



# Highest and Lowest Pitch and Vowel Formants Measurement by Using PRAAT Application

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## A B S T R A C T

The aims of this study is to describe the steps of measurement in identifying the value of pitch and formant in PRAAT to find out the highest value of vocal pitch and formant. This study employed descriptive qualitative research by using content analysis approach. Content analysis is to organize and elicit meaning from the data collected and to draw realistic conclusion from it (Bengtsson, 2016). Based on the data the results in the formants of the word being pronounced highest is a male and the lowest is female. Meanwhile the pitch highest is a female and lowest is teenager. This study only focus on identifying the highest and lowest pitch and formants from the singer cover (female, male and teenager) on Youtube by applying PRAAT application to calculate in the data that will be analyzed. In addition, the data was descriptive analysis with the presentation of data in the form of numerical tables.

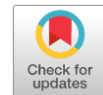
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## INTRODUCTION

According to (Suyudi & Saptano, 2016) In the linguistic system, speech is one of the most basic things to determine the occurrence of communication. Periodic sound which is constant, allows sound filtration which is then streamed through an articulator consisting of teeth, lips, tongue, palate and so on. Moreover, according to (Tilman & Nurhayani, 2015) the external sound can be vowels or consonants, and the tendency to communicate in speech is to produce the two types of sounds in a combination. Outcomes like this can be used as a source of data in several studies related to Phonetics & Phonology. Speech sound analysis can produce other outputs, especially in the field of technology. According to (Duraó (Richards & Weber), 2007) the related software used in this study is PRAAT which is a phonetic program to analyze speech sounds even though the speech Although the PRAAT application is still a computer-based tool and is not yet available for mobile devices, it does offer the ability to record voice directly using an installed device.

A spectrogram is made up of sound signals at low and high frequencies. It is also feasible to measure the overall sound's pitch, intensity, and formant, and the results can be shown graphically on a graph. One other thing to consider is the intonation of speech, which can differ from speaker to speaker even when they are pronouncing the same word. When

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pronouncing a word, some people always end up with a descending intonation, but other people decide to end with a rising intonation. The voice will be proportionately and suitably analyzed using the PRAAT application, depending on the menu or program that is used to perform a measurement.

A formant is also referred to as acoustic resonance of the human vocal tract. The spectral peaks of the spectrum are referred to as formants. This definition is generally utilized in acoustic analysis and trade. The peaks that are determined within the spectrum envelope are referred to as formants (Priyanka A. Abhang & Suresh C. Mehrotra, 2016). A formant is a concentration of acoustic energy around a particular frequency in the speech wave. There are several formants, each at a different frequency, roughly one in each 1,000 Hz band. Each formant corresponds to a resonance in the vocal tract. We distinguish one vowel from another by the differences in these overtones.

Formants are amplified frequency ranges within a vowel that distinguish one vowel from another. Three formants in particular help distinguish vowels from one another. According to (Ladefoged, 2006), each vowel has three formants, three overtone pitches. The first formant (F1) is inversely related to vowel height. The second formant is related to the degree of backness of a vowel. If the F1 number is higher, the tongue position is lower. Meanwhile, if the F2 number is higher, the tongue position is further forward. Formants can be seen in a wideband spectrogram as dark bands.

According to Johansson et al, 1982 compared to the male voice, relatively little is known about the qualities of the female voice. It can be said that due to the female voice's high fundamental frequency range, formant frequency estimates are deemed uncertain, thereby making information about the voice source unsafe.

This paper is a study of phonetic acoustic in formants. We will look at what differences there are and what kind of explanations have been given for these differences. This study focuses on the lyric of the song under the title "can't help falling in love" by Elvis Presley in 1961 that taken by YouTube cover by one female, one male and one kid.

Based on the background above, the formulation of the problems in this study are how does the pitch and formant are measured by using PRAAT? And how do the highest vocal pitch and formant can be determined? Thus, the purposes of this study are to describe the steps of measurement in identifying the value of pitch and formant in PRAAT and to find out the highest value of vocal pitch and formant.

## METHOD

This study used descriptive qualitative research by using content analysis approach. The purpose of content analysis is to organize and elicit meaning from the data collected and to draw realistic conclusion from it (Bengtsson, 2016). The collection of the data was from the performance on YouTube the cover song "can't help falling in love" by Elvis Presley.

