SHINEY-THE HUMANOID ROBOT

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Abstract

Humanoid robots, designed to mimic human appearance and behavior, have emerged as a pivotal area of research in robotics and artificial AI. It plays a diverse role in multidisciplinary advancements in this Humanoid Robot basically concentrating on mechanical systems, sensory integration, and Analytical capabilities. We developed and tested the role of robot under Artificial Intelligence in enriching the conversation between humans and robots. This robot is capable of basic facial expressions, locomotions such as walking, dancing and other hand movements that makes it entertaining. To build this Robot, We have used several electronic components majorly like ESP32 microcontroller, PAM8403 Amplifier and Servomotors with Arduino IDE tool.

Problem definition

Title: Enhancing User Engagement and Experience in the Shiney Project

The Shiney Robot project aims to create a platform that caters to the needs of its users by providing personalized content and interactions. With a growing user base, it has become essential to analyze user behavior and preferences to enhance the overall experience.

Key Issues:

1. User Interface: Despite a steady influx of users, current engagement metrics indicate that users are not interacting with the platform as frequently or as deeply as expected.

2. Content Personalization: Based on the previous inputs it will not analyze the data for best use and enhanced user experience.

3. User Retention: A significant downfall rate among users after initial sign-up suggests that the platform is not meeting user expectations or providing sufficient value.

4. Feedback Integration: There is limited capability for users to provide feedback, making it

challenging to adapt the platform to user needs. The only main drawback of this Robot.

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Tools used for simulation

The ESP32 microcontroller was programmed using Arduino IDE tool or platform, with Adafruit GFX library, Adafruit SSD1306,Adafruit PWM servo driver library, ESP Async webserver, XT_DAC_Audio libraries for controlling the servos, OLED display, and voice output through the PAM8403 amplifier.

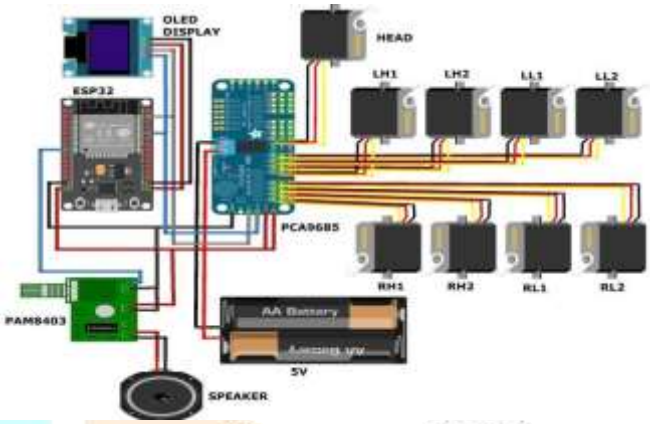

Figure: Circuit diagram of Shiney robot

Limitations of the study

While "Shiney" successfully mimicked human behaviors, there were challenges in real-time processing due to the limitations of the onboard hardware components. More advanced AI-based interactions, such as deep learning, were restricted by the ESP32's computational capacity.

Power consumption was another limitation observed during the trials, as the combination of servos, displays, and sensors LED to relatively short operational times before requiring a recharge.

Methods

1. Design and Components:

The core components include:

ESP32 Microcontroller: Used for processing and controlling the operations of the robot.

Servomotors: The MG995 and SG90 servos were employed for articulation, providing precise control over the movement of the limbs and facial expressions.

PCA9685 Servo Controller: This controller was used to handle multiple servo connections simultaneously, ensuring synchronized movements.

PAM8403 Amplifier: Integrated to enhance the sound output, enabling verbal communication.

OLED Display: Used for providing visual feedback, such as robot status or simple emotive responses.

Sensors: Various sensors (such as the ESP32's onboard capabilities) were implemented for environmental sensing and interaction.

2. Assembly and Programming:

The robot's assembly was based on connecting the servomotors and sensors to the ESP32 via the PCA9685 controller. The servos controlled joint movements (for walking, arm movements) and facial expressions.

Extracted audio generation code from a GitHub repository and integrated it with Audiopad to produce custom sound patterns. This involved modifying the C++ code for waveform manipulation and using Audiopad to generate and control the audio output.

The Shiney robot uses Wi-Fi for seamless communication and remote control, allowing real-time monitoring and access to cloud services for enhanced performance and features.

3. Programming Tools: The ESP32 was programmed using Arduino IDE, with Adafruit GFX library, Adafruit SSD1306,Adafruit PWM servo driver library, ESP Async webserver, XT_DAC_Audio libraries for controlling the servos, OLED display, and voice output through the PAM8403 amplifier.

4. Interaction and Communication:

Verbal Communication: "Shiney" was programmed to recognize simple commands and respond via a synthesized voice through the speaker. Its responses were based on programmed dialogues.

Gesture-Based Interaction: Movements such as waving or pointing were synchronized with verbal communication to create a more natural interaction experience. These gestures were based on predefined9already dumped) motor movements coordinated through the PCA9685 servo controller

Results

FIGURE:SHINEY-THE HUMANOID ROBOT

Reference Video:

https://drive.google.com/file/d/11N_WVHbsh95XmuU7nNukxUEIt8DauoQj/view?usp=drivesdk

FUTURE SCOPE

The future scope of this SHINEY-THE HUMANOID ROBOT is that this Robot will be interfaced with ChatGPT, that enables robot to interact very efficiently. Hence interfacing the ChatGPT with the robot it helps in more effective communication. i.e, If you ask 'Who is the current prime minister of India?', It will give you the answer based on Real-time application.

CONCLUSION

In summary, the Shiney robot project showcases the notable progression in robotics field, giving importance to its ability to communicate or interact with the people. It is mainly used for entertainment purpose through its facial expressions and moments. This robot can be modified into the requirement in later days, as we mentioned in future scope this will be helpful in education, customer support and other areas for its versatile use.

REFERENCE:

1. Honda, A. (2000). "ASIMO: The Humanoid Robot." IEEE Robotics & Automation Magazine, 7(1), 20-31.
2. Katsumata, S., & Hirose, S. (2004). "Design and Control of a Humanoid Robot with High Mobility." Proceedings of the IEEE International Conference on Robotics and Automation.
3. Breazeal, C. (2003). "Emotion and Sociable Humanoid Robots." International Journal of Humanoid Robotics, 1(1), 49-64.
4. Takahashi, S., & Hirai, S. (2006). "Humanoid Robot with High Agility and Versatility." IEEE International Conference on Robotics and Automation (ICRA).
5. Kugler, T., & D'Andrea, R. (2012). "Towards Cognitive Humanoid Robots: A Hybrid Architecture for Intelligent Behavior." IEEE Transactions on Robotics, 28(1), 144-157.
6. Robinson, H., et al. (2014). "The Role of Robots in the Care of Older Adults." Journal of Gerontological Nursing, 40(1), 18-24.
7. Goodrich, M. A., & Schultz, A. C. (2007). "Human-Robot Interaction: A Survey." Foundations and Trends in Human-Computer Interaction, 1(3), 203-275.