INTRODUCTION:

The present study was conducted with multiple objectives in mind:

- to provide an objective phonetic description of vowels and diphthongs of Indian English in acoustic terms and
- to provide acoustic evidence of sound change in English in language contact situation.
- This of course would have implications in ESL in India, as knowledge about the vowel space and vowel qualities produced by speakers in India can help us in teaching spoken English to the students in various parts of this country. Spoken skills also have economic and job opportunity related ramifications in today’s globalized world, and therefore, such a study would be tremendously useful for ESL teachers and institutes alike.

This study shows how vowels can be described in terms of the first two formants, F1 and F2. There are several theories and hypotheses about how vowels are arranged within a vowel space. The most common interpretation based on available evidence is that vowels arrange themselves across the vowel space in a manner that maximises auditory distinction and at the same time minimizes articulatory effort. Acoustically, this vowel space can be calculated by measuring the formants produced during vowel enunciation. These formants are produced as the sound waves travel through the various cavities in the vocal tract and thereby produce various overtones to the fundamental frequency, relationships between which are characteristic of a particular vowel sound. These formants change based on the height of the tongue, the frontness/backness of the tongue and based on the degree rounding or the spreading of the lips. Being able to plot these formant values on a graph produces a visual representation of what is remarkably close to the actual position of the vowel within the vowel space.

The Experiment Design:

The five diphthongs selected for the present study are /ʊə, ɪə, eɪ, ɑʊ, ɔɪ/ whereas the twelve monophthongs are /ə, ʌ, ɪ, e, æ, ʊ, ɒ, ɔː, ɜː, iː, uː, ɑː/. Most samples of Indian English pronunciation were procured from students in Jawaharlal Nehru University pursuing their Master’s degree in Linguistics. These students were between 20-25 years old and were from different parts of India; hence the sample was fairly representative. Apart from this, the data for Tamil speakers was also obtained from Presidency College, Chennai, for Marathi from BR Ambedkar University, Aurangabad, and for Hindi from Delhi University.

Control Data:

The control data for monophthongs was obtained from 5 native speakers of English who were recorded either in England or during their stay in India. Only those with a neutral accent were considered for this study, and as far as possible, people from the Oxbridge area were preferred, in order to stay as close as possible to a form of English which is the accepted standard across the world. The normative English language data for diphthongs, on the other hand, was obtained from http://www.fonetiks.org/engsou3.html in the case of diphthongs. In India, we conducted two separate experiments, one for diphthongs and another one for monophthongs, in which subjects from several states of India participated. The words selected for the study are: foil, face, fear, foul, coat (diphthongs) and pet, pat, pot, pit, apart, put, cut, court, caught, stoop, keep, perk (monophthongs). The comparison shows how diphthongs in IE get modified, sometimes pronounced as monophthongs in language contact situations. Also, it shows how the overall vowel space gets modified and how the vowel phonemes re-arrange themselves in a language-contact situation, to gain an identity quite independent of its native counterparts.
Subjects:
30 Subjects for the present study were from different parts of India. All the subjects have learnt English as their second language since school. The age of the subjects ranges between 20-25 years. The educational qualification, socio-economic status of all the subjects is similar.

Data / Sample:
The diphthongs occur in the medial positions. The speakers were asked to pronounce each word thrice. Thus there are 5 diphthongs stimuli and 180 (12 speakers * 5 diphthongs * 3 repetitions) samples. Thus a sample of 180 words was recorded. Out of this sample of 216 words, we selected the middle articulation of the three repetitions. This gave us a select sample of 72 words. The five words chosen for the six diphthongs are the same as those pronounced by the native speaker on http://www.fonetiks.org/engsou3.html. In the case of monophthongs, a separate word list was created and given to both the native speakers and the learners of English in India. The words chosen for the study are: pot, pet, pit, pat, put, cut, apart, perk, court, caught, stoop, keep. Since ‘caught’ and ‘court’ are pronounced with two separate vowels in India, these two words were kept in the study, although they contain the same vowel phoneme in British English, as was confirmed by this study.

