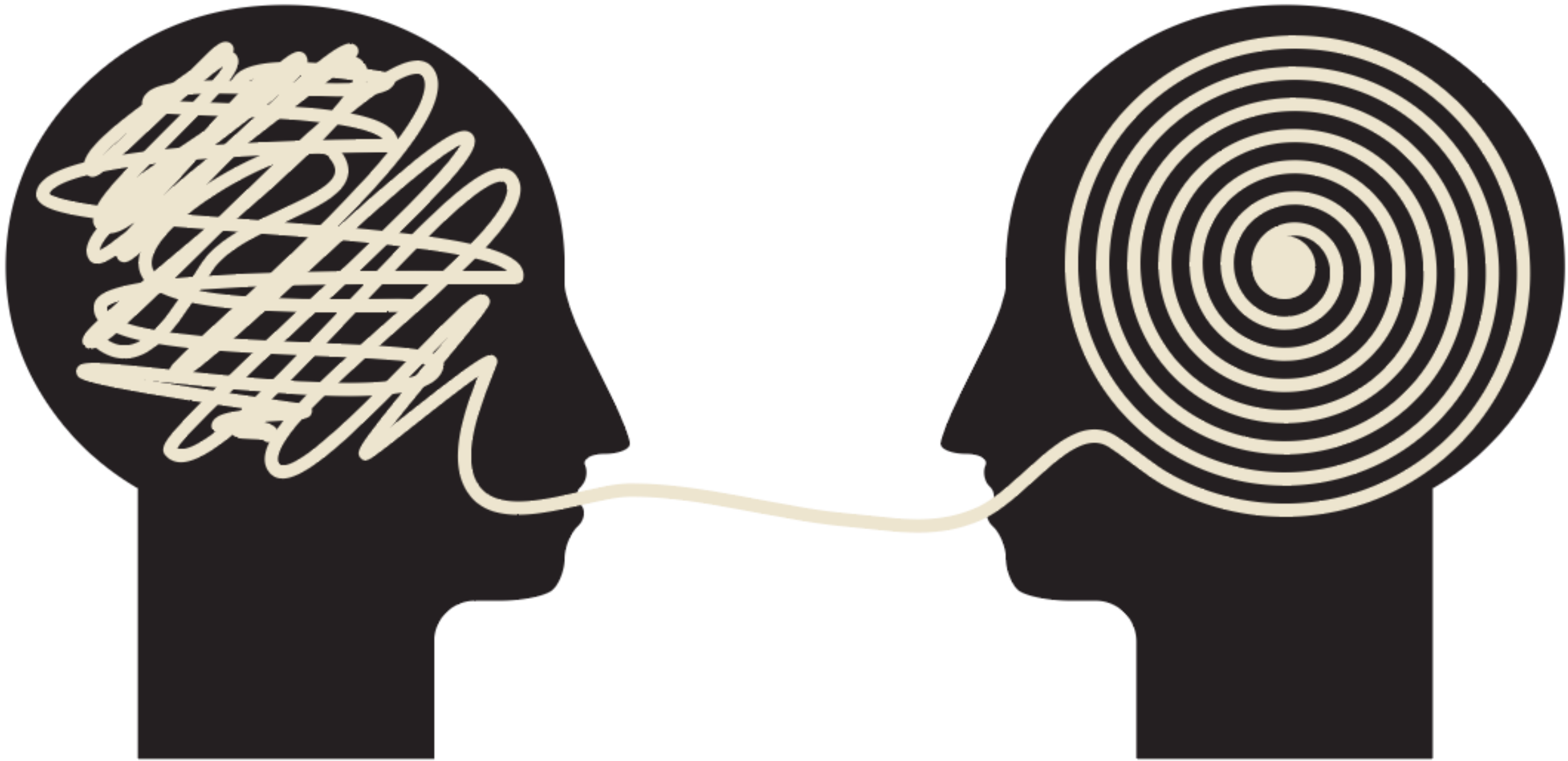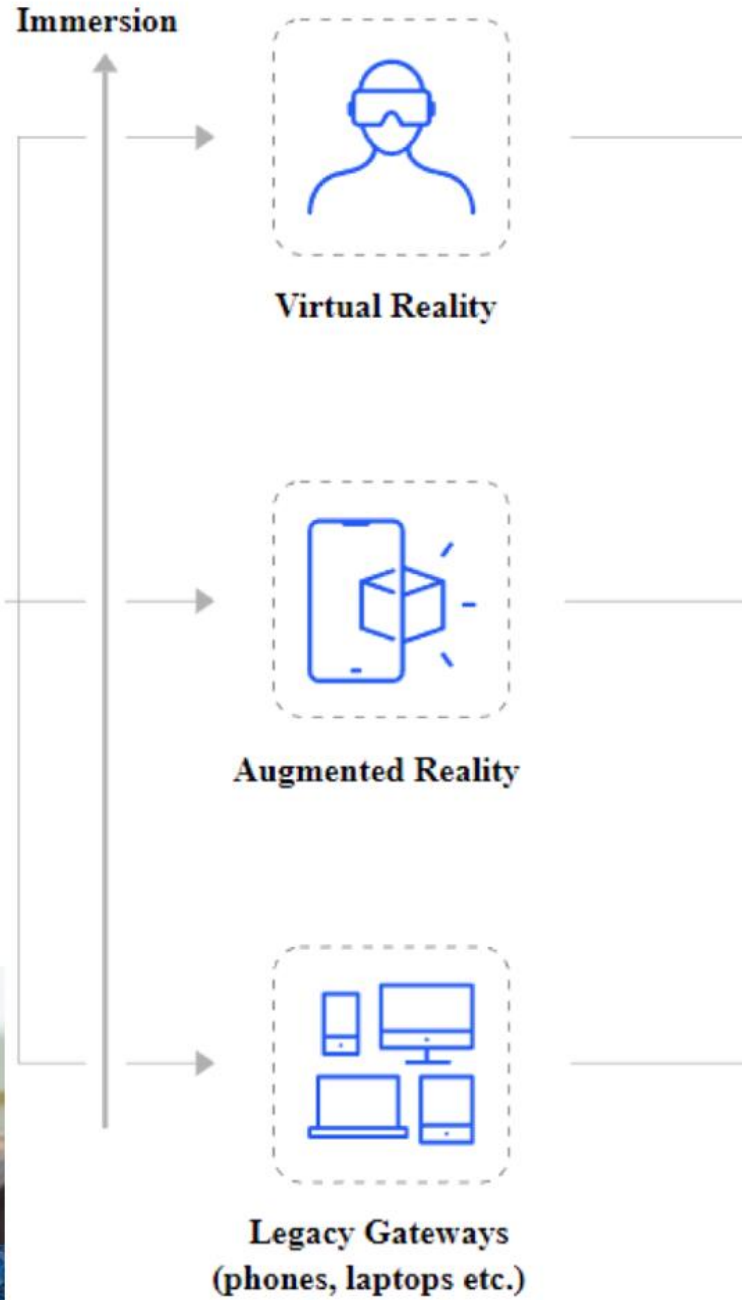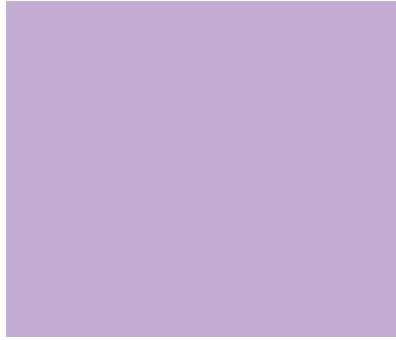# Technical Specification on Requirements for communication between human-avatar languages in the metaverse

