Google Voice Assistant with Re-Speaker Using Raspberry Pi

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Abstract: *Voice-based human–machine interaction has become a key component of modern smart systems and IoT applications. This paper presents the design and implementation of a low-cost intelligent voice assistant using a Raspberry Pi 5 integrated with a Re-Speaker microphone array and Google Generative AI services. The Re-Speaker enables far-field voice acquisition through beamforming, noise suppression, and echo cancellation, ensuring accurate speech capture in noisy environments. Captured audio is processed using cloud-based speech recognition and natural language understanding, enabling real-time responses and command execution. The system supports wake-word detection, hands-free interaction, and integration with IoT devices. Experimental results demonstrate high voice detection accuracy, reduced noise interference, fast response time, and reliable system performance, validating the effectiveness of combining embedded hardware with cloud-based AI for smart voice-controlled applications.*

Keywords: Voice Assistant, Raspberry Pi, Re-Speaker, Google GenAI, IoT, Speech Recognition, Embedded Systems