

Interactive NeuroKnitting: Knitting with Your Brain

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ABSTRACT

Interactive NeuroKnitting: Knitting with Your Brain stems from our previous work about knitting and brain data. A self-made circular knitting machine Circular Knitic is activated on the user's EEG data in real-time. It means that knitting happens only when a spectator wears BCI (brain-computer interface). The audience's meditation and attention levels are translated to the knitting machine's speed and pattern. Hence, the autonomous knitting machine is turned into a brain-data-driven mechanism that enables the audience to experience their brain activity through the knitting process, leaving the pattern in the garment behind. The growing collective brain-knitting installation is accompanied by the on-screen personal EEG data visualization overlaying AI-generated videos. A multimodal EEG data experience enables the viewers to understand their brain activity in novel and artistic ways.

CCS CONCEPTS

• Applied computing → Media arts.

KEYWORDS

EEG, BCI, biometric data, interactive art, brain art, interdisciplinary, data experience, data physicalisation, data materialisation

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1 DESCRIPTION

It is an interactive artwork that brings together biometric data, craft, digital fabrication, interaction, and data physicalization and sensification. Interactive NeuroKnitting: Knitting with Your Brain invites the audience to knit with the power of their brain (see Figure 1,2). The custom-made circular knitting machine Circular Knitic and accompanying videos are activated by the incoming brain signal only. It means if there is nobody wearing BCI, then the artwork is still. Although the feedback is very concrete, on and off, the audience struggles to control their brain state, and thus, the knitting processes. As Guljajeva writes, in the case of biometric

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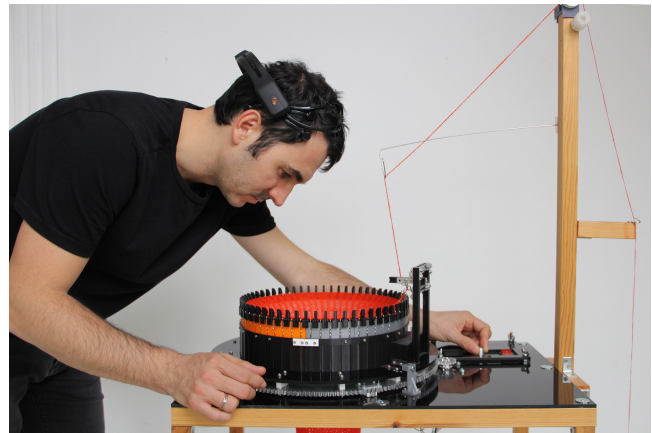


Figure 1: Interactive NeuroKnitting. A participant knitting with the power of his brain signal.



Figure 2: Installation view. A participant controlling knitting machine with his meditation level and the pattern-making follows the attention. On-screen EEG raw data visualization.

data, especially brain data, usage as input, users struggle to control an interactive artwork [4].

The art installation combines data physicalization and sensification with more traditional on-screen data visualization. Data physicalization and sensification are realised through the knitting processes that happen at the same time and place with a participant wearing a BCI. A user's meditation is mapped to the speed of the knitting machine, and attention to the pattern generation. It means