This study will be focused on the lyric "**Take my hand**" and the analysis will be focused on vowels phonetic sound those is "**take and hand**". There are three participants on this study who did cover of the song represented by American female, male and also teenager. The biographical data of the participant will be explained below :

Table 1. Biodata of Participants Analysis

Name of Participant	Channel YouTube	Born	Age	Occupation	Language
Kina Kasuya Grannis	Kina Grannis	August, 04 <sup>th</sup> 1985	35 Years Old	Singer, songwriter, guitarist	English American
Alejandro Manzano	Boyce Avenue	October, 04 <sup>th</sup> 1986	37 Years Old	Vocalist	English American
Shania Yan	Shania Yan	June, 21 <sup>st</sup> 2001	20 Years Old	Cover singer	English American and Indonesia

Source : Wikipedia.org ( [https://en.wikipedia.org/wiki/Kina\\_Grannis](https://en.wikipedia.org/wiki/Kina_Grannis) ) , Allfamous.org ( <https://allfamous.org/id/people/alejandro-manzano-19861004.html> ) ( <https://allfamous.org/id/people/shania-yan-dajr.html> )

Technically, first this research was started by downloaded the video files from Youtube application and converted the audio from the files. Recording vocal sounds from various speakers by using the audio file and put to the PRAAT application which has available. From one speech source will be recorded several words that consisted of consonants and vowels that will be separated with the help of software.

The audio files were cut into several segments contains one word that has vowel sound. After selected the word that will be analyzed to find out the formants frequencies and pitch of the English vowels. The data will be show the F1,F2 and F3 frequencies and pitch and show the table of data comparison. This study used Praat and put the diagram to Ms.word. Data analysis was conducted to the vowels by the lyric “can’t help falling in love” by three singer cover. The lyrics that will be analyzed is “Take my hand”. In that lyric the researcher used the word that have vowels sound that is *take* and *hand*. The vowels /eɪ/ and /æ/ sound to analyzed in the spectrogram on the PRAAT to see the formants F1, F2 and F3 in the different frequencies and Pitch. The formants and pitch from the cover singer are will be show below ; (a) /eɪ/ (b) /æ/

Table 2. Data Formants

	F1	F2	F3
Female			
(a)	462 Hz	2598 Hz	4669 Hz
(b)	912 Hz	2532 Hz	4651 Hz
Male			
(a)	1851 Hz	2395 Hz	4611 Hz
(b)	1085 Hz	1787 Hz	4541 Hz
Teenager			
(a)	671 Hz	3290 Hz	4619 Hz
(b)	913 Hz	2757 Hz	4748 Hz

Source : Application of PRAAT

Table 3. Data Pitch

	Female	Male	Teeneger
Pitch			
(a)	4140 Hz	4102 Hz	4906 Hz
(b)	4753 Hz	4548 Hz	4906 Hz

Source : Application of PRAAT

### FINDINGS AND DISCUSSION

The analysis of formants in the praat is the essential of this study. With the Praat application it can be identified the value of pitch, formant and spectrogram of each sound recording. The sentence from the lyric is "take my hand" that will be sing by 3 singer cover. The diagram will be show below :

Female : Take /eɪ/ and hand /æ/

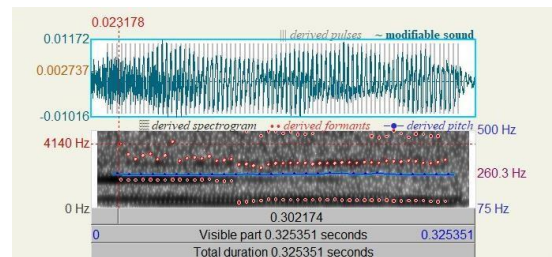
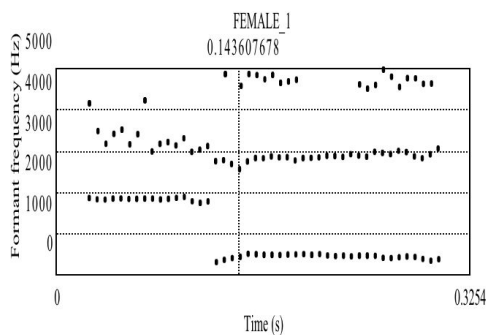


