

A Multimodal Model Of Number-Based Nonverbal Signs: Evidence From Uzbek, English, Russian And Turkish

Kurbanova Sevarakhon Rustamjon qizi

PhD Student, Andijan State Institute of Foreign Languages, Uzbekistan

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Abstract: This article presents a multimodal analysis of number-based nonverbal signs, offering one of the first integrative models that unifies their cognitive, semiotic, pragmatic, cultural, and digital dimensions. Drawing on comparative evidence from Uzbek, English, Russian, and Turkish, the study demonstrates how numerical gestures evolve from embodied finger-counting practices to culturally loaded ritual symbols and further into algorithmic codes within digital communication. The methodology incorporates Peircean semiotics, cross-linguistic cultural comparison, speech-act pragmatics, multimodal discourse analysis, and digital semiotics. The results reveal the cognitive specificity of number gestures in child development, their stable interactional and evaluative functions across cultures, culturally anchored symbolism (e.g., 7, 12, 40), and their transformation into globally recognizable digital signs such as “100,” “404,” and “143.” The proposed five-criteria semiotic classification provides a comprehensive framework for understanding how numbers function as multimodal semiotic units integrating perceptual, interactional, and digital meanings.

Keywords: Number-based nonverbal signs; multimodal semiotics; cultural symbolism; numerical gestures; digital semiotics; cognitive models; speech-gesture integration; cross-cultural pragmatics; ritual numbers; algorithmic codes.

Introduction: Research on nonverbal communication has traditionally focused on gesture, proxemics, facial expression and multimodal discourse [1], [2], while number-based nonverbal signs remained a fragmented field of inquiry. Over the past two decades (2000–2025), however, number gestures have increasingly been examined from cognitive, neurolinguistic, semiotic and cross-cultural perspectives [3], revealing that numbers function not only as quantitative indicators but as symbolic, interactional and culture-specific semiotic units.

Studies by Dimitrova, García-Orza and Nuerk demonstrate that children interpret number gestures differently from nonsymbolic quantities, treating finger-based numbers as a special cognitive code [4]. Multisystem linguistic environments—such as Uzbek, Turkish, English and Russian provide a rich field for observing how numerical gestures evolve under the

influence of ritual practices, cultural cognition, digital media and linguistic categorization.

Despite this progress, scholars note the lack of a unified, linguosemiotic classification of number gestures [3]. Existing research covers separate aspects cognitive development [5], cultural symbolism [6], discourse functions [7], and semiotic categorization [8] yet a multimodal, cross-linguistic model integrating all layers is still absent.

The present study aims to fill this gap by proposing a multimodal model of number-based nonverbal signs, grounded in comparative evidence from four typologically different languages.

METHODOLOGY

This research employed an integrated, five-stage methodological system designed to capture the cognitive, semiotic, pragmatic and digital dimensions of numerical gestures.

1. The semiotic classification of number-based nonverbal signs was conducted through an expanded application of Peirce's triadic model [8], with emphasis not on traditional gesture labeling but on the functional pathways through which numerical meanings emerge. Within this framework, iconicity was interpreted as the degree to which numerical gestures visually resemble cognitive quantity models, including differentiated hand shapes and spatial structuring strategies used by speakers of various languages. Indexicality was examined through the situational anchoring of number gestures, such as their role in organizing interactional sequences, regulating conversational rights, or indicating social hierarchy within group dynamics. Symbolic forms, meanwhile, were analyzed as culturally stabilized semiotic constructs in which numbers lose direct visual motivation and instead acquire abstract socio-historical meanings. Examples include identity-marking numerical cycles in Uzbek and Turkish ritual communication, conventionalized rating-based expressions in English discourse, and historically inherited classificatory numbers in Russian institutional language [6]. This mapping process enabled the identification of how numerical gestures transition between perceptual, interactional and culturally encoded levels within a multimodal semiotic system.

2. Cross-Linguistic Comparative Analysis. Data from Uzbek, Turkish, English and Russian were compared to identify similarities and divergences in ritual usage, cultural schema, gestural norms and digital adaptations. This method drew on linguistic-cultural frameworks by Wierzbicka [9] and ethnosemiotic studies of number symbolism [6].

3. Pragmatic Analysis. Using Austin's and Searle's speech-act theories [10], number gestures were examined for illocutionary force, interactional function and contextual intention. For example, raising one finger for requesting a turn, showing "five" for praise in Uzbek classrooms, or forming a "zero" to express disapproval in Russian interpersonal communication.

