AlienGo SDK HighLevel Interfaces

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1. AlienGo SDK HighCmd

适用于1.0.17及之后版本的运动程序&SDK。

1.1 Useful control command in HighCmd struct for custom development

uint8_t **mode**	0	Idle.
	1	Standing, in force control.
	2	Walking, following target velocity.
	3	Walking, following target position.
	4	Walking, following a given path, reserve for future release.
	5	Stand down, in position control.
	6	Stand up, in position control.
	7	Damping mode, all motors.
	8	Recovery mode.
uint8_t **gaitType**	0	Trot walking.
	1	Trot running, reserve for future release.
	2	Stairs climbing.
uint8_t **speedLevel**	0	Default low speed.
	1	Default medium speed.
	2	Default high speed.
	SpeedLevel setting is now only used for **mode 3**.	

float **dFootRaiseHeight** (unit: m)	Swing foot height adjustment from default swing height.
float **dBodyHeight** (unit: m)	Body height adjustment from default body height.
float **position**[2] (unit: m)	Desired x and y position in the inertial frame, which is established at the beginning instance of the sport mode. Position setting is used in **mode 3** as target position.
float **rpy**[3] (unit: rad)	Desired yaw-pitch-roll Euler angle, with Roll = rpy[0], Pitch = rpy[1], Yaw = rpy[2]. RPY setting can be used in **mode 1** as target orientation. Yaw setting can be used in **mode 3** as target yaw angle.
float **velocity**[2] (unit: m/s)	Desired robot forward speed and side speed in the body frame. Velocity setting is used in **mode 2** as target linear velocity.
float **yawSpeed** (unit: rad/s)	Desired rotational yaw speed. YawSpeed setting is used in **mode 2** as target rotational speed.

1.2 AlienGo SDK HighCmd mode

mode	state	controlled by	previou
mode 0	Idle.	none	all mod
mode 1	Standing, in force control.	rpy, dBodyHeight	mode 2
mode 2	Walking, following target velocity.	velocity+yawSpeed, dBodyHeight, dFootRaiseHeight	mode 1

1192 字

mode 3	Walking, following target position.	position+rpy[2]	mode 1
mode 4	Walking, following a given path, reserve for future release.	reserve for future release	mode 1
mode 5	Stand down, in position control.	none	mode 6
mode 6	Stand up, in position control.	none	mode 1
mode 7	Damping mode, all motors.	none	all mod
mode 8	Recovery mode.	none	mode 7

状态机：

注意：

1．**mode5（低姿态锁定）仅为一个过渡状态，请勿长时间保持这个状态。**

2．**mode7（阻尼模式）相当于L2+B，软急停。**

3．**蹲下过程：mode2 -> mode1 -> mode6 -> mode5 -> mode7 。**

4．**站起过程：mode7 -> mode5 -> mode6 。**

5．**解锁行走：mode6 -> mode1 -> mode2 。**

6．**摔倒恢复：摔倒 -> mode7 -> mode8 。**

7．**没有指令给到机器狗时，可以让机器狗处于mode0（空闲状态）。**

1.3 HighCmd变量初始化

1192 字

```
128         }
129     if(motiontime>24000 ){
130         cmd.mode = 1;
131     }*/
132
133     HighCmd mycmd = {0};
134     udp.InitCmdData(mycmd);
135
136     mycmd.mode = 2;
137     mycmd.gaitType = 1;
138     mycmd.velocity[0] = 0.2f;
139     mycmd.footRaiseHeight = 0.1;
140
141     udp.SetSend(mycmd);
142 }
143
```

HighCmd结构体变量，申请变量后需要初始化变量（主要是其中的标志位变量初始化），可以使用udp.InitCmdData(&HighCmd highcmd)函数来实现。初始化之后可以正常使用。

2. AlienGo SDK HighState

适用于1.0.17及之后版本的运动程序&SDK。

2.1 Useful state feedback in HighState struct for custom development

uint8_t **mode**	参考1.1 HighCmd中mode的注释
IMU **imu**	参考2.2 AlienGo SDK HighState IMU
float **position**[3] (unit: m)	机器人的位置坐标反馈，通过机器人在惯性系（世界坐标系）中里程计的数据获得的位置坐标，会漂移 position[0] = x position[1] = y position[2] = z

| float **velocity**[3] (unit: m/s)	机器人在各个方向的速度反馈 velocity[0] = forwardSpeed velocity[1] = sideSpeed velocity[2] = updownSpeed
float **yawSpeed** (unit: rad/s)	机器人的旋转速度
Cartesian **footPosition2Body**[4] (unit: m)	足端相对于身体的位置（机身坐标系） footPosition2Body[0] = 右前腿足端的位置 footPosition2Body[1] = 左前腿足端的位置 footPosition2Body[2] = 右后腿足端的位置 footPosition2Body[3] = 左后腿足端的位置
Cartesian **footSpeed2Body**[4] (unit: m/s)	足端相对于身体的速度（机身坐标系） footSpeed2Body[0] = 右前腿足端的速度 footSpeed2Body[1] = 左前腿足端的速度 footSpeed2Body[2] = 右后腿足端的速度 footSpeed2Body[3] = 左后腿足端的速度
int16_t **footForce**[4]	足端传感器数值，触地检测。 这个值是飘的，每个气囊的值不一样，需要实际测试，通常是通过变化量来检测是否触地。
uint8_t **wirelessRemote**[40]	遥控器键值的反馈，可参考提供的手柄例程源码