Figure 1. Spectrogram of Formants and Pitch

Source : Application of PRAAT

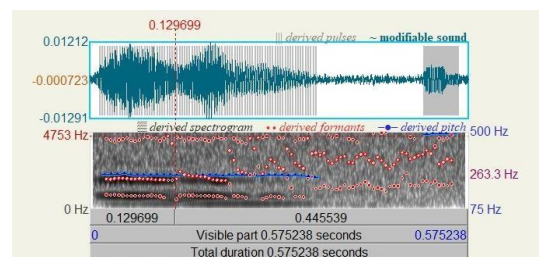
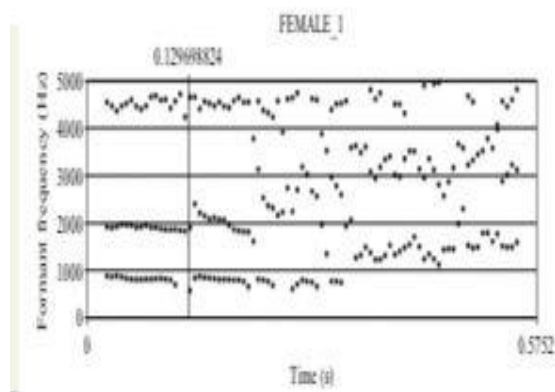


Figure 2. Spectrogram of Formants and Pitch

Source : Application of PRAAT



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Male : Take /eɪ/ and hand /æ/

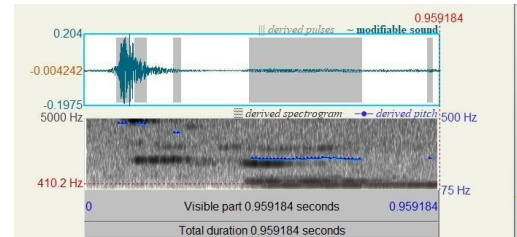
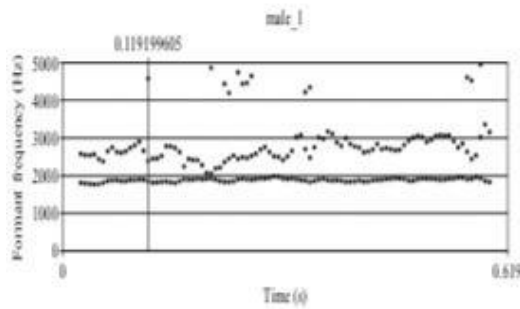


Figure 3. Spectrogram of Formants and Pitch

Source : Application of PRAAT

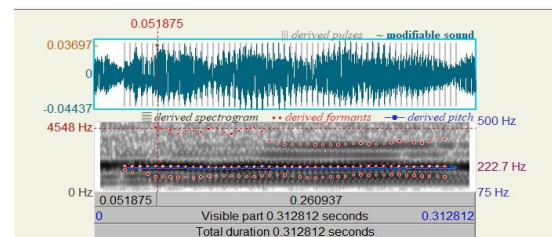
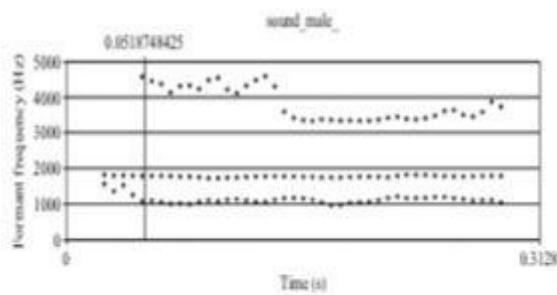


Figure 4. Spectrogram of Formants and Pitch

Source : Application of PRAAT

Teenager : Take /eɪ/ and hand /æ/

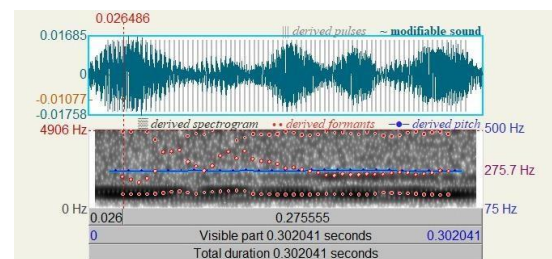
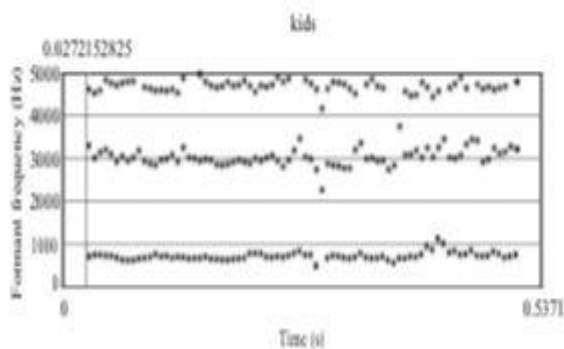


