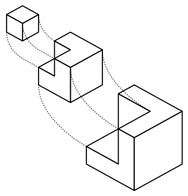
MediaFranca

A Practice-Based Inquiry into a Generative Pictographic System for Cognitive Accessibility

Keywords
Generative System, Pictographic Communication, Complex Communication Needs (CCN), Cognitive Accesibility, Augmentative and Alternative Communication (AAC).

PICTOGRAPHIC COMMUNICATION | **GENERATIVE MODEL** | **COMMUNITY PROJECT**



MOTIVATION

A longstanding interest in cognitive accessibility through visual communication has influenced previous projects such as PiX and PICTOS, where interaction notations and pictographic systems were examined as tools to improve understanding and enable collaboration. Visual communication often bypasses the ambiguities of spoken language. The ability to externalise thought through structured visual forms supports comprehension and reinforces self-determination, giving individuals greater control over their interactions and decisions. Communication is a vehicle for expressing intent and a fundamental aspect of shaping identity and agency. When pictographic systems are designed with this in mind, they become more than mere supports; they become tools for negotiation, participation, and meaningful engagement with the world.

The desire to understand AI as a "design material" stems from the need to maintain individual control over systems that mediate interaction. AI should function as a flexible and transparent medium, rather than an opaque, pre-defined structure, enabling users to mould it according to their needs. The interface must be hospitable, self-explanatory, and adaptable, facilitating customisation and progressive refinement of complexity. A crucial aspect of this vision is the concept of an "aesthetic of accessibility," where language and representation are not only functional but also resonate with the user's cognitive and perceptual expectations. Words and actions should "rhyme" to create a system that feels natural, generous, and open-ended, avoiding rigid constraints that may alienate or exclude users. How a system reveals its internal workings—its reversibility, editability, and openness to change—affects users' perceptions of their own agency.

A communication system cannot exist in isolation; it must be embedded in a social structure that allows for shared meaning, adaptation, and collective evolution. Communication systems require mechanisms of governance that empower users rather than subject them to imposed linguistic or structural norms. The challenge is to design a system that starts at the level of individual personalisation and scales to a community level without enforcing uniformity or hierarchy. Learning from federated learning models, the system should be structured to allow local adaptations to inform broader frameworks, so that collective norms emerge organically rather than being dictated from above. This distributed approach aligns with the nature of communication—fluid, context-dependent, and shaped by shared experience—offering a foundation for a truly inclusive and participatory system.

MAIN FOCUS

Pictographic communication systems for individuals with complex communication needs (CCN) synthesise text and image, seeking the most cognitively accessible equation for conveying meaning. Unlike conventional linguistic structures, which often rely on culturally embedded syntax and grammar, pictograms function as immediate, recognisable communication units. However, their effectiveness is always culturally situated; they are not neutral symbols but elements shaped by the perceptual and conceptual frameworks of the communities that use them. The challenge lies in defining a adaptable pictographic structure while maintaining a core of shared intelligibility, allowing for personalisation without sacrificing the clarity needed for broader communication.

The pictogram is not an isolated sign but part of a more extensive design system governed by its internal logic. Composition, level of detail, abstraction, communicative rhetoric, visual syntax, and stylistic conventions determine its legibility and effectiveness. This layer of the research focuses on understanding the pictogram as a generative algorithm, as a structured logical pipeline that defines how meaning emerges through the arrangement of visual elements.

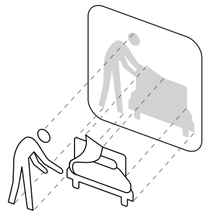
Open-source platforms are not confined to a single institutional or corporate framework but instead become tools that individuals and communities can shape to fit their needs. Designing mechanisms that give people control over their models. The intersection of individual agency and collective intelligence is central here: the system should allow users to contribute to its evolution while also benefiting from the refinements made by the broader community. The goal is to establish a framework where personalisation and collaboration coexist without one overpowering the other.

KEY QUESTIONS

Q1: How can a pictogram-based visual system, supported by emerging technologies, create a more intuitive and natural interaction experience that supports self-determination and cognitive accessibility for adults with complex communication needs?

