Development of an easily-usable smartphone application for recording instrumental sounds

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Introduction

To collect the high-quality instrumental sounds for acoustic analysis, the researchers often use a soundproof room or recording studio with a recording engineer. However, if the background noise contained in the recorded instrumental sound does not affect the analysis, it is unnecessary to record in these environments, and it is desirable to guarantee enough sound pressure level (SPL) of the instrumental sound. In this study, we developed a smartphone application for recording instrumental sound that meets with the following two concepts.

- The application can be completed from recording to analysis with a single button tap operation.
- After the recording, a simple analysis is performed immediately to detect inappropriate results automatically.

Application Procedure

1. Ready

pitch: High / Middle / Low

dynamics: Crescendo / Stable / De-crescendo

START

30 cm

2. Recording

Recording...

Clipping icon

82 dB

Sound pressure level

5-seconds countdown bar

3-1. Result (Failed)

Task failed.

RETRY

NEXT

3-2. Result (Succeed)

Laeq (Min) 71.0 dB, (Max) 78.2 dB

The min/max value of the SPL

Fundamental frequency

Sound pressure level

Spectrogram

RETRY — move to Recording panel
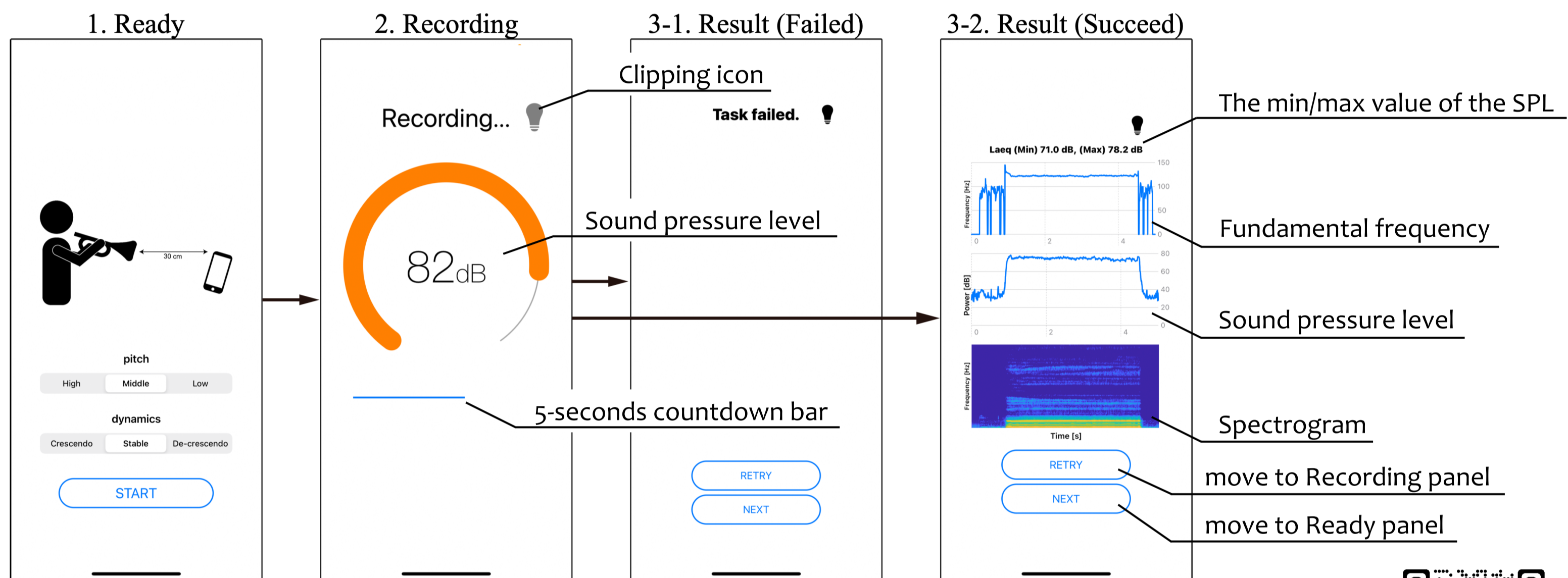
NEXT — move to Ready panel

Fig. 1 shows screenshots of the implemented application.