Figure 5. Spectrogram of Formants and Pitch

Source : Application of PRAAT

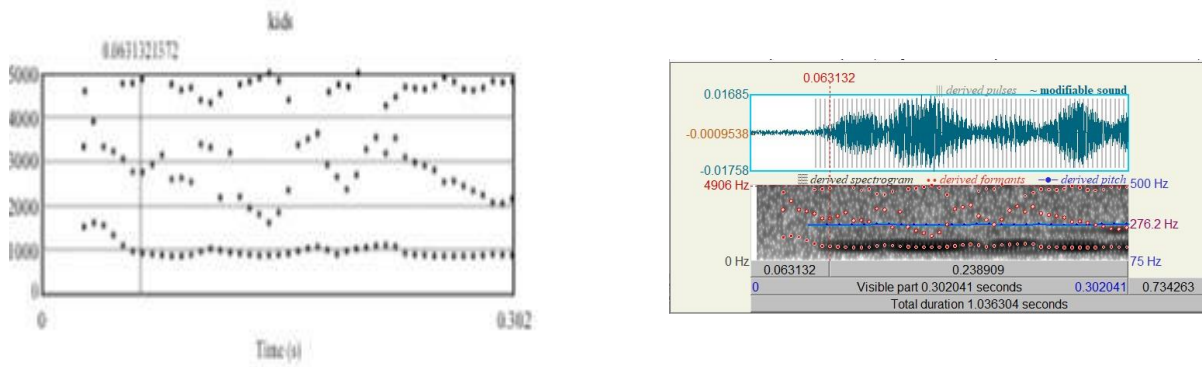


Figure 6. Spectrogram of Formants and Pitch

Source : Application of PRAAT

Thus, in determining each vowel in several words can be assisted by the boundary on PRAAT and the spectrogram also can be identified easily. For the female, male and kids sound in spectrogram, frequency and pitch. It can be made in a table below :

**Pitch Value**

Table 4. Findings Pitch Value

No	Vowels	Pitch Value	
		Female	Pitch
1	Take : /eɪ/		4140 Hz
2	Hand : /æ/		4753 Hz
		<b>Male</b>	
1	Take : /eɪ/		4102 Hz
2	Hand : /æ/		4548 Hz
		<b>Teenager</b>	
1	Take : /eɪ/		4906 Hz
2	Hand : /æ/		4906 Hz

Source : Application of PRAAT

From the tables above, it is obvious that Pitch analysis can be used to perform voice recognition on a person's voice, that is through statistical analysis of minimum pitch, maximum pitch and average pitch. Meanwhile, formant can be analyzed from first formant until fourth. However, the highest vowels for the native speaker is male in word take and hand. In that table the researchers got different the different pitch in every sound with the same word. The highest pitch from the analyzed in the word take /eɪ/ is from female that have 4140 Hz and the lowest is the teenager with 4906 Hz. Meanwhile for the highest pitch in the word take /æ/ is from female also with 4753 Hz and the lowest is teenager also with 4906 Hz.

**Formants**

Table 5. Findings Formants

No	Vowels	Formants		
		F1	F2	F3
Female				
1	Take : /eɪ/	462	2598	4669
2	Hand : /æ/	1912	2532	4651
Male				
1	Take : /eɪ/	1851	2395	5611
2	Hand : /æ/	1085	1787	4541
Teenager				
1	Take : /eɪ/	671	3290	4619
2	Hand : /æ/	913	2757	4748

Source : Application of PRAAT

From the tables above in F1, F2 and F3 the researcher found the different frequencies in each vowels sound. Based on the table and the result of the analyzed the highest formants for the word take /eɪ/ is by Male and the lowest for the word take /eɪ/ is by female. Meanwhile for the word hand /æ/ the highest formants by female and the lowest formants for the word hand /æ/ by teenager.

**CONCLUSIONS**

According to the analysis, there is a connection between the formant, high, and pitches, and the vowels used in the utterance of these words. After do this research the researcher can conclude that when the respondent pronounces the word take and hand (which has the vowels /eɪ/ and /æ/, it does not mean have a same result. This results in the formants of the word being pronounced highest in vowel /eɪ/ is a male and the lowest of vowels /eɪ/ is a female. Meanwhile the highest of the vowels /æ/ is female and the lowest of vowels /æ/ is a teenager. Meanwhile the highest pitch of the vowel /eɪ/ and /æ/ have a same result that is the highest is by female and the lowest by teenager. The female have a dominant highest than male and teenagers. And the teenager have a dominant lowest than female and male.

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