Q2: What design principles should an interface adopt to be sufficiently flexible and inhabitable, allowing for personalisation, reversibility, and the progressive development of a user-driven generative AI model?

Q3: What rules and communicative mechanisms can structure the governance of federated models in an open-source ecosystem, keeping a balance between individual autonomy and collective coherence?

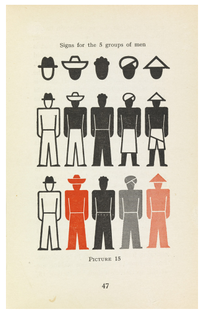


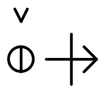
HYPOTHESIS

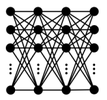
- There must be a strong semantic relationship between the space of words and the space of images.
- A pictogram is a structured composition of visual elements that, when arranged appropriately, convey precise meaning. This research considers the Natural Semantic Metalanguage (NSM) as a foundational approach for visual tokenisation, seeking to establish a fundamental set of pictographic primitives that align with cognitive accessibility.

- Users should be provided with the highest level of granularity and specificity in their feedback to the system, treating code and image as a cohesive, elegant whole. This approach is embodied in the concept of a round-trip edition interface, where edits made in one representation are seamlessly reflected in the other, reinforcing transparency, control, and reversibility.
- As a communication system, interaction should function as a cognitive extension rather than a hermeneutic relationship, allowing a cognitive coupling between the user and the system.

- Federated Learning presents a viable approach to resolving the universal-local paradox in communication systems. It enables individual contributions to be valued within a shared framework while safeguarding privacy. Decentralising learning and model adaptation allows users to retain control over their data and their evolving pictographic systems, allowing a participatory and context-sensitive ecosystem.







CONTEXTUAL REVIEW

Pictographic representation and cognitive accessibility. Key references include foundational AAC research (Beukelman & Light, 2020; Light & McNaughton, 2012), historical cases such as Blissymbolics and ISOTYPE (Bliss, 1949; Burke, 2009), and studies on universal visual languages. The Natural Semantic Metalanguage (Wierzbicka, 1996) is particularly relevant as a conceptual tool for breaking down meaning into fundamental cognitive units. This level also integrates self-determination theory (Adams et al., 2017) and linguistic-philosophical perspectives on meaning and communication (Goddard & Wierzbicka, 2014; Wittgenstein, 2010). The doctoral research will engage with practitioners using AAC to validate pictographic principles, with interviews providing insights into real-world applications and challenges.

Interaction design and AI integration, exploring how users interact with and personalise pictographic systems. Literature on usability and accessibility in interfaces (Draffan et al., 2023) informs the approach, alongside perspectives from Activity Theory (Engeström, 2014) and theories of cognition and learning (Wehmeyer & Shogren, 2017). This level remains speculative but provides the groundwork for designing interfaces that allow personalisation, reversibility, and user-driven model evolution. The concept of AI as a design material (Holmquist, 2017; Feng et al., 2023) informs the exploration of generative models capable of adapting pictograms dynamically. In this phase, speculative personas and scenarios will be developed—following an interaction design (IxD) tradition—to articulate potential uses and constraints of AI-enhanced pictographic systems.

