EQUATION 1.1

\[ E = M - X \cdot \phi(t) \]

where \( X \) is the coefficient of the proportionality to adjust the quality to the limit system used. Applying this concept of acoustic energy, we obtain the acoustic energy from the square of the acoustic pressure, thus the energy from the square of the acoustic pressure in the time domain, thus furnishing a spectrum of acoustic energy:

\[ E = \frac{1}{2} \cdot \phi(t)^2 \]

It will be observed that the imaginary component disappears, showing that energy is a scalar value and not a vectorial, able to be expressed only by real numbers, contrary to pressure which is essentially vectorial.

To obtain the total energy, one only has to sum the components in every frequency, mathematically expressed by the following formula:

\[ E = \frac{1}{2} \cdot \phi(t)^2 + \phi(t+1)^2 + \ldots + \phi(t+n)^2 \]

where \( \phi(t) \) is the frequency of the lower integration limit, \( \phi(t+1) \) is the frequency of the upper integration limit, and \( n \) is the differential of the frequencies.

To compare the total energy of two sounds, one only has to effect its quotient, obtaining the relation in absolute and adimensional terms by the following formula:

\[ Q = \frac{E}{E_1} \]

\\

\[ B. \] CYBERNETIC PROCEDURES

The instrument system for the capture of sounds is composed of transducers, which consist of a microphone or an amplifier, a source of voltage, an amplifier, and a computational system:

- **Transducer**
- **Source and Microphone**
- **Pre-amplifier**
- **Fourier Analyser System**

To capture the signal, one works with 4066 channels, a voltage key from 4 and 8 volts and frequencies up to 35 kHz. The routine used to register the utters in 4 blocks of memory is the following:

\[ \text{BUCAL} \quad \text{B} \]
\[ \text{LABEL} \quad \text{E} \]
\[ \text{ANALOG-1} \quad \text{E} \]
\[ \text{ANALOG-1} \quad \text{E} \]
\[ \text{ANALOG-3} \quad \text{E} \]
\[ \text{CLEAR} \quad \text{E} \]
\[ \text{END} \quad \text{E} \]

To obtain the signal, we inspect the microphone and enter the utterance to be registered simultaneously with the command: JASP 3 E. We verify if the signals obtained are in the blocks of memory and we repeat the procedure if necessary. To filter out

\[ \text{Sy 2.1.1} \]

\[ \text{Sy 2.1.2} \]

\[ \text{Sy 2.1.3} \]
background room noise, a good procedure consists of capturing the noise with a microphone, its storing in an adequate memory block and its subtraction from other sound signals, annuling in this way any undesirable component.

For the segmentation of various sounds of an utterance, the command CLEAR is used in an adequate manner, deleting the undesirable parts and storing the results in memory blocks for later treatment. Once a pertinent segment is isolated, a Fourier transform is performed by means of the command:

$$\text{F A} \theta$$

On the result obtained, the command:

$$\text{J A} \theta$$

is applied to obtain the energy spectrum, which is integrated by the command:

$$\text{J A} \theta$$

the last channel having to be read by means of the cursor.

04. ILLUSTRATION

For sake of illustration, we use the initial cluster [p] from the Brazilian Portuguese word psicologia, pronounced without [i] epenthesis.

Figure 1: oscillogram of the sequence [p] (6.2 ms), [s] (20.4 ms) and the first cycle of the following [l].

Figure 2a: Real part of the Fourier transform of [p]

Figure 2b: Real part of the Fourier transform of [s]

Figure 3a: Imaginary part of the Fourier transform of [p]

Figure 3b: Imaginary part of the Fourier transform of [s]

Figure 4a: Energy spectrum of [p]

Figure 4b: Energy spectrum of [s]

Figure 5a: Integration of the energy spectrum of [p]

Figure 5b: Integration of the energy spectrum of [s]

With the over-all amplitude of [p] ($f_p^2$ [wdb]) being 1.1200 E +3.0000 and the over-all amplitude of [s] ($f_s^2$ [wdb]) being 36.6263 E -3.0000, the ratio of amplitude between the two obstats is the following:

$$Q = \frac{1.1200}{36.6263} = 0.0305$$
05. GUILE'S CORPUS (selection)

(1) t --> Ø / {f,x,...} / {f,x,...} / {f,x,...} / {f,x,...} / {f,x,...} (a) Zurich dialect
(b) Faroese
(c) Danish
(d) Colloquial American

Examples:
(a) höfft > Riff German: 'Ramft'
(c) tapetz[a] [taperze] German: 'Tapetieren'  cf. Tapett [tapet] German: 'Tapete'
(b) ndertal > ndaral German: 'Abendmahl'
(d) hundredths [handv르rhs] / [hahndv르rhs]

(2) p --> Ø / {l,r,...} / {l,r,...} / {l,r,...} / {l,r,...} / {l,r,...} (a) Middle High German
(b) Colloquial Westphalen

Examples:
(a) helpen > OHG hülfpan > MG hülfpan > hülfen
(b) wærfan > OHG wærfpan > MG wærfan > wärfen
(c) Pfund [pu:fnt] / [funt] 'pound'

(3) k --> Ø / {st,...} / {st,...} / {st,...} / {st,...} / {st,...} (a) Faroese
(b) Swiss German dialect
(c) Colloquial Zulu

Examples:
(a) russiskur [rus:sikst] 'Russian'
(b) khwebeza [khwebeza] 'shrink'
(c) [kwebeza] / [kwebeza] [kwebeza] [kwebeza] 'shrink'

(4) f --> Ø / {s,...} / {s,...} / {s,...} / {s,...} / {s,...} (a) Southern Dutch

Example:
(a) lifst > list 'dearest'

(5) (s) --> Ø / {s,...} / {s,...} / {s,...} / {s,...} / {s,...} (a) Colloquial American English

Examples:
(a) fishstick[s] [fi'stiks] / [fi'stiks]
(b) kidsch'ten [khìds'ten] / [khÌds'ten] 'most childish'
(c) Du wäschst [vu:s't] / [vu:s't] 'you wash'

(6) s --> Ø / {s,...} / {s,...} / {s,...} / {s,...} / {s,...} (a) Colloquial American English
(b) Colloquial Standard German
(c) Colloquial Westphalen

Examples:
(a) horseshead [hors'shaid] / [hors'shaid]
(b) Du wäschst [vu:s't] / [vu:s't] 'you wash'
(c) Ausschneiden [au:s'hnaiden] / [au:s'hnaiden] 'to cut out'

(7) x --> Ø / {s,...} / {s,...} / {s,...} / {s,...} / {s,...} (a) Southern Dutch

Examples:
(a) sounds [souds] 'sunday' cf. Standard Dutch 'zondags'

(8) h --> Ø / {x,...} / {x,...} / {x,...} / {x,...} / {x,...} (a) Colloquial Dutch
(b) Afrikaans

Examples:
(a) heethoofdheedheid [hetho:di:xeit] / or
(b) lafhartig [lafla:xt] 'cowardly'

06. REFERENCES


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