Realtime Audio-to-Audio Translation on Replit

Project: Real-Time Audio-to-Audio Translation

Platform: Replit

Use Case: Translate spoken input from a teacher into spoken output in another language - in real time - using OpenAI's real-time streaming API.

Objective:

Implement a real-time streaming web app on Replit that:

- Captures live microphone input in the browser

- Streams audio to OpenAI's real-time speech translation API

- Receives translated audio and plays it back to the user (or to connected students)

Tech Stack:

Frontend: HTML, JavaScript, Web Audio API

Backend: Node.js + ws for WebSocket proxy

Hosting: Replit (always-on repl)

Streaming API: OpenAI Real-Time Audio API

Architecture Overview:

Mic Input in Browser

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WebSocket Connection -> Node.js Backend on Replit

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OpenAI Real-Time Streaming API

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Translated Audio Response -> Browser Playback

Required APIs:

OpenAI Real-Time Translation (Streaming)

Docs:

- https://platform.openai.com/docs/guides/speech-to-text/streaming
- https://openai.com/blog/introducing-new-speech-and-vision-capabilities-in-the-openai-api

Replit Implementation:

1. Fork & Setup

Create a new Node.js Replit project. Install: npm install express ws axios dotenv

Create .env with your OpenAI key.

2. Backend (Node.js WebSocket Proxy)

index.js - sets up WebSocket relay between browser and OpenAI's API.

3. Frontend (Mic Capture & Playback)

index.html + app.js - captures mic audio, streams to backend, receives translated speech, and plays it.

Goals & KPIs:

Latency: < 2 seconds

Audio quality: 4.5 / 5

Translation accuracy: 90%+

Uptime: 24/7 on Replit

Testing Tips:

- Use Chrome
- Use headphones
- Adjust buffer size for latency tuning

Security & Deployment:

- Replit provides HTTPS/WSS
- Store OPENAI_API_KEY in Secrets
- Use console.log() for debugging

Helpful Links:

- https://docs.replit.com/tutorials/05-websocket-server
- https://platform.openai.com/docs/guides/speech-to-text/streaming
- https://developer.mozilla.org/en-US/docs/Web/API/MediaDevices/getUserMedia
- https://developer.mozilla.org/en-US/docs/Web/API/AudioWorklet