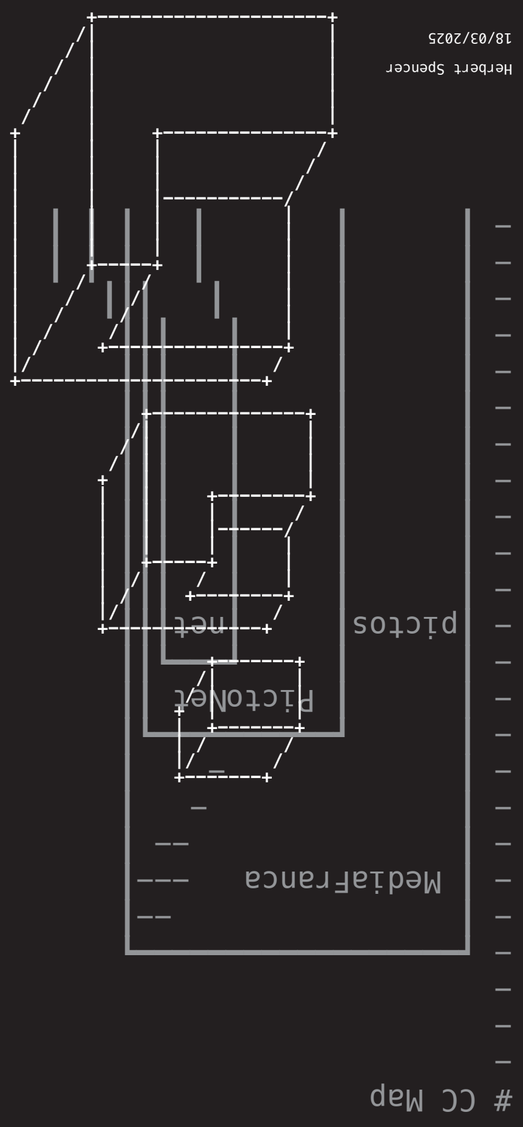
Community governance, federated models, and open-source sustainability. While the least defined, it serves as a research horizon, identifying pathways for a scalable, community-driven pictographic ecosystem. References on federated learning (Uddin & Mashwani, 2024), decentralised governance (Murturi et al., 2023), and sustainable open-source business models (Light, 2021) suggest possible directions. This level will take shape as the system matures, leveraging insights from the first two layers to determine governance structures that balance individual agency with collective adaptability.

DESIGN SPACE, OUTCOME AND EXPECTED IMPACT

The space of the pictogram, where the outcome is a generative model capable of producing pictographic representations tailored for cognitive accessibility. This model does not merely generate images but structures meaning through a systematic composition of visual elements. The expected impact is the enhancement of communication and autonomy for individuals with complex communication needs (CCN), offering accessible pictographic tools that align with diverse cognitive profiles and communicative contexts.

The space of the training interface, particularly the split edition interface, which enables users to interact dynamically with the system. This interface is designed to maintain a seamless relationship between the underlying code and the visual representation, ensuring that modifications remain transparent and reversible. The impact of this layer is the facilitation of pictogram creation and adaptation through AI, allowing users to refine and expand their communication repertoire. This process serves not only as a tool for expression but also as a means of disambiguation—helping users structure and reflect upon their perception of the world while actively engaging in the evolution of their pictographic system.

The space of the open-source project, encompassing web-based engagement channels, repository publishing, and online services that allow for distributed collaboration. This layer ensures that the system is not confined to isolated instances but instead evolves through community contributions, benefiting from the collective refinement of culturally and contextually adapted pictograms. The expected impact is the establishment of an active, participatory community that contributes to the continuous development of the system, fostering a distributed and inclusive model of pictographic communication.



Category	Semantic Prime	Emoji
Substantives	I	☝️
	YOU	👊
	SOMEONE	👤
	PEOPLE	👥
	BODY	🧍
Determiners	THIS	👉
	THE SAME	👯
	OTHER	🔁
Quantifiers	ONE	1
	TWO	2
	SOME	🎲
	ALL	🌍
Evaluators	GOOD	👍
	BAD	👎
Descriptors	BIG	🔪
	SMALL	🔍
Mental Pred.	THINK	🤔
	KNOW	📖
	WANT	❤️
	DON’T WANT	✋
	FEEL	😊
	SEE	👀
	HEAR	👂
Speech	SAY	🗣️
	WORDS	📝
	TRUE	✅
Actions	DO	🏃
	HAPPEN	⏳
Location	BE (somewhere)	📍
	THERE IS	👉
Possession	HAVE	🤲
Life & Death	LIVE	🌱
	DIE	☠️
Time	WHEN	⏰
	TIME	🕒
	NOW	⏳
	BEFORE	⬅️
	AFTER	➡️

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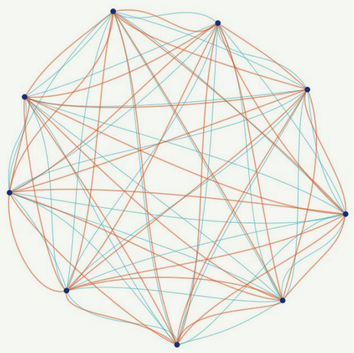
Make the bed