4. Multimodal Discourse Analysis. McNeill's multimodal theory [1] and Kress-van Leeuwen's frameworks [11] were applied to investigate how number gestures synchronize with intonation, gaze, body orientation and verbal components. Classroom recordings, everyday conversations and public speech samples were analyzed to observe rhythmic, prosodic and visual integration.

5. Digital-Semiotic Observation. A corpus of social-media samples (memes, emoji-number combinations, algorithmic codes) was analyzed following Danesi's digital semiotics [3] and Crystal's Internet linguistics [12]. Codes such as "404", "99+", "100", "143", "520"

were examined for their emotional, evaluative and symbolic functions across languages.

RESULTS

1. Cognitive Mechanisms of Number-Based Signs. Evidence supports the view that children treat number gestures as structured mental categories rather than simple quantity indicators [4], [5]. Finger counting fosters abstract number concepts, stabilizes numerical memory and forms the bridge between nonsymbolic quantity perception and symbolic number knowledge. In Uzbek and Turkish children, ritualized numerical schemas (e.g., 7, 12, 40) further reinforce conceptual salience.

2. Linguo-Pragmatic Functions. Across languages, number gestures perform stable communicative functions:

Regulative: one-finger signals for turn-taking in classrooms; "two" for role distribution in Uzbek and Turkish group tasks.

Structuring: sequential gestures accompanying discourse markers, supporting McNeill's "gesture-speech unity" [1].

Evaluative: "five!" as praise in Uzbek pedagogy; "zero" as rejection in Russian and English informal settings.

Attentive: index-finger pointing combined with stress patterns to mark critical information. These functions confirm that numerical gestures act as illocutionary condensers [10] capable of encoding intent in minimal form.

3. Cultural-Semiotic Divergence.

Distinct cultural patterns emerged: Uzbek & Turkish: ritual-mythopoetic prominence of 7, 12, 40; transitional and purificational symbolism in "qirq kun" / "kırkı çıkmak" [6].

English: dominance of technological-metaphorical numbers such as "404", "101", "24/7", reflecting digital cognition [12].

Russian: persistence of Soviet-era numeric labels such as "perviy sort", and culturally anchored sets like "troika" [6].

These results confirm that number gestures are deeply culturally conditioned, even when formally similar.

4. Digital Transformation of Numeric Signs. The rise of internet culture reshapes number gestures into algorithmic symbols:

"100" – approval, certainty

"404" – confusion, absence

"143" – affectionate message ("I love you")

"99+" – overload

“520” – Sino-phonosemantic love code

Digital platforms thus generate a new, globally shared semiotic register, where numbers function as emotional shortcuts and identity markers [3], [12].

5. Five-Criteria Semiotic Classification. Based on dissertation data, number-based signs can be systematized through five criteria [3]:

Denotative–semantic (quantity, abstraction)

Cultural–mythopoetic (ritual numbers)

Functional–pragmatic (interactional intent)

Multimodal (gesture–speech coupling)

Digital–algorithmic (internet codes)

DISCUSSION

1. Multimodal Integration. Consistent with McNeill’s theory, number gestures interact dynamically with prosody, rhythm, pauses and gaze to form unified multimodal meaning [1]. Their communicative value arises not from hand movement alone but from coordinated semiotic layering.

2. Cultural Anchoring. Lotman’s semiosphere concept explains why certain numbers—7, 12, 40—remain stable cultural anchors across generations [6]. In Uzbek and Turkish communities, these numbers transmit cosmological beliefs, moral values and ritual cycles.

3. Cognitive Stability and Universality. As shown in developmental psychology [4], [5], number gestures form a core domain of human cognition, enabling children to move from perception to conceptualization. This universality explains the persistence of finger counting across cultures.

4. Digital Re-Encoding of Numbers. Following Danesi and Crystal [3], [12], number gestures now manifest as emoji-number hybrids, hashtags and interface codes, marking a shift from embodied gesture to algorithmic symbolization. This evolution represents a new stage in semiotic compression and communicative efficiency.

CONCLUSION

The study develops a multimodal model demonstrating that number-based nonverbal signs represent a complex semiotic system shaped by cultural traditions, cognitive development, pragmatic needs and digital communication. While rooted in embodiment (finger counting), number signs evolve into ritual symbols and later into global digital codes.

Further research should focus on:

1. Building multimodal corpora for cross-linguistic gesture analysis.
2. Examining generational variation in digital-numeric semiotics.

3. Developing an expanded semiotic taxonomy integrating embodied and digital number signs.

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