

# An Automatic Vowel Space Generator for Language Learners' Pronunciation Acquisition and Correction

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## Introduction

- Pronunciation acquisition is a difficult and challenging problem for language learners at the beginning stage of learning a new language.
- Based on the author's personal experience in new language pronunciation learning, it will be helpful if the learner can have a more straightforward method to sense and feel how to pronounce the target language.
- What if we can "see" our pronunciation?
- To help learners overcome this first barrier in language studying, we present a visualised assistant method for pronunciation acquisition and correction which is friendly for them to understand their pronunciation status and how to improve by practice.

Keywords: Speech Visualisation, Acoustic-Articulatory Mapping, Speech Signal Processing

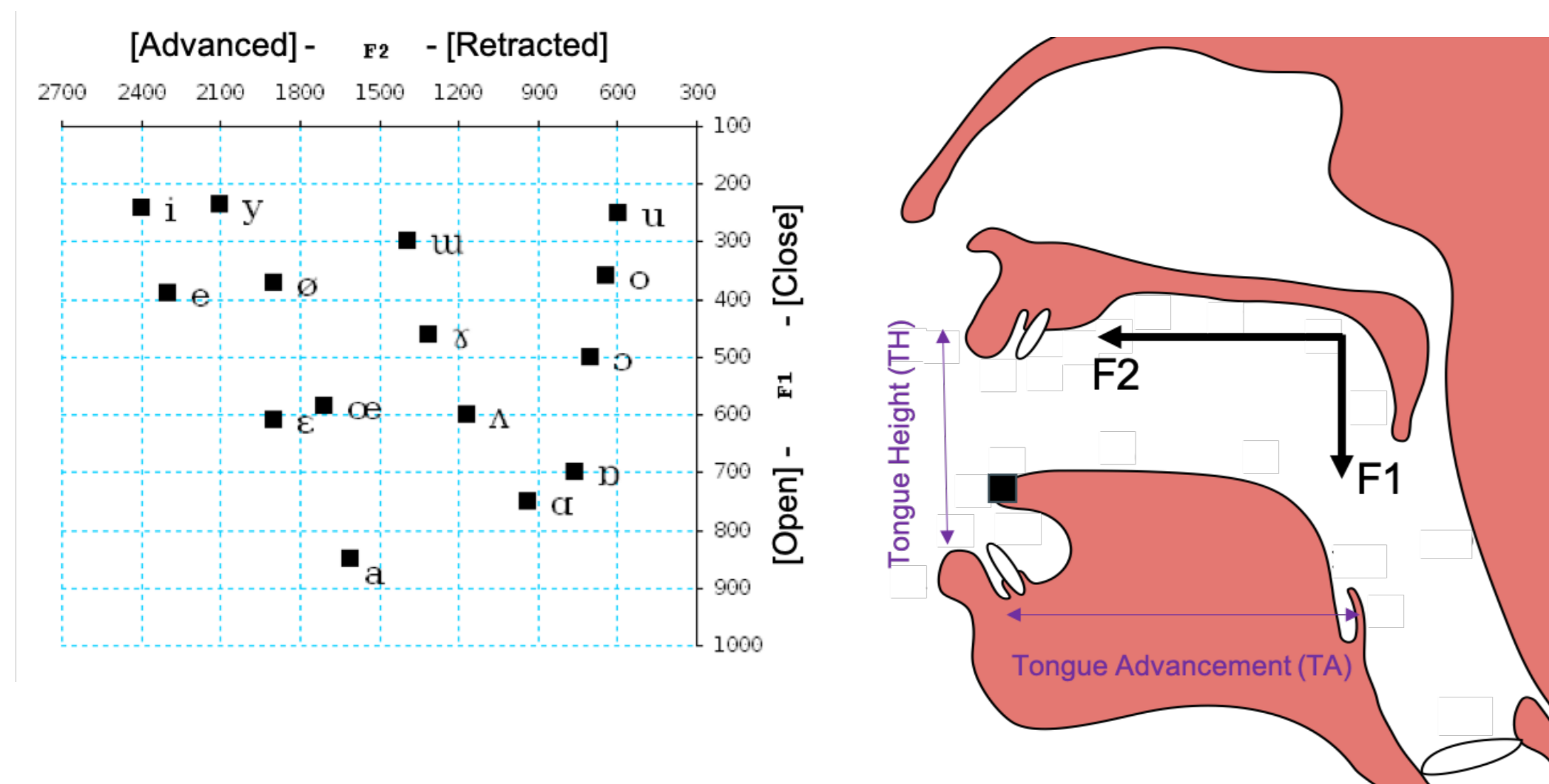


Figure 1: Use vowel space plot to estimate the position of the tongue tip from speech signals [1].

