KaraoKey

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https://tinyurl.com/teamd0

Product Pitch

When it comes to reaffirming or growing one's skills as a casual singer, the options are limited. Vocal coaches are expensive and hard to find. Also, they are often more than what the average singer would need, as vocal coaches target upper echelon singers.

KaraoKey is a free web application that provides asynchronous feedback for casual singers to reaffirm their singing abilities. We are taking a gamified approach inspired by one of the most popular and successful educational apps, Duolingo. Users record themselves singing with the backing track and our web app will provide a visualization, as well as overall feedback of their performance.

Our use case requirements include pitch detection accuracy, latency in inputted song processing, and latency in post-song analysis. Our system meets and exceeds these requirements, with our pitch detection accuracy at 99.4%, latency in inputted song processing at 0.51 seconds, and latency in post-song analysis at 0.26 seconds.

System Architecture
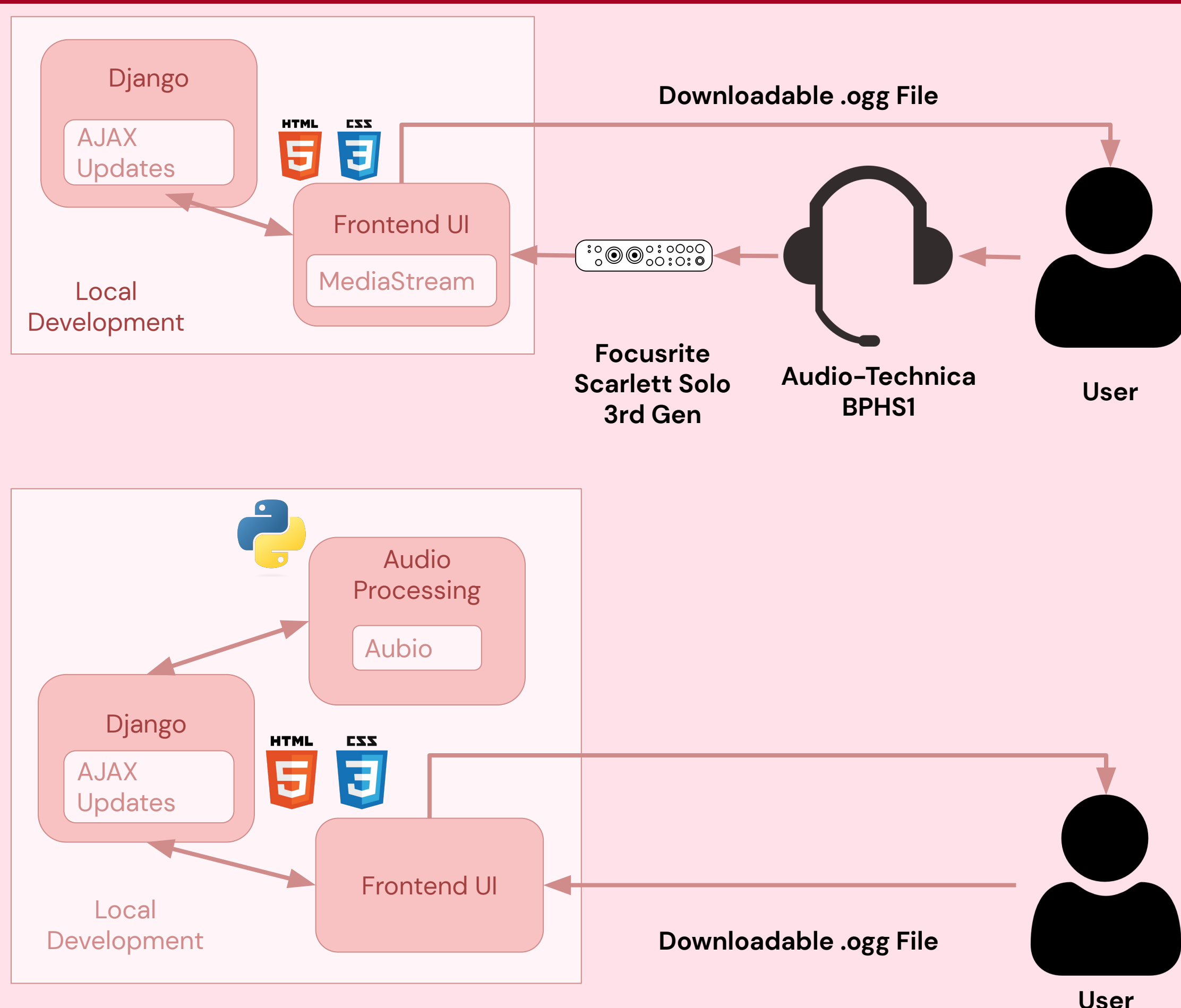

Conclusions & Additional Information

While we had to pivot our project to include an asynchronous feedback mechanism, we believe that we exceeded our original use case requirements.

We learned that there are tradeoffs in every design decision, and that these tradeoffs must be evaluated for both short and long term impacts. For example, using an already existing PDA module was great for early stages of development, but when it came to system integration, it quickly became a bottleneck.

In the future, we can consider creating our own PDA. This would allow use to have more control over our system integration and allow us to incorporate synchronous, real-time feedback.

