Design and implementation of a walking **quadruped** robot cat

Optimizing the gait of a 3d-printed robot cat

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1 Introduction

This project focuses on designing, 3D-printing, and programming a walking quadruped robot cat. The robot is controlled by an onboard Arduino system, and the main goals were:

- Develop an optimized gait so the robot can walk forward independently.
- Ensure the robot operates solely on battery power, without external cables.
- Create a 3D-printed prototype that clearly resembles a cat.

2 Tools and Materials

The mechanical components were designed in **SolidWorks** and 3D-printed on a **Ender 3 v2 SE** in **PLA**. The key hardware used in the robot includes:

- 8 × Dynamixel AX-12
- 4 × Dynamixel AX-18
- Arduino Uno microcontroller
- DYNAMIXEL Shield for Arduino Uno
- SMPS2Dynamixel switched-mode power supply
- 2 × Luxorparts LM2596S, 2.5 A adjustable voltage regulator
- LiPo battery, 4S 15.2 V, 1300 mAh
- 1–8S LiPo battery voltage checker / alarm
- ROBOTIS 3-pin extension PCB
- Plastic "ball bearings" for Dynamixel joints and FP04-F2 brackets
- Seeed Studio addressable RGB LED strip
- 5 V red/green indicator LED
- Momentary push button

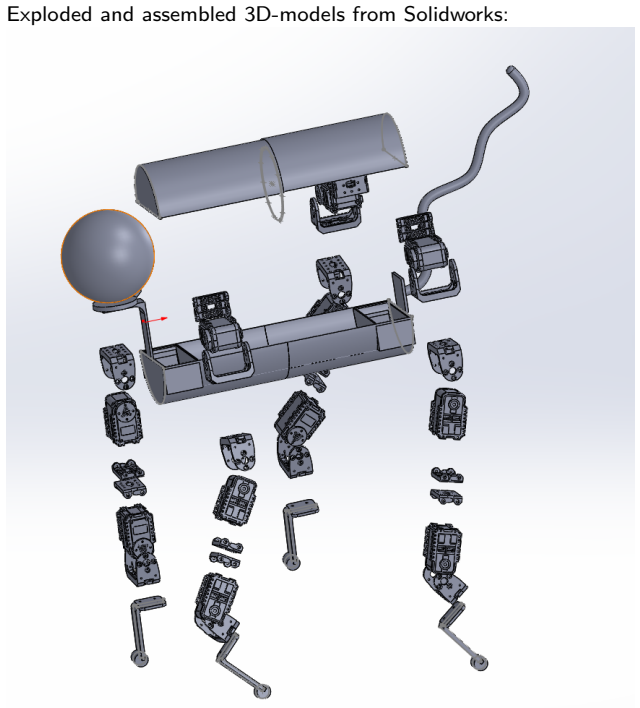
3 Result

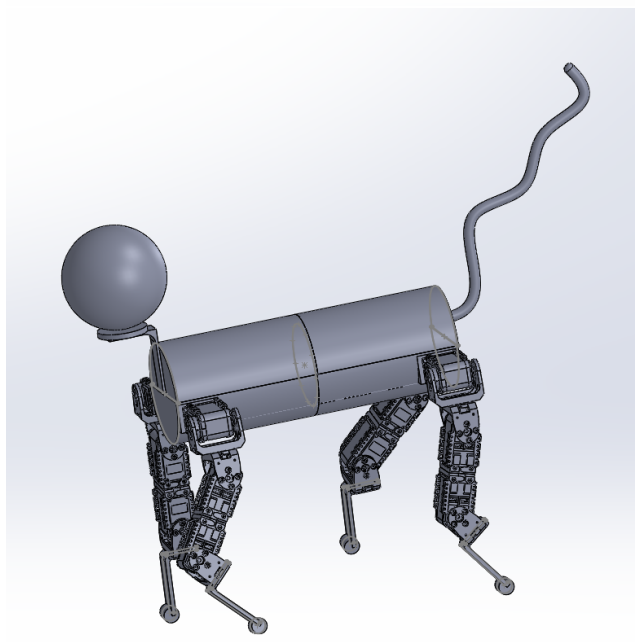


- The robot cat successfully walks using a stable gait at multiple speeds.
- The physical prototype achieves a clear, cat-like appearance.
- The robot can move fully independently without any external power or tether.
- An additional feature was implemented: a mode switch that lets the user select between normal walking gait, dancing or display mode.
- Future work includes implementing dedicated running gaits and adding sensors such as an accelerometer for self-stabilization or a camera for navigation.

Extra figures

Exploded and assembled 3D-models from Solidworks:





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