Development: Swift, Recording: AVAudioRecorder provided by Apple Inc., Analysis: WORLD
For more details, please watch this video on YouTube; https://youtu.be/K-AOkXbkIzY

YouTube

Test Recording

To investigate the sufficient SPL, we test-recorded trumpet sounds in the appropriate condition using this application. According to the result, the relative SPLs were included from 3 to 27 dB. In the application, the recorded result is accepted when a median value from the relative SPL in all frames identified as the voiced section is in this range.
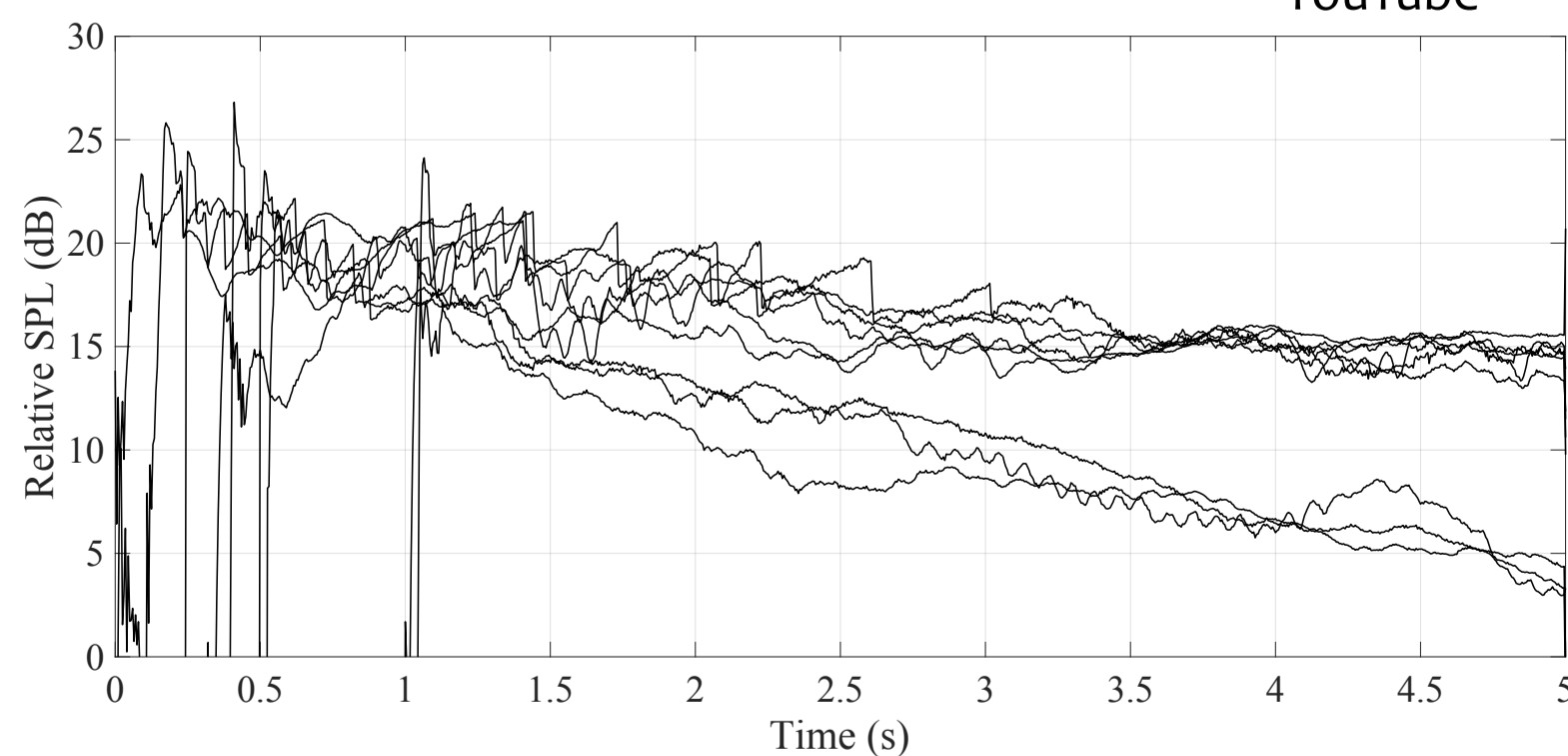

Fig. 2 shows the relative SPLs of ten trumpet sounds.

To guarantee sufficient SPL of the instrumental sound for the acoustic analysis, the insufficient result will be rejected by the clipping detection (the SPL is too high) or this function (too low).

Discussion & Conclusion

In this study, we implemented a smartphone application that users can record instrumental sounds, analyze, and save a file with a single tap operation. Since the application can reject the insufficient result by the clipping detection or the SPL, users can record their performance in a general room.

Since our research target is the automatic performance skill evaluation by recorded instrumental sounds, the next step requires the evaluation of the application by recording many kinds of sounds. Developing acoustic features related to the performance skill by using the recorded sounds is also an important future work.