2.2 AlienGo SDK HighState IMU

float quaternion[4]	归一化的四元数 quaternion[0] = w quaternion[1] = x quaternion[2] = y quaternion[3] = z

1192 字

float gyroscope[3] (unit: rad/s)	陀螺仪，角速度，原始数据 gyroscope[0] = x gyroscope[1] = y gyroscope[2] = z
float accelerometer[3] (unit: m/s²)	加速度计，加速度，原始数据 accelerometer[0] = x accelerometer[1] = y accelerometer[2] = z
float rpy[3] (unit: rad)	欧拉角 rpy[0] = Roll rpy[1] = Pitch rpy[2] = Yaw
int8_t temperature	IMU温度
在加速运动时，由 IMU 计算出的机器人姿态会发生漂移。	

2.3 坐标系

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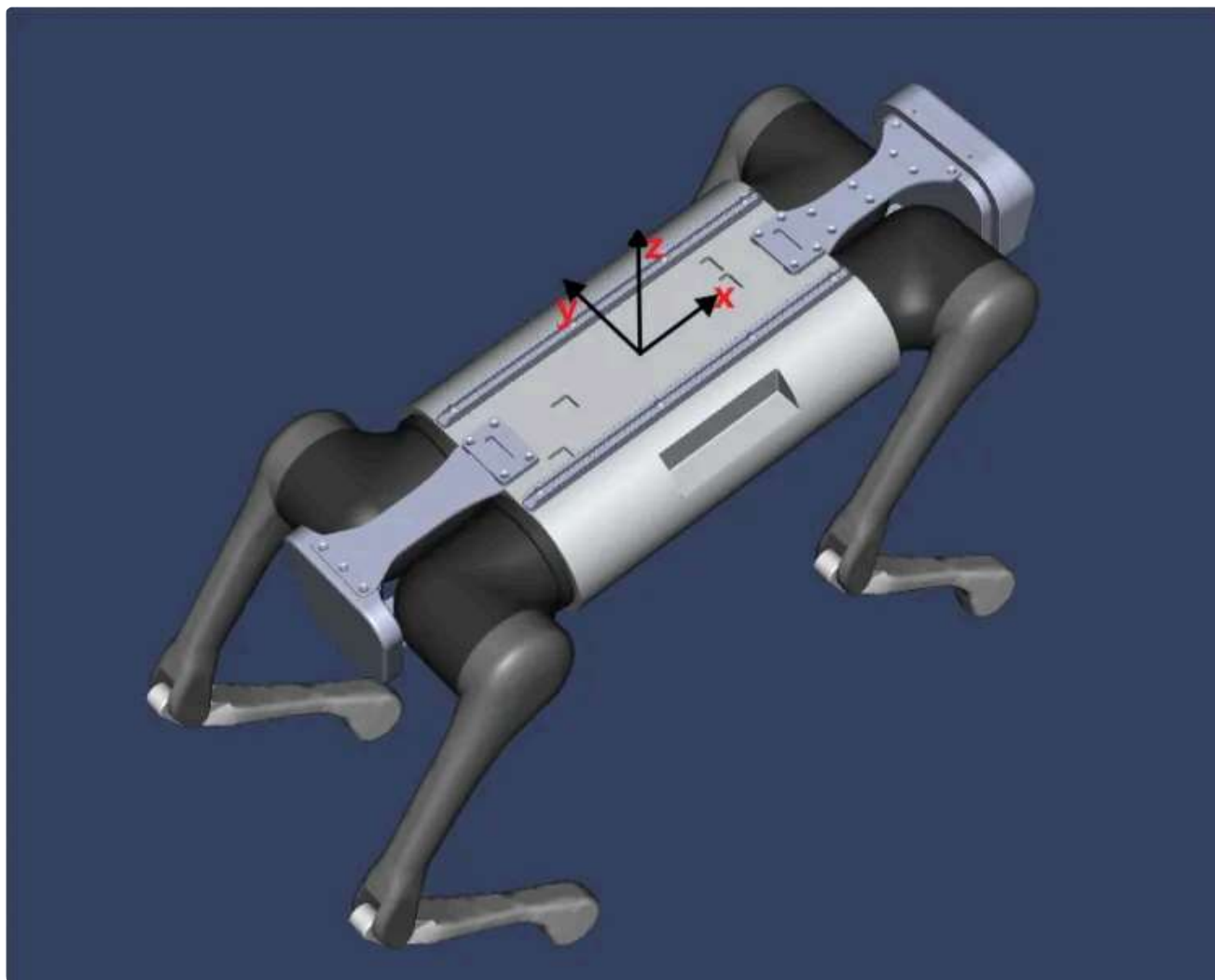
机身坐标系

运动模式启动建立，以机身中心为原点，前向为x向，左向为y向，垂直向上为z向。

世界坐标系（惯性系）

运动模式启动建立，以机身中心为原点，前向为x向，左向为y向，垂直向上为z向。

初始坐标系

IMU上电时建立，IMU方向Z轴以重力方向，XY以开机时为准，拿到的角速度是在初始坐标系下的。

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