PROJECT ABSTRACT

Quadruped Spider Robot with Servo Gait Control

A four-legged spider robot: eight servos drive four two-joint legs through programmed wave and trot gaits, with ultrasonic obstacle avoidance and Bluetooth control. Delivered built-to-order with assembled robot, firmware, tuning guide, report, PPT and viva kit.

Project type: Hardware

Availability: Built to order

Suitable branches: Mechanical

Technologies: Arduino Uno, 16-channel servo driver, 8x servo motors, aluminium chassis, ultrasonic sensor, HC-05 Bluetooth, gait firmware

Price: Request a quotation

Prepared by Projectech · projectech.in — for academic project reference.

01. Title

Quadruped Spider Robot with Servo Gait Control

02. Introduction / Background

Wheeled robots are easy; legged robots are where robotics gets interesting. A quadruped must coordinate eight servos in precise phase relationships just to stand, let alone walk — and when the timing is right, the machine genuinely walks. The core engineering is the gait: the timed pattern of leg lifts and plants, from the ultra-stable wave gait (one leg at a time) to the faster trot (diagonal pairs together). This project builds a spider-style quadruped — four legs, hip and knee servos per leg, an Arduino with a servo driver board, ultrasonic obstacle sensing and Bluetooth phone control — and teaches gait sequencing, servo power budgeting and sensor-driven behavior.

03. Problem Statement

Student robotics rarely moves beyond wheels because legged locomotion looks intimidating: eight servos, phase timing, power spikes and balance. The project addresses this with a buildable quadruped where gaits are implemented as phase tables the student can read, tune and extend — plus obstacle avoidance and Bluetooth control — making legged locomotion a practical final-year build.

04. Objectives

- Build a quadruped chassis: four two-joint legs, eight servos, aluminium linkages.
- Implement wave and trot gaits as phase-timed servo sequences in firmware.
- Add ultrasonic obstacle detection with stop-and-turn behavior.
- Provide Bluetooth remote control from a phone app.
- Design a dedicated high-current servo power bus with a documented current budget.
- Supply a gait tuning guide for stride, lift height and phase timing.
- Deliver the complete student kit: robot, firmware, wiring and power docs, report, PPT and viva Q&A.;

05. Proposed Methodology

The robot is built around an Arduino with a 16-channel servo driver generating the PWM signals for eight servos on four two-joint legs. Gaits are stored as phase tables: the firmware steps a gait phase at the gait frequency and looks up each servo's angle, producing the wave gait (sequential leg lifts) or the trot (diagonal pairs). Turning uses differential leg phasing. An ultrasonic sensor scans ahead for obstacles; an HC-05 Bluetooth link takes phone commands. Servos run on a dedicated 5–6 V high-current bus separate from logic power, sized from the documented current budget, and the student tunes the gait parameters on their own build with the tuning guide.

06. System Architecture / Working

On boot the servos move to the neutral standing pose. The selected gait table defines each servo's angle versus gait phase; the firmware advances the phase and updates all eight servos each cycle. The ultrasonic sensor watches ahead — on obstacle detection the robot halts and turns — while Bluetooth commands override autonomy for walking, turning and gait selection. The separate high-current servo supply prevents the brownouts that stall servo robots, and the tuning guide lets the student adapt stride and timing to their own build.

07. Hardware / Software Requirements

- Arduino Uno (ATmega328P)
- 16-channel servo driver (PCA9685 class)
- 8x SG90/MG996R-class servo motors

- Aluminium chassis and leg linkages
- Ultrasonic distance sensor
- HC-05 Bluetooth module
- Phone control app (generic Bluetooth controller)
- 5–6 V high-current servo supply + logic supply
- Arduino IDE (C/C++ firmware)

08. Expected Outcomes

- A walking quadruped demonstrating wave and trot gaits.
- Ultrasonic obstacle stop-and-turn behavior.
- Bluetooth phone control of walk, turn and gait select.
- A documented servo current budget and power design.
- A complete report, PPT and viva Q&A; on gaits, servo control and power design.

09. Applications

- Teaching legged locomotion and gait kinematics.
- Demonstrating multi-servo coordination and power design.
- A platform for advanced gaits and sensor additions.

10. Future Scope

- IMU-based balance feedback for uneven terrain.
- Autonomous waypoint walking with odometry.
- Additional gaits (pace, bound) in the gait library.
- Camera-based line or target following.