## Methodology

- Vowel space plot** is a good tool to visualise and reflect tongue position according to the provided speech signal.
- The **formant-articulation relationship** [2] is the key behind vowel space plots to achieving tongue movement visualisation with the information of input speech.
- Criterion of **energy-entropy ratio** based on previous research [3] has been applied to detect vowels from input speech.
- We use Modern Standard Arabic (MSA) as the target language for students to learn and practice the fundamental pronunciations.
- A MSA lecturer provided us a standard reference list of MSA vocabularies, which will give learners a target to reach.
- Four MSA students (two male and two female) provided their pronunciation practice speech signals.

Vocabulary	MSA	Transliteration	Vowels
shark	قِرْش	/qirš/	1
soap	صابون	/šābūn/	2
student(male)	طالِب	/ṭālib/	2
student(female)	طالبة	/ṭāliba/	3

Table 1: MSA vocabularies for students to learn and practice.

## Experiments

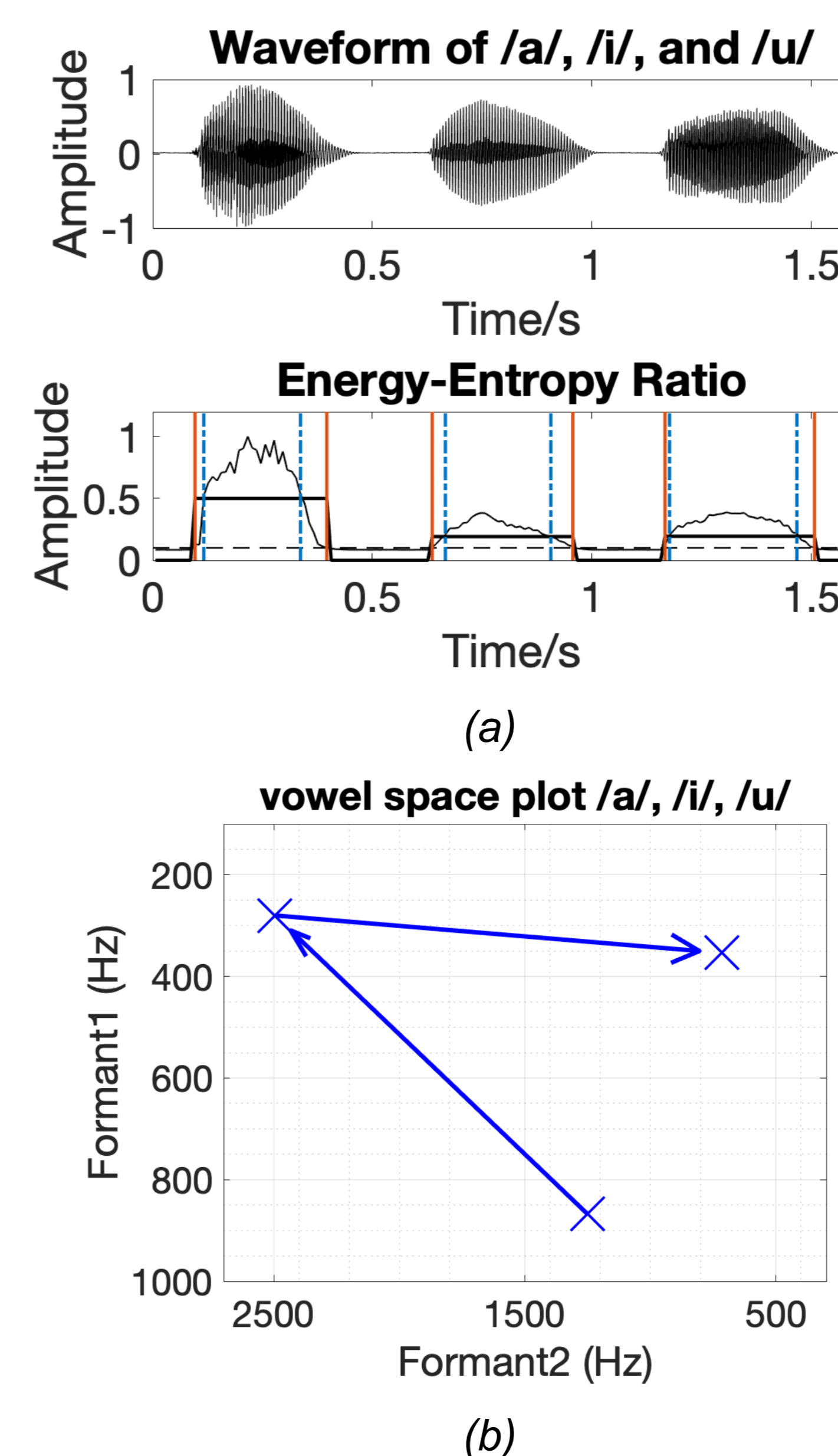


Figure 2: The vowel segmentation and vowel space plot. (a) Waveform and vowel segmentation, (b) The corresponding vowel space plot

