6.0 Extracted Signal Space

Consider Fig 1-1 (page 1-2) as a representation of both data transmission and voice-input-translator, then the following analogous relationships can be considered:

Digital Data	Voice Data	Major Space
Signal	Voice signals of average or normal individuals	S Signal Space
Noise	Variation between different individuals	N Noise Space
attenuation, } Linear phase,	Variation of α, β for different individuals	$e^{(\alpha+j\beta)L}$ Transmission Space
Freq. Shift } Non-linear Mod-Demod	Male - Female Diff.	$L(w)$ mod-demod Space
Received Signal	Actual voice signal	$V=(S+N)e^{(\alpha+j\beta)L}$ Observation Space
Detection Process	Resolution in Vector Space V' V' may be: (a) binary attributes (b) phonemes (c) sonograms a, w, t *(d) envelopes of amplitude, frequency (description curves)	Decision Rule $\delta(\gamma/V)$
Decoded Symbols	Decoded symbols	Decision Space γ

* W.C. Dersch memo of 2/24/58

F.B. Wood
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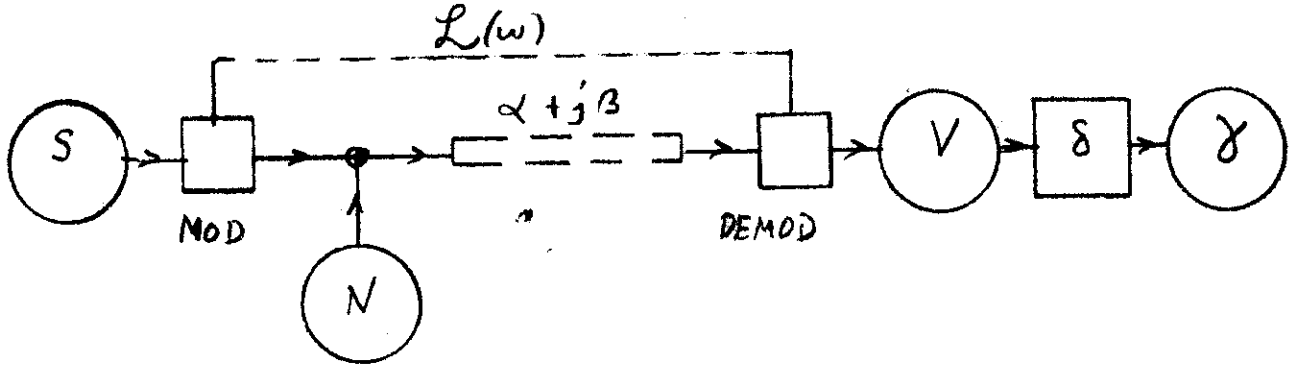


Fig 6.0a: Proposed analogy between data transmission system and voice (word) recognition system.

The resolution in vector space V' would be compared for the following systems

(a) Binary attributes of phonemes*:

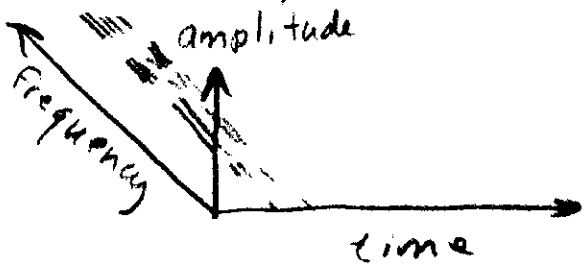
Vocalic / non-
Consonantal / non-
Compact / diffuse
Grave / acute
Flat / plain
Nasal / Oral
Tense / lax
Continuant / interrupted
Strident / mellow

* C. Cherry On Human Communication p95

(b) Phonemes

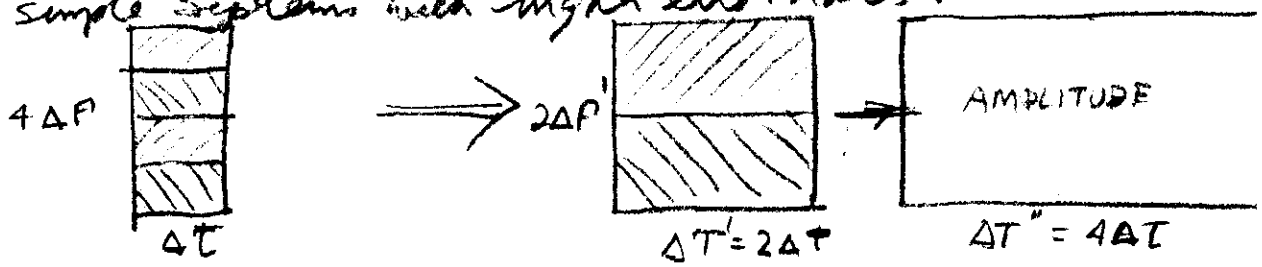
o	i	k	f	s	h
a	l	ʒ	p	θ	*
e	ŋ	ʃ	v	t	
u	ʃ	g	b	ð	
ə	ʧ	m	n	d	

(c) Sonograms *



(d) Description areas

By reducing the definition (number of filters) of the frequency axis, and lengthening the time interval, transformations can be made on the sonograms to simple systems with high error rates.



By sacrificing resolution in frequency and using a longer time interval the system is restricted to identifying words instead of letters.

* C. Cherry, op cit p. 145

The objective of this proposed theoretical analysis is to define the different vector spaces that can be used in voice input. The analysis is proposed to determine how economy of design can be accomplished through accepting less definition in one or more of the coordinates.

See also Information Retrieval Committee reports of 1/29/58.

It is proposed that the analysis of description curves would be more significant if their transforms to and from other vector spaces are understood.

F B Wood
3/27/58

Possible use can be made of decision theory in determining decision rules for the description curves.