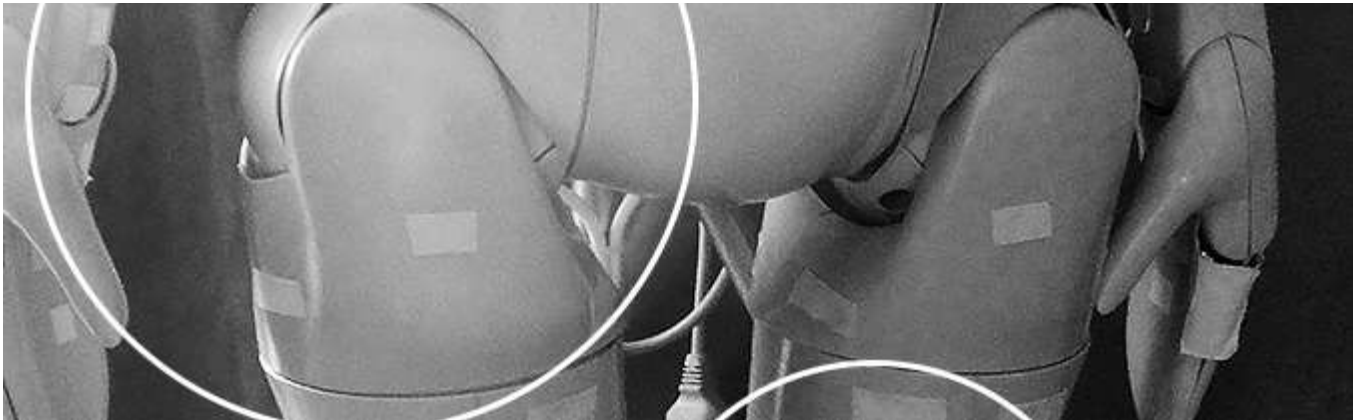


MA-UNI

TECHNICAL BRIEF · CURRENT PROTOTYPE

A full-scale humanoid robotics proof of concept exploring an alternative approach to lightweight architecture, mechanical integration and human-oriented physical design.



CURRENT PROTOTYPE — KEY PARAMETERS

155–160 cm human-scale height	10–15 kg current prototype weight	~30 servo-driven joints	~US\$2,000 materials + fabrication*
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*Approximate cost of materials and fabrication, excluding development labor.

1 — MECHANICAL & DESIGN PHILOSOPHY

MA-UNI explores a different starting point for humanoid robotics. Instead of designing primarily around exposed mechanical systems and subsequently creating a human-like exterior, the project attempts to develop the **mechanical architecture and human-oriented body design as one integrated system.**

Integrated Human-Oriented Architecture

Mechanical components are organized within the body structure, allowing smoother external forms and proportions inspired by the human body while maintaining the required mechanical functionality.

2 — MECHANICAL ARCHITECTURE

Lightweight Construction

The current full-scale structure has been developed with a very low overall mass relative to its human-scale dimensions.

Modular Structure

Structural elements are designed to allow modification, replacement and future redesign without rebuilding the entire platform.

3D-Printed Components

Digital fabrication enables rapid prototyping, iterative development and relatively low-cost structural experimentation.

Plastic Bearings & Bushings

The prototype uses 3D-printed plastic bearing and bushing solutions to reduce mechanical complexity, weight and cost.

3 — WEIGHT DISTRIBUTION

The autonomous power batteries are integrated into the thigh sections of the robot.

This creates a relatively low center of gravity and contributes to the overall balance of the humanoid structure.

4 — ACTUATION & MOTION

Current Actuation

Approximately 30 servo actuators currently control different sections of the body.

Scalable Architecture

The conceptual architecture can be expanded toward approximately 100 actuators depending on the desired functionality and future engineering requirements.

Movement Capabilities

The prototype supports articulated movement, programmable gestures and coordinated body-motion experiments.

Extended Articulation

The body architecture explores extensive rotational movement of the arms, legs and waist, allowing complex experimental humanoid poses.

5 — ELECTRONICS & CONTROL

- Arduino Mega controller
- Dedicated electronic control systems
- Programmable movement sequences
- Autonomous power system

6 — WHAT HAS ALREADY BEEN DEMONSTRATED

PHYSICAL Full-scale humanoid body Human-scale proportions Lightweight construction Integrated body structure	MECHANICAL ~30 actuated joints Articulated limbs Waist mobility Modular components 3D-printed structures	SYSTEM Autonomous power Arduino Mega control Programmable movement Coordinated motion
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7 — MANUFACTURING PHILOSOPHY

The current prototype intentionally uses accessible components and digital fabrication methods rather than expensive industrial robotics hardware.

This makes it possible to rapidly test mechanical ideas, modify components and explore alternative configurations.

The long-term objective is not to retain hobby-grade components, but to investigate whether the same architectural philosophy can be translated into **purpose-designed industrial components and scalable manufacturing methods.**

8 — CURRENT DEVELOPMENT STATUS

MA-UNI is an early-stage physical proof of concept. The current prototype should therefore not be interpreted as an industrial humanoid product or as a demonstration of commercial-grade reliability, safety or autonomous intelligence.

The primary achievement at this stage is the physical realization of the underlying architecture and design philosophy at full human scale.

9 — DEVELOPMENT PATH

STAGE 01 Engineering Refinement Structural optimization, purpose-designed components, advanced actuators and improved reliability.	STAGE 02 Intelligent Interaction Sensors, perception, AI systems, voice, interaction and autonomous behavior.	STAGE 03 Industrial Platform Safety engineering, manufacturing optimization, scalable production and application development.
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The current prototype demonstrates that the core architectural concept can be physically realized with relatively simple and accessible components.

The next question is not whether the concept can be built, but how far its underlying architecture can be developed when supported by industrial engineering, advanced actuation, sensing, AI and manufacturing expertise.