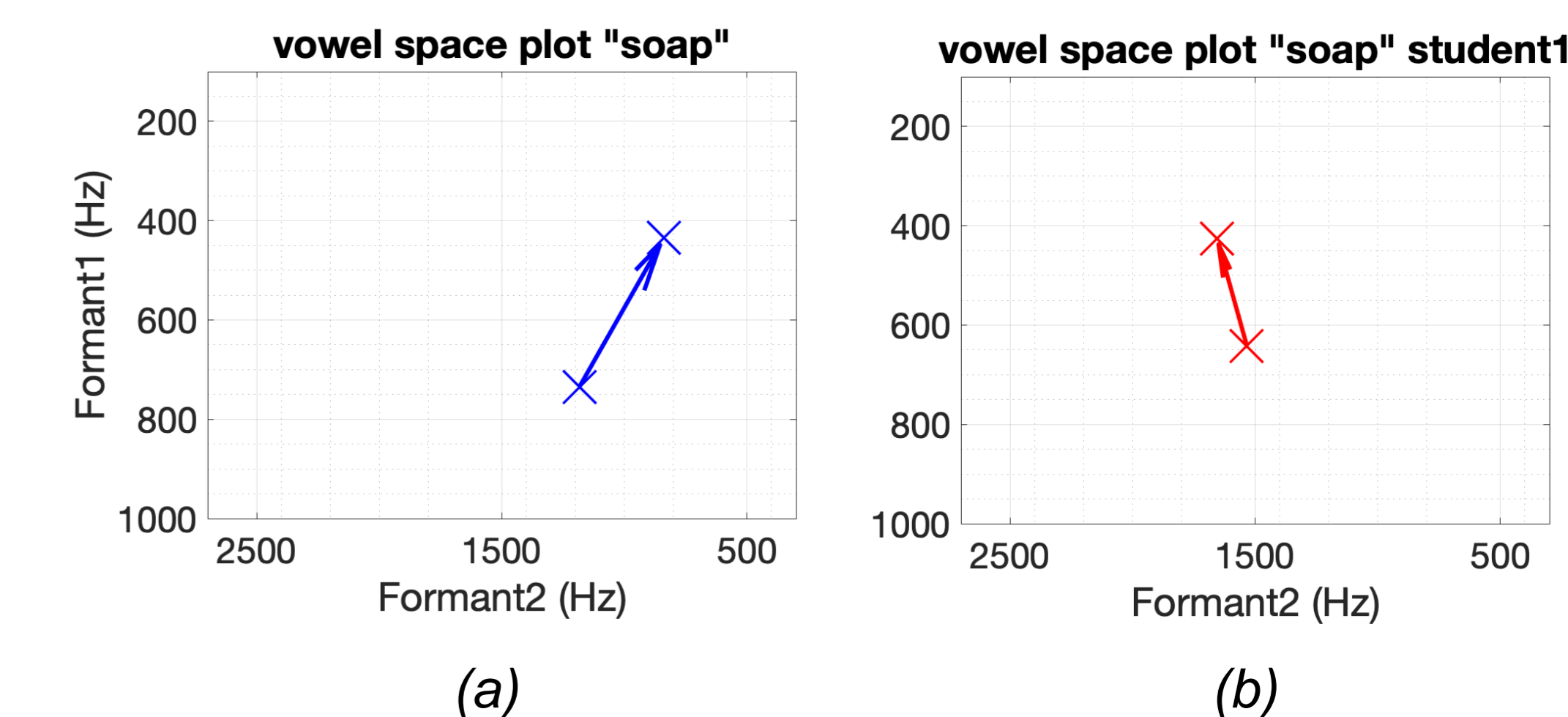


Figure 3: Use vowel space plot to adjust the position of tongue to acquire a better pronunciation: the case of Arabic word صابون (soap) which contains two vowels. (a) Standard reference, (b) Student1's practice.

## Result and Discussion

- Our method which adopted vowel space plots are able to reflect and visualise the tongue movement.
- Easy-understanding plots for students to visualise their pronunciations.
- We focus on word level visualisation, which is helpful for learners on the beginning stage of new language learning process.

## References

- The vowel space plots can provide the information on the tongue movement during pronunciation to students.
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