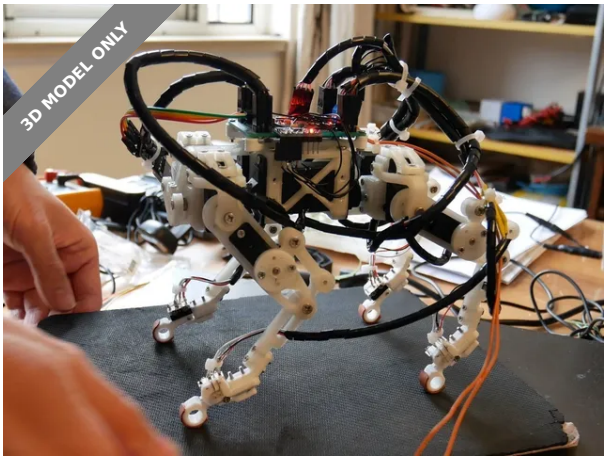

Quadruped Bai Servo 12-DOF Desktop Robot Dog

TomKnox

VIEW IN BROWSER

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Summary

Low-cost 3D-printed robot dog with twelve micro servos, bushing joints, MPU-6050 balance and an Arduino Nano trot gait.

Hobby & Makers > RC & Robotics

Tags: robot arduino robotics arduinonano servo quadruped walkingrobot mpu6050 kinematics robotdog

A small four-legged walking robot driven by twelve micro servos. Each leg has three joints (abduction, hip and knee), every joint turns on a self-lubricating bushing, and an IMU keeps the body level while the legs trot. An Arduino Nano runs the inverse kinematics and the gait on board, so the robot walks with no PC attached.

Updated for modern use: an Arduino Nano build with off-the-shelf modules, one purchase list, a print list with counts and one build guide in build order.

What you build

- 12 EMAX ES08A II micro servos, three per leg
- Bushing joints: an SF-1 0305 bushing in every joint hole, M3 joint screws and M2 servo screws

- A printed body frame with bridges, board holders and an 18650 battery holder underneath
- Arduino Nano and MPU-6050 IMU on a prototype carrier board with 12 servo headers
- Optional foot switches so the gait knows when each foot touches down

Files

- All 25 print-ready STL files: body frame and bridges, board and joint holders, hip and servo holders, legs, links, foot tips and optional foot-sensor parts
- Build guide PDF: print list, parts, servo calibration, leg and body assembly, wiring and firmware
- Bill of Material PDF with quantities, notes and a shop link for every off-the-shelf part

Print settings

PETG or PLA at about 70% infill. Orient each part for strength along its long axis and add supports where needed. Most parts come as a left and a mirrored right version; print two of each. Print leg_1_2_MIR four times, two of them mirrored in the slicer.

Electronics

- Arduino Nano compatible board (ATmega328P, 5 V)
- MPU-6050 (GY-521) IMU module for roll and pitch correction
- TPS61088 boost converter set to 5.5 V for the servo rail
- One 18650 high-drain Li-ion cell in a holder, with an XT30 plug

Bill of Material

Every part you need to buy, with quantities, notes and shop links, is in the Bill of Material PDF in the files of this model. About 20 M2 x 26 mm screws come from a metric fastener supplier, because this length is rarely sold in mixed kits. The original custom controller and boost boards are optional; order them from PCBWay or another PCB assembly service. The build guide lists both.

Software

Install the Arduino IDE and the FlexiTimer2 library, open the gait sketch from the source files, select Arduino Nano and upload over USB. Adjust the servo zero offsets until all four legs stand symmetric, then try the trot gait on a flat, grippy surface.

Skill level

Intermediate. You calibrate servos before fitting the horns, press bushings into the joints, solder a carrier board with 12 servo headers and upload an Arduino sketch.

Full build guide and source

The build guide, source and all project files: https://github.com/ToolKnox/hawkridge-quadruped-bai-servo-12dof-robot (Code > Download ZIP).

Safety

Li-ion cells can deliver very high current. Use protected cells or a protected holder, insulate the wiring and charge cells outside the robot. Set the boost converter to 5.5 V before plugging in the servos.

This remix is based on

GitHub - psrobotics/quadruped_bai_servo: Open source quadruped with feet sensor.

Model files

STL files 25 files

leg_link_1.stl

hip_joint_holder_1.stl

pcb_holder.stl

leg_link-1_mir.stl

leg_tip.stl

leg_2.stl

body_bridge_1.stl

leg_2_mir.stl

leg_1.stl

feet_sensor_leg_tip_sensor.stl

hip_holder_2.stl

servo_holder_1_mir1.stl

feet_sensor_leg_tip_sensor2.stl

body_frame_1.stl

servo_holder_1.stl

body_frame_2.stl

leg_link-1.stl

leg_1_2_mir.stl

leg_link_1_mir.stl

hip_joint_holder_1_mir.stl

joint_ab_holder.stl

leg_1_mir.stl

feet_sensor_sensor_shelf.stl

leg_tip_mir.stl

hip_holder_2_mir.stl

Other files

Documentation 2 files

quadruped-bai-servo-robot-dog-build-guide.pdf

quadruped-bai-servo-robot-dog-bill-of-material.pdf

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