ACOUSTIC MECHANISM OF PHONEME FORMATION

Sultanova Aleksandra Anatolevna
Uzbekistan State World Languages University
English Philology Faculty
lexashel@gmail.com
Scientific advisor: **Salimova Nilufar**

Abstract: This article discusses the acoustic mechanism for the formation of phonemes. This means that it will discuss how sounds are produced, transmitted, and received as linguistic units. Although articulatory phonetics discusses sounds as physical units, acoustic phonetics discusses sounds as waves and their properties. This article will discuss the interrelationship between sounds produced and received, focusing on important terms such as formants and resonance as well as sound wave patterns. This article will discuss acoustic phonetics based on linguistic and phonetic studies and will highlight its importance for understanding speech sounds and pronunciation.

Keywords: acoustic phonetics, phoneme formation, sound waves, frequency, formants, speech analysis.

Annotatsiya. Ushbu maqolada fonemalarning shakllanishidagi akustik mexanizmlar muhokama qilinadi. Bunda tovushlarning lisoniy birliklar sifatida qanday hosil bo'lishi, tarqalishi va qabul qilinishi ko'rib chiqiladi. Artikulyatsion fonetika tovushlarni jismoniy birliklar sifatida o'rgansa, akustik fonetika ularni to'lqinlar va ularning xususiyatlari sifatida tahlil qiladi. Maqolada hosil qilingan va qabul qilingan tovushlar o'rtasidagi o'zaro bog'liqlik, formantlar va rezonans kabi muhim atamalar, shuningdek, tovush to'lqinlarining tuzilishiga e'tibor qaratilgan holda tadqiq etiladi. Ushbu maqola lisoniy va fonetik tadqiqotlarga tayangan holda akustik fonetikani yoritib beradi hamda uning nutq tovushlari va talaffuzini tushunishdagi ahamiyatini ko'rsatib o'tadi.

Kalit so'zlar: akustik fonetika, fonema shakllanishi, tovush to'lqinlari, chastota, formantlar, nutq tahlili.

Аннотация. В данной статье рассматривается акустический механизм формирования фонем. Это подразумевает обсуждение того, как звуки производятся, передаются и воспринимаются как лингвистические единицы. В то время как артикуляционная фонетика рассматривает звуки как физические единицы, акустическая фонетика изучает звуки как волны и их свойства. В статье исследуется взаимосвязь между производимыми и воспринимаемыми звуками с акцентом на такие важные термины, как форманты и резонанс, а также на структуру звуковых волн. Акустическая фонетика рассматривается на основе лингвистических и фонетических исследований, подчеркивается её важность для понимания звуков речи и произношения.

Ключевые слова: акустическая фонетика, формирование фонем, звуковые волны, частота, форманты, анализ речи.

DOI: 10.5281/zenodo.19649121

Introduction

It is not only a physiological process but is also an acoustic one. While making a speech, we create sound waves that travel through the air and are received by the listener as a meaningful linguistic unit. Therefore, to understand the topic of language, it is important to understand how these sound waves are formed and how information is conveyed through these waves.

In the study of phonetics, much emphasis is given to the process of articulation, i.e., how the speech organs make sounds. However, it is important to understand the acoustic aspect of the formation of phonemes and how these sounds exist as physical entities and can be measured and analyzed. For the students of philology, understanding the acoustic mechanism of the formation of phonemes is important to understand the scientific nature of language and to master the practical skills of language. This article will discuss the main principles of acoustic phonetics.

Acoustic phonetics is concerned with physical properties of speech sounds as sound waves. The sound waves are formed when air vibrations, produced by vocal cords and shaped by the vocal tract, reach the ear of the listener through the air. The acoustic properties of speech sounds can be described in terms of various parameters. The parameter of frequency is concerned with the number of vibrations per second, which is known as pitch. The parameter of amplitude is concerned with the strength of sound waves, which is known as loudness. The parameter of duration is concerned with the length of time for which sounds are produced. Duration is an essential parameter for distinguishing between various phonemes.

A major feature of acoustic phonetics is the concept of formants. Formants are concentrations of sound energy at particular frequencies. Formants play an essential role in identifying vowel sounds, but they also influence consonant sounds. The acoustic properties of speech sounds are determined by the configuration of the vocal tract. The process of the formation of a phoneme based on the acoustic perspective can be described as a series of interconnected processes.

