

# **Arduino-Based Humanoid Robot**

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**Abstract:** *This project presents a simplified humanoid robot designed for basic speech and movement functionalities. The robot is programmed to speak only pre-inputted phrases and performs limited motions, including moving left, right, forward, and backward, as well as controlled head, arm, and whole-hand movements. The system relies on pre-defined voice modules and servo motor mechanisms to execute these actions, ensuring precise yet restricted operation. Unlike advanced AI-driven humanoids, this model operates within a closed-loop framework, making it suitable for applications requiring predictable behaviour, such as educational demonstrations, customer service roles, or interactive exhibits. Key advantages include ease of programming, low computational requirements, and reliable performance. However, its lack of autonomous decision-making and natural language processing limits adaptability. Future enhancements could integrate sensor-based feedback for improved responsiveness while retaining simplicity.*

**Keywords:** BLDC Motor, OLED, Humanoid, ESP32, HC-SR04, HC-05