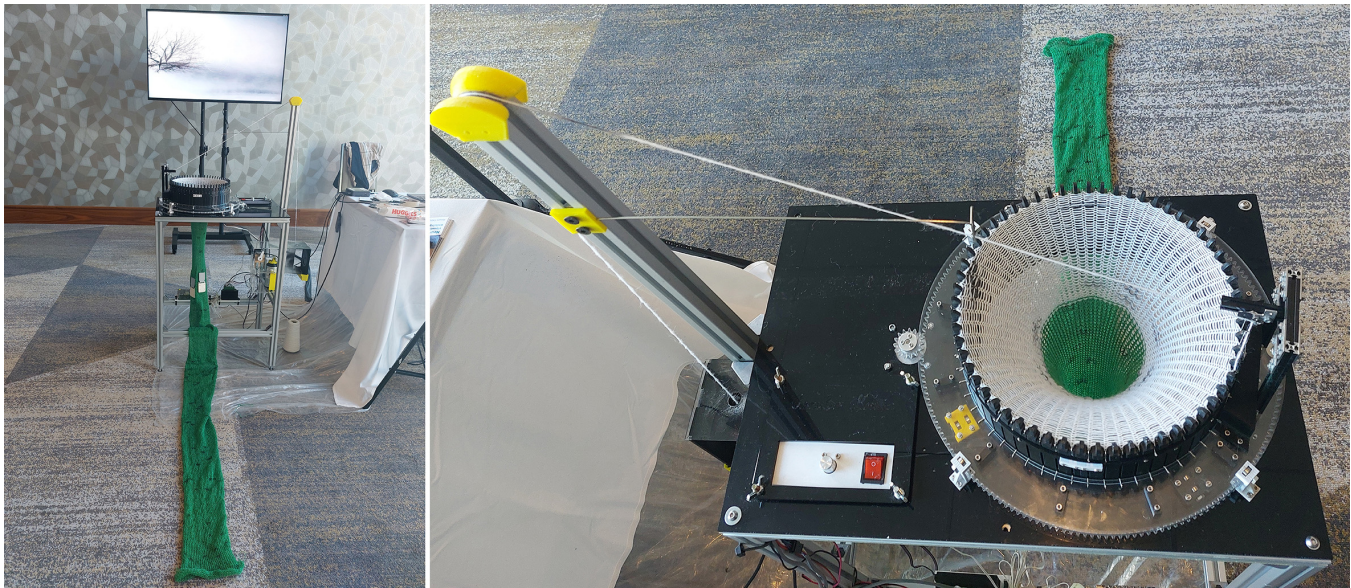


Figure 3: Installation view on the left and close view of Circular Knitic on the right.

that higher the meditation level is higher the knitting speed, and the attention data triggers the pattern-making mechanism each time it passes the set threshold. Regarding the on-screen component, raw EEG data is visualised as circular lines following the aesthetics of knitting. The data viz overlies the pre-made AI-generated video.

When it comes to the knitting machine, Circular Knitic is designed and fabricated by us in 2014 with the intention of bridging the gap between textile and computer-aided manufacturing (CAM) [2]. For this particular project, we upgraded the machine with the pattern-generating mechanism, which is a digitally controlled spraying system (see Figure 3). We dye the yarn when the attention peak triggers the spray before it gets knit. This way, a participant can experience their mind state in a novel way through the textile manufacturing process.

Furthermore, the audience’s attention gets plotted to the garment that remains an artefact and data visualization of past experiences.

To sum up, Interactive NeuroKnitting: Knitting with Your Brain is an interdisciplinary art project that allows experiencing personal EEG data in a novel way. Namely, it a real-time knitting installation, which speed and pattern generation function as feedback to a user’s brain activity accompanied by on-screen raw brain data visualisation.

2 ARTIST STATEMENT

Our work, which explores the intersection of neuroscience and knitting, began with the NeuroKnitting project in 2012, aimed at integrating these two fields [3]. In the same year, we hacked the obsolete knitting machine Brother 930, and invented open-hardware Knitic that enabled real-time control of the electronic knitting machine via computer program [1]. The experience gained from the Knitic project led us to the development of Circular Knitic in 2014, an open-source circular knitting machine created with digital fabrication and makers’ tool set.

In the NeuroKnitting Beethoven project (2020), we combined Circular Knitic with brain data and performance for the first time. Our latest endeavor, Interactive NeuroKnitting: Knitting with Your Brain, provides the audience with a unique opportunity to quite literally knit with their brains.

One distinctive aspect of this project is data materialization through knitting and pattern-making that happens in real-time. This allows the artwork to be interactive and responsive to the audience, a novel feature as data physicalization typically happens after data has been collected. Furthermore, the collective pattern created through audience interaction forms an alternative archive of brain waves submitted to the system, expanding with each new participant. Consequently, the resulting garment serves as a physical repository of collective knitting experiences and brain data.

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