Data Recording Methods:
The data was recorded in the sound proof recording room of the language Laboratory of Jawaharlal Nehru University and in similar sound-proof rooms in the other universities visited for the recording. The recording and analysis was done using a combination of PRAAT and Wavesurfer. The voice files were converted into .wav format to make it suitable for importing into the software. WAV is the short form for Waveform Audio Format. PRAAT and Wavesurfer was used for recording and analyzing data. Analysis using PRAAT includes calculation of formant frequencies.

DATA ANALYSIS:

Figure 1: Native English (Black Arrows) & Indian English (Coloured Arrows) Diphthongs Mapped Together
As explained in the methodology the first two formant values F1 and F2 for all the diphthongs and monophthongs was calculated using PRAAT and Wavesurfer. For plotting the two formants it was decided to plot F1 against F2-F1 rather than F2, as indicated in Figure 1 and Figure 2 below.

![Native English vs Indian English](image)

**Figure 2:** Native English & Indian English Monophthongs Mapped Together

**MAIN FINDINGS:**

As compared to the native speaker’s articulation of these five diphthongs in the study, the data from Indian English shows that the diphthongs are mostly not produced as diphthongs in Indian English. Some diphthongs as in ‘face’ and ‘coat’ are mostly pronounced as single long vowels/monophthongs such that [fel] becomes [fe:s] and [kou] becomes [ko:t] in Indian English. We also see that in the case of diphthongs with vertical movement, the Indian diphthongs move much less compared to British English, while in the case of horizontal movement, there is an equally clear distinction in India between the starting and ending points of the diphthong. The diphthong /ɪə/ has moved far towards the front compared to its British counterpart in both its starting and ending points. ə has a higher starting point but ends lower than the British ə. ə is approximately where the British ə is, but the movement is much less compared to the latter.

When it comes to the monophthongs, we see that the overall vowel pace remains more or less the same when it comes to Indian English and Native English, however, the positions of the vowels within the vowel space differs greatly. We see that there is a greater differentiation between central and peripheral vowels in native English, while in Indian English, this distinction is not that pronounced. We see that the /ʌ/ and /æ:/ are acoustically the same in Indian English whereas, the schwa moves closer to the /ɑː/. In British English, however, the /ə/ and the /æ:/ sound are identical in quality, while ‘cup’ moves closer to the /ɑː/. In the peripheral vowels, the biggest difference is in the position of the /u:/, which in British English is almost a front vowel, possibly with lip rounding, while in Indian English, it remains a back vowel with lip rounding. The /e/ is much more open in British English compared to Indian English, and the /æ/ and /ɑː/ are pronouncedly more back than their Indian counterparts. Another great difference between the Englishes is that the /n/ and /caught/ are identical in quality in Indian English, whereas in British English, /caught/ is identical with /ɔː/. Thus, in Indian English, /caught/ has moved itself to the more open position.
of /ɒ/. We also observe that the British /ɔː/ is more closed and further back in the vowel space compared to its Indian counterpart.

![Figure 3: Deviations of Indian English vowels from Native Speakers (F2-F1 values in dark blue & F1 values in light blue) [1-keep, 2-pet, 3-pat, 4-task, 5-pot, 6-caught, 7-court, 8-stoop, 9-pit, 10-put, 11-cut, 12-perk, 13-apart]]

As can be seen in the figure above, the variations in F2-F1 depict the deviation in frontness/backness of the tongue, while the F1 variations indicate the deviation in tongue height. An earlier study on Acoustic Space of Indian English Vowels, Narang et al. 2010 showed how vowel quality changes in such a way that the vowel space gets redefined in a language contact situation. In this case we see how Indian English in contact with Indian languages evolves a regional standard with a fairly uniform pattern of change in acoustic space and also in the quality of diphthongs.

**References:**


