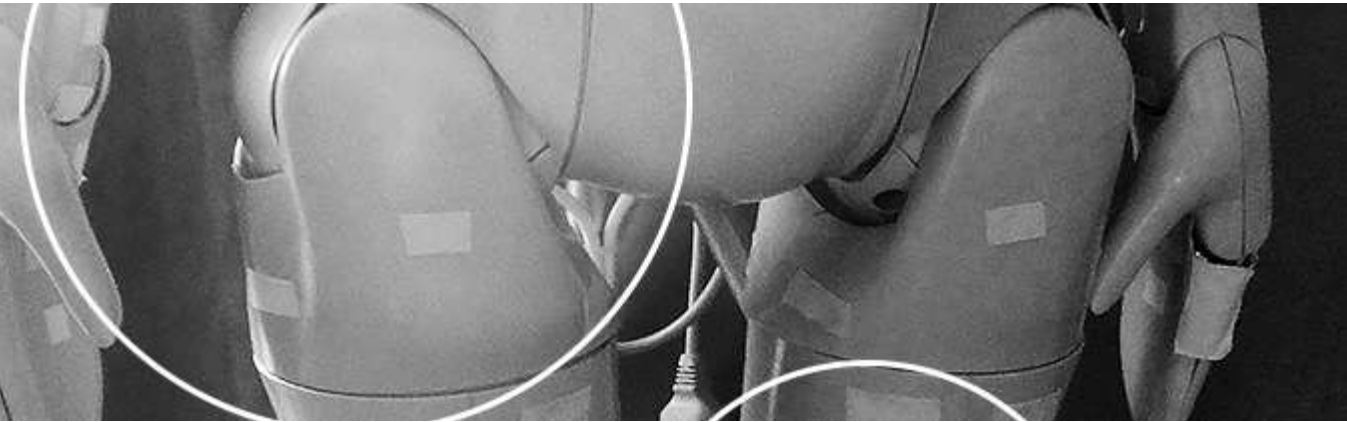


# MA-UNI

## TECHNICAL DEVELOPMENT OPPORTUNITY

From a physically realized full-scale prototype toward a potentially scalable humanoid platform combining lightweight architecture, integrated mechanical design and human-oriented interaction.



### 1 — THE DEVELOPMENT OPPORTUNITY

MA-UNI should not be evaluated only as the current prototype. The more important question is whether the underlying architectural philosophy can be translated into a new generation of industrial humanoid systems.

**The current prototype is a starting point, not the final product.** It demonstrates that a human-scale humanoid body can be physically realized using a lightweight, modular and relatively low-cost construction approach.

Industrial development could preserve this fundamental philosophy while replacing prototype-level components with purpose-designed engineering solutions.

### 2 — FROM PROTOTYPE COMPONENTS TO INDUSTRIAL SYSTEMS

|                                                      |   |                                                                                                 |
|------------------------------------------------------|---|-------------------------------------------------------------------------------------------------|
| <b>Current</b><br>Hobby-grade servo actuators        | → | <b>Development Direction</b><br>Purpose-designed high-performance actuators                     |
| <b>Current</b><br>3D-printed structural components   | → | <b>Development Direction</b><br>Optimized composite, polymer or lightweight metal structures    |
| <b>Current</b><br>Arduino-based control architecture | → | <b>Development Direction</b><br>Industrial-grade distributed control and computing architecture |
| <b>Current</b><br>Programmable movement sequences    | → | <b>Development Direction</b><br>Whole-body motion control and autonomous behavior               |
| <b>Current</b><br>Basic autonomous power             | → | <b>Development Direction</b><br>Optimized power architecture and energy management              |

### 3 — ENGINEERING DEVELOPMENT AREAS

|                                                                                                                                               |                                                                                                                           |                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Actuation</b><br>Development of more powerful, efficient and controllable actuation systems while preserving the lightweight architecture. | <b>Structure</b><br>Optimization of load-bearing structures, materials, joints and interfaces for industrial reliability. | <b>Sensing</b><br>Integration of perception, position, force and environmental sensing systems.           |
| <b>Control</b><br>Transition from predefined motion sequences toward advanced real-time movement control.                                     | <b>AI &amp; Interaction</b><br>Integration of speech, perception, AI models and human-machine interaction.                | <b>Manufacturing</b><br>Development of repeatable manufacturing processes suitable for future production. |

### 4 — PRESERVING THE CORE PHILOSOPHY

Industrial development should not simply turn MA-UNI into another conventional humanoid robot.

The central opportunity is to preserve the characteristics that distinguish the concept while replacing prototype-level implementation with professional engineering.

|                                                                                          |                                                                                             |                                                                                                                 |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Lightweight</b><br>Human-scale dimensions without unnecessarily high structural mass. | <b>Modular</b><br>Architecture designed for continuous evolution and component replacement. | <b>Human-Oriented</b><br>A deliberately approachable artificial body rather than an exposed industrial machine. |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

### 5 — POTENTIAL HUMAN INTERACTION PLATFORM

The human-scale physical architecture creates the possibility of developing MA-UNI for environments in which direct human interaction is more important than purely industrial automation.

- Human-machine communication
- Education and learning
- Interactive demonstrations
- Movement and physical activity applications
- Entertainment and creative experiences
- Future domestic and personal environments

These applications should be considered future development directions rather than capabilities currently demonstrated by the prototype.

### 6 — DEVELOPMENT PHASES

|                                                                                                                                                              |                                                                                                                                                     |                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PHASE 01</b><br><b>Engineering Validation</b><br>Re-engineer the existing architecture using professional mechanical, electrical and control engineering. | <b>PHASE 02</b><br><b>Advanced Prototype</b><br>Develop improved actuators, sensing, computing, power management and dynamic movement capabilities. | <b>PHASE 03</b><br><b>Industrial Platform</b><br>Validate manufacturability, reliability, safety, cost structure and potential application markets. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|

### 7 — WHY EXTERNAL EXPERTISE IS IMPORTANT

The current project has been developed independently by a concept designer rather than by a conventional robotics engineering organization.

This is both a limitation and an opportunity.

The limitation is that the current prototype has not yet benefited from industrial engineering resources, specialized actuation development, advanced control systems or manufacturing optimization.

The opportunity is that the underlying concept can now be evaluated and developed by specialists in robotics, mechanical engineering, AI, manufacturing and venture development.

## 8 — WHAT WOULD NEED TO BE PROVEN

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- Industrial feasibility of the lightweight architecture
  - Long-term mechanical reliability
  - Actuator efficiency and performance
  - Dynamic stability and safe human interaction
  - Power consumption and operating time
  - Manufacturing cost at meaningful production volumes
  - Practical applications with clear market value
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**MA-UNI is not presented as a finished humanoid product.**

It is a physical starting point for investigating whether a different architectural philosophy can become a viable industrial humanoid platform.

**The opportunity lies in developing the concept without losing the characteristics that made the original prototype different.**

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