System Description

To use KaraoKey, the user signs in (or registers). Next, the user selects a song to perform and performs it, while the backing track plays. The user sees lyrics and target pitch at this time. Afterwards, the user is navigated to see their results, where they view a similar graph, now with their pitch also displayed, and receive numerical feedback on their success.
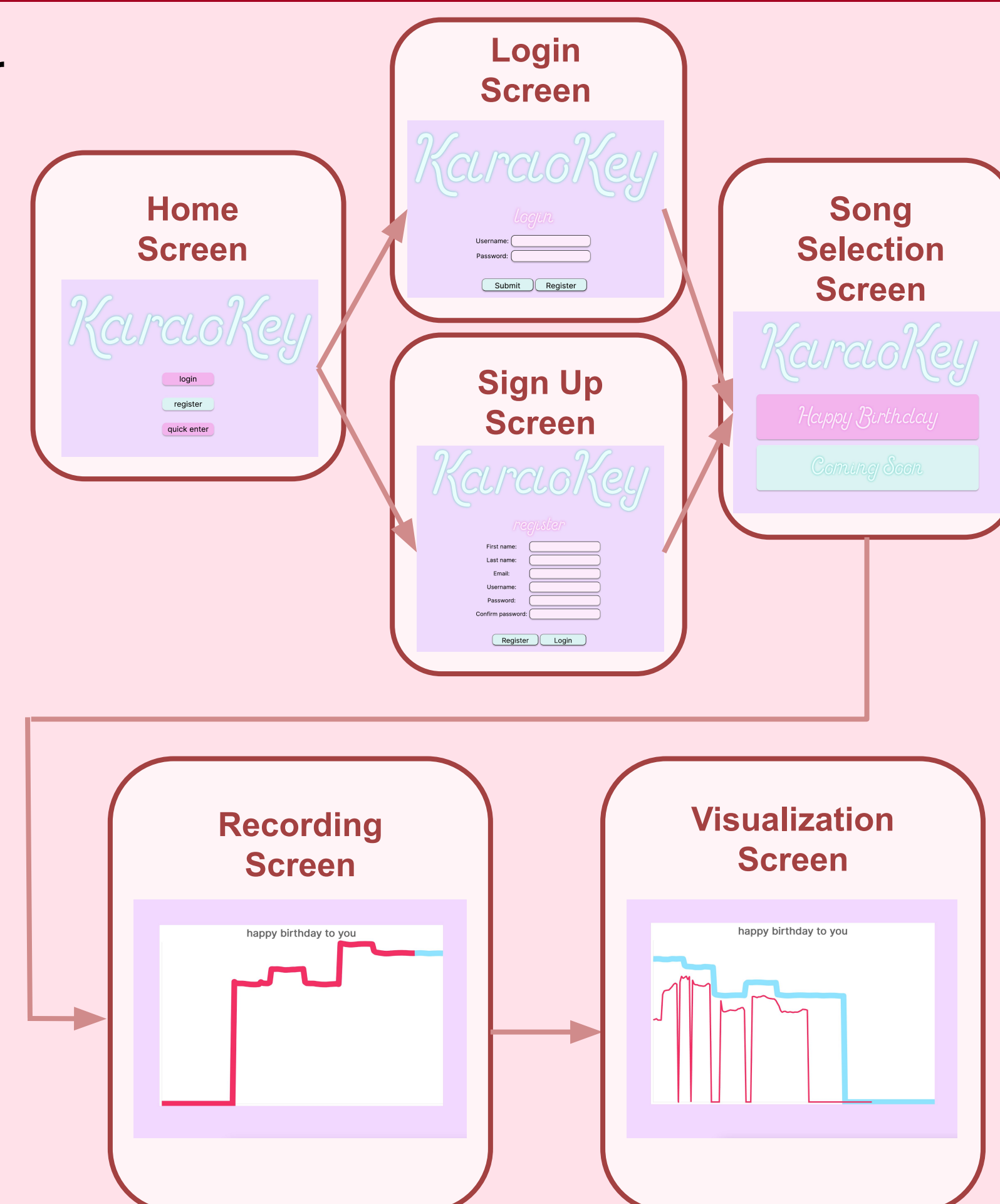
For demo purposes, we are using KaraoKey in conjunction with a headset microphone and audio interface. This ensures better audio quality, especially in a potentially noisy area. However, these are not necessary for KaraoKey and we have also successfully used it without them.

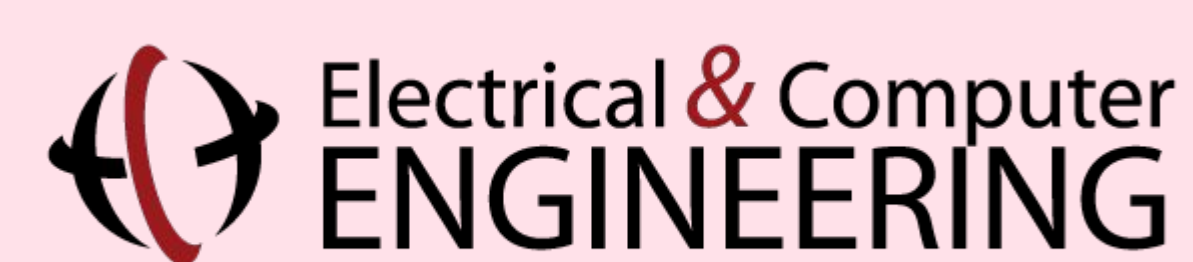**Results of user performance vs target pitch displayed via graph**

System Evaluation

Requirement	Result	Quantitative Limit
Latency in real time feedback (AJAX)	0.05s	Under 0.25s
Latency in inputted song processing	0.51s	<= 10s
Latency in analysis	0.26s	< 5s
Pitch accuracy	99.4%*	>= 90%

*ignores octave errors

To measure latency, automated testing using Python's time module was used.

To evaluate our system's pitch detection accuracy, 108 known pitches as well as songs with known pitches were fed into our PDA and the output was compared to the known expected result.

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