GENERATE

ELEMENTS

- bed
- person



```
<?xml version="1.0" encoding="UTF-8"?>
<svg id="pictogram" xmlns="http://www.w3.org/2000/svg" version="1.1" viewBox="0 0 100 100">
  <!-- Make the bed  -->
  <defs>
    <style>
      .f {
        fill: #fff;
        stroke: #000;
        stroke-linejoin: square;
      }
      .k {
        fill: #000;
        stroke: #FFF;
        stroke-linejoin: square;
      }
    </style>
  </defs>
  <g id="bed">
    <path id="bed_frame" class="f" d="M86.6,66.1l6.7,10.9v7.1h-5.1v5.1c0,.9-.7,1.6-1.6,1.6h-
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7.1l6.7-10.9v-18.5c0-1.3,1.1-2.4,2.4-2.4h41.3c1.3,0,2.4,1.1,2.4,2.4v18.5h-.1Z"/>
    <path id="matress" class="f" d="M85.9,78.6h-44.4c-3,0-5.4-2.4-5.4-5.4v-1.9c0-1.5.7-3,1.8-4l7.7-6.8c1-
.9,2.3-1.4,3.6-1.4h29c1.3,0,2.6.5,3.6,1.4l7.7,6.8c1.2,1,1.8,2.5,1.8,4v1.9c0,3-2.4,5.4-5.4,5.4Z"/>
    <path id=" pillow" class="f" d="M52.2,53.5h22
.4c2.3,0,4.1,1.8,4.1,4h0c0,2.2-1.8,4-4.1,4h-22.4c-2.3,0-4.1-1.8-4.1-4h0c0-2.2,1.8-4,4.1-4Z"/>
    <path id="sheet" class="f" d="M50.6,39.6c2.1,1.3,15.3,5.5,15.3,5.5,0,0-1.3,9.6-3.9,12.5-6.3,7.1-
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  </g>
  <g id="person">
    <path id="arm" class="k" d="M29.9,37.5l4.2,7.8,6.7,3.7c1.1.6,1.5,2.1.7,3.2h0c-.6.8-1.7,1.1-2.6.7l-9.1-3.9-4.1-6.4"/>
    <path id="body" class="k" d="M29,90.5l-4.9.2-5-35.6-3,18.9-4.2,17.1h-5l4.3-19.7.6-19.4c.2-2.1.2-
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,2l10,3c1.4.4,2.2,2,1.6,3.4h0c-.5,1.1-1.7,1.8-2.9,1.5l-13.7-3.3-9.1-7.5-4.9,7.5,4,45.5h0Z"/>
    <circle id="head" class="k" cx="38.9" cy="19.9" r="5.5"/>
  </g>
</svg>
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I

THERE IS SOMETHING
THIS SOMETHING IS NOT A PERSON
PEOPLE CAN SEE THIS SOMETHING
WHEN PEOPLE SEE THIS SOMETHING, THEY
CAN THINK ABOUT SOMETHING ELSE
BECAUSE OF THIS, PEOPLE CAN KNOW SOMETHING

THIS SOMETHING IS LIKE A PICTURE
THIS SOMETHING IS NOT MANY PICTURES, IT IS ONE PICTURE
THIS PICTURE IS NOT LIKE A PICTURE OF A REAL THING
THIS PICTURE IS SIMPLE
PEOPLE IN MANY PLACES CAN UNDERSTAND THIS PICTURE

PEOPLE CAN THINK LIKE THIS:
“I WANT TO SAY SOMETHING TO SOMEONE”
“I WANT THIS PERSON TO KNOW WHAT I THINK”
“I CAN SHOW THIS PICTURE TO THIS PERSON”
“BECAUSE THIS PERSON CAN SEE THIS PICTURE,
THIS PERSON CAN THINK ABOUT WHAT I WANT TO SAY”

BECAUSE OF THIS, THIS PICTURE CAN HELP PEOPLE
IT CAN HELP PEOPLE WHO CANNOT SAY WORDS WITH THEIR MOUTH
IT CAN HELP PEOPLE WHO CANNOT READ MANY WORDS