5th Forum on Integrating virtual and physical worlds
in the metaverse with digital twin
Geneva, 13th June 2024

Pilar Orero
Co-chair Working group 8: sustainability, accessibility
and inclusion

www.itu.int

Immersion

Virtual Reality

Augmented Reality

**Legacy Gateways
(phones, laptops etc.)**

Item no.	Equation
1.	$dmax := \delta_i \cdot \max_{j=1,2,...,J} \left\{ d_{j,p,r} \right\}$
2.	$avgd := \frac{\sum_{j=1}^{J} d_{j,p,r}}{J}$
3.	$sd_{p,r} := \frac{1}{\sqrt{J}} \cdot \sum_{j=1}^{J} \sqrt{\left(avgd - d_{j,p,r} \right)^2}$
4.	$w_{i,p,r}^{\{s,a\}} := \left(1 - \frac{sd_{p,r} \cdot avgd}{\max_{\substack{p2:=1,2,...,P \\ r2:=1,2,...,R}} (sd_{p2,r2} \cdot avgd)} \right)$
5.	$\overline{xA}_{i,p,r,m}^{\{s,a\}} := \frac{(m-1) \cdot dmax}{nRules - 1}$
6.	$\overline{\sigma A}_{i,p,r}^{\{s,a\}} := \frac{\overline{xA}_{i,p,r,2}^{\{s,a\}} - \overline{xA}_{i,p,r,1}^{\{s,a\}}}{2}$