First, the process begins with the expulsion of air from the lungs, which serves as the source of energy for the formation of speech sounds. This air then passes through the vocal cords, which vibrate to form voiced sounds and remain open to form voiceless sounds. These vibrating vocal cords form a basic sound wave. The sound wave then undergoes a series of transformations as it passes through the vocal tract. During this process, the position of the tongue and other articulators determines the shape of the vocal tract, thereby creating different resonance patterns. These resonance patterns amplify different sounds and dampen others, thereby creating different sounds for different phonemes.

The sound waves then leave the mouth and travel to the brain of the person to be heard.

Key Acoustic Features of Phonemes are Frequency and Pitch, Amplitude and Loudness, Duration, Formants and Resonance.

Frequency is considered one of the most important acoustic features of sound. This is because it affects the pitch of the sound. Pitch is related to the frequency of the sound wave, which is affected by the rate of vibration of the vocal cords. Pitch is important in intonation, but it is related to the identification of phonemes as well.

The amplitude is related to the strength of the sound wave. In English, the loudness of the sound is important in distinguishing certain words. Amplitude is less important than other acoustic features of phonemes.

The duration of the sound is important in some languages. Duration is important in distinguishing between sounds in English, too.

Formants are important in distinguishing phonemes, especially vowels. They are related to the shape and size of the vocal tract. Each phoneme is characterized by a unique pattern of formants. The change in the position of the tongue affects the formant frequencies.

Acoustic phoneme formation has both theoretical and practical importance. From the theoretical point of view, it enables linguists to describe speech sounds in objective and quantifiable terms. This helps in the development of a more precise understanding of language structure. From the practical point of view, acoustic phonetics has numerous applications in language teaching, therapy, and technology. For instance, visual representations such as the spectrogram enable students to visualize the differences between sounds which may not be audible. This is especially useful in the teaching of pronunciation and the improvement of listening skills.

Furthermore, acoustic phonetics has significant importance in the development of contemporary technologies such as speech recognition and synthesis systems.

Conclusion

In conclusion, the acoustic mechanism of phoneme formation offers a scientific explanation for the creation, transmission, and perception of speech sounds. It is possible to gain an understanding of the difference between various phonemes based on various properties, including frequency, amplitude, duration, and formants.

The application of the acoustic mechanism of phoneme formation for philology students is significant because it bridges the gap between theory and practice. It is apparent that the principles of acoustic phonetics are complicated at first glance, but they will become more obvious when they are linked with real speech processes.

REFERENCES

1. Ashirkulovna, M. F. (2023). Linguacultural characteristics of English and Uzbek phraseological units with cooking utensils. British View, 8(4).
2. Ashirkulovna, M. F. (2021). Linguocultural Classification of English and Uzbek Culinaronyms in Proverbs. Berlin Studies Transnational Journal of Science and Humanities, 1(1.6 Philological sciences).
3. Crystal, D. (2008). A Dictionary of Linguistics and Phonetics. Blackwell.
4. Johnson, K. (2012). Acoustic and Auditory Phonetics. Wiley-Blackwell.
5. Ladefoged, P., & Johnson, K. (2011). A Course in Phonetics. Cengage Learning.
6. Mamatkulova, F. (2024). Comparative linguacultural analysis of phraseological units in terms of lexical and semantic composition. O'zbekiston davlat jahon tillari universiteti konferensiyalari, 624-627.
7. Roach, P. (2009). English Phonetics and Phonology. Cambridge University Press.
8. SALIMOVA, N. (2025). INGLIZ TILI DARSLARIDA VIDEODAN FOYDALANISHNING XUSUSIYATLARI. «ACTA NUUz», 1(1.1), 189-191.
9. SALIMOVA, N. (2025). INGLIZ TILI DARSLARIDA VIDEODAN FOYDALANISHNING XUSUSIYATLARI. «ACTA NUUz», 1(1.1), 189-191.

10. Salimova, N. O 'zbekiston milliy universiteti xabarlari, 2025,[1/1] issn 2181-7324.
11. Маматкулова, Ф. А. (2021). Тилшуносликда кулинаронимларнинг лингвокултуралогик ўрганилиши. Международный журнал искусство слова, 4(2).
12. Маматкулова, Ф. А. (2019). О свойствах кулинаронимов. NovaInfo. Ru, (108), 22-24.
13. Эрданова, З. А. (2021). Замонавий лингвистикада инсон ва унинг фаолияти акс этилиши. *Международный журнал искусство слова*, *4*(5).
14. Эрданова, З. (2021). Инсоннинг касбий фаолияти билан боғлиқ тил бирикмаларининг шаклланиши. *Общество и инновации*, *2*(9/S), 186-190.
15. Эрданова, З. (2021). Формирование языковых единиц, связанных профессиональной деятельностью человека. *Общество и инновации*, *2*(9/S), 186-190.