}$	$10^{-4}$	$10^{-4}$