ITU Focus Group Technical Specification

(03/2024)

ITU Focus Group on metaverse
(FG-MV)

FGMV-26

Requirements for communication between human-avatar languages in the metaverse

Working Group 8: Sustainability, Accessibility & Inclusion

ITU Focus Group Technical Specification

FGMV-26

Requirements for communication between human-avatar languages in the metaverse

Spoken

Voice

20 Most Spoken Languages in the World in 2023

WRITTEN - TEXT

Writing Systems of the World

ABJADS

Although the Egyptians had hieroglyphs for some single consonant sounds, they never used them as an abjad. The first real abjad was probably Proto-Sinaitic, from which Phoenician likely evolved.

Approx. English value + Hebrew letter name	PRE-PHOENICIAN		PHOENICIAN & DERIVATIVES					
	EGYPTIAN HIEROGLYPHS c. 3000 BCE	PROTO-SINAITIC c. 1750 BCE (possible basis for Phoenician)	UGARITIC CUNEIFORM c. 1300 BCE	PHOENICIAN c. 1000 BCE	IMPERIAL ARAMAIC c. 500 BCE	HEBREW	SYRIAC	ARABIC
(glottal stop) alef								
b/v bet								
g gimel								
d dalet								
h he								
v vav								
z zayin								
h het								

ALPHABETS

All the scripts below evolved from the Greek alphabet, which in turn was based on the Phoenician abjad. The Greeks changed the pronunciation of some of the Phoenician consonant letters to represent vowel sounds instead.

Approx. English value + Greek letter name	ANCIENT		MEDIEVAL			MODERN				
	ARCHAIC GREEK c. 800 BCE	ARCHAIC LATIN c. 500 BCE	ROMAN (Latin) c. 1 CE	ANGLO-SAXON RUNES c. 600 CE	OLD ENGLISH (Insular Latin) c. 1000 CE	ENGLISH (Latin)	GREEK	RUSSIAN (Cyrillic)	ARMENIAN	GEORGIAN (Mkhedruli)
a alpha						Aa	Aα	Aa	Uш	
b/v beta						Bb	Bβ	Бб Вв	FP	
g gamma							Γγ	Гг	Qq	
			C	ʎ	c	Cc				
d delta			D			Dd	Δδ	Дд	Тη	
e epsilon			E		e	Ee	Eε	Ee Ёё	Եե	
v/f digamma			F			Ff	FF archaic		Ψψ	
g (duplicate letter placed at end as capital)			G	X		Gg				
z zeta							Zζ	Зз	Qq	
e/h eta			H			Hh	Hη	Ии Йй	Եе	

ABUGIDAS

Aside from the Ethiopic abugida shown on the far right (with Brahmi script used in Ancient India, which in turn was likely basic consonants (with the inherent vowel 'a') are shown. M with a slight curling of the tongue) and the bar indicates lo

Approx. English value	NORTH INDIC								SOUTH IND
	BRAHMI c. 250 BCE	HINDI (Devanagari)	GUJARATI	PUNJABI (Gurmukhi)	BENGALI	TIBETAN	ORIYA	KANNADA	TELUGU	TAMIL
a		अ	અ	ਅ	অ					அ
ā		आ	આ	ਆ	আ					ஆ
i		इ	ઇ	ਇ	ই					இ
ī		ई	ઈ	ਈ	ঈ					ஈ
u		उ	ઉ	ਉ	উ					உ
ū		ऊ	ઊ	ਊ	ঊ					ஊ
ṛ		ऋ								
e										எ
ē		ए	એ	ਏ	এ					ஏ
ai		ऐ	ઐ	ਐ	ঐ					ஐ
o										ஒ

DISTRIBUTION
— of —
WORLD WRITING SYSTEMS

TACTILE - BRAILLE

FG MV 16 - Requirements for communication between human-avatar languages in the metaverse

Gracias!
pilar.orero@uab.cat

Email
tsbfgmv@itu.int

Website
www.itu.int/metaverse