IT CAN HELP PEOPLE UNDERSTAND THINGS FAST
BECAUSE OF THIS, MANY PEOPLE THINK IT IS
GOOD TO HAVE PICTURES LIKE THIS

II

THERE IS SOMETHING
THIS SOMETHING IS NOT A PERSON
THIS SOMETHING IS A KIND OF THING PEOPLE CAN SEE AND TOUCH
PEOPLE CAN DO SOME THINGS WITH THIS SOMETHING USING THEIR HANDS
PEOPLE CAN DO SOME THINGS WITH THIS SOMETHING USING THEIR EYES
PEOPLE CAN THINK ABOUT WHAT THEY WANT TO DO WITH THIS SOMETHING

IT IS GOOD IF:
PEOPLE CAN DO MANY DIFFERENT THINGS WITH THIS SOMETHING
PEOPLE CAN CHANGE HOW THIS SOMETHING LOOKS
PEOPLE CAN CHANGE WHAT THIS SOMETHING DOES
IF PEOPLE DO SOMETHING, THEY CAN MAKE IT NOT HAPPEN LATER
IF PEOPLE DO SOMETHING, THEY CAN
CHANGE IT LATER IF THEY WANT
IF PEOPLE USE THIS SOMETHING FOR A LONG TIME,
IT CAN LEARN ABOUT WHAT THESE PEOPLE WANT
BECAUSE OF THIS, THIS SOMETHING CAN DO
NEW THINGS THAT THESE PEOPLE LIKE

IT IS GOOD IF THIS SOMETHING IS NOT HARD TO USE
IT IS GOOD IF THIS SOMETHING DOES NOT MAKE
PEOPLE THINK: **“I CANNOT DO THIS”**

IT IS GOOD IF THIS SOMETHING MAKES PEOPLE THINK:
“I CAN DO MANY THINGS WITH THIS”
“THIS CAN BE LIKE I WANT”
“IF I DO SOMETHING NOW, I CAN CHANGE IT LATER”
“THIS CAN LEARN ABOUT ME”

III

THERE ARE MANY PEOPLE
THESE PEOPLE WANT TO DO SOME THINGS TOGETHER
THESE PEOPLE USE THE SAME KIND OF THING TO DO THESE THINGS
THIS THING IS NOT ONE BIG THING, IT IS
MANY SMALL THINGS TOGETHER
EACH SMALL THING CAN BE DIFFERENT
EACH SMALL THING CAN BE LIKE ONE PERSON WANTS IT TO BE
AT THE SAME TIME, ALL THESE SMALL THINGS
HAVE TO BE LIKE OTHER PEOPLE WANT

IT IS GOOD IF:
ALL THESE PEOPLE CAN SAY WHAT THEY WANT
ALL THESE PEOPLE CAN KNOW WHAT OTHER PEOPLE WANT
ALL THESE PEOPLE CAN THINK ABOUT WHAT IS GOOD FOR EVERYONE
ALL THESE PEOPLE CAN DO THINGS TOGETHER IN THE SAME WAY
ALL THESE PEOPLE CAN DO THINGS IN THEIR OWN WAY IF THEY WANT

IT IS GOOD IF THERE ARE SOME RULES:
“IF SOMEONE DOES SOMETHING, OTHER PEOPLE CAN KNOW ABOUT IT”
“IF SOMEONE CHANGES SOMETHING, OTHER
PEOPLE CAN SEE THIS CHANGE”
“IF SOMEONE DOES NOT WANT TO DO SOMETHING,
THIS PERSON DOES NOT HAVE TO DO IT”
“IF MANY PEOPLE WANT TO DO SOMETHING
TOGETHER, IT CAN HAPPEN”

IT IS GOOD IF PEOPLE HAVE A WAY TO SAY:
“I THINK THIS IS GOOD FOR ME”
“I THINK THIS IS GOOD FOR MANY PEOPLE”
“I WANT TO DO THIS IN A DIFFERENT WAY”
“I WANT TO DO THIS IN THE SAME WAY AS OTHER PEOPLE”
“IF WE ALL DO THIS TOGETHER, IT CAN BE GOOD”

IF THIS HAPPENS, PEOPLE CAN FEEL:
“I CAN DO WHAT I WANT”
“OTHER PEOPLE CAN DO WHAT THEY WANT”
“WE CAN DO SOMETHING TOGETHER”