Artists' Views on Robotics Involvement in Painting Productions

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***Abstract*—As robotic technologies evolve, their potential in artistic creation becomes an increasingly relevant topic of inquiry. This study explores how professional abstract artists perceive and experience co-creative interactions with an autonomous painting robotic arm. Eight artists engaged in six painting sessions—three with a human partner, followed by three with the robot—and subsequently participated in semi-structured interviews analyzed through reflexive thematic analysis. Human-human interactions were described as intuitive, dialogic, and emotionally engaging, whereas human-robot sessions felt more playful and reflective, offering greater autonomy and prompting for novel strategies to overcome the system's limitations. This work offers one of the first empirical investigations into artists' lived experiences with a robot, highlighting the value of long-term engagement and a multidisciplinary approach to human-robot co-creation.**

***Index Terms*—Human-robot interaction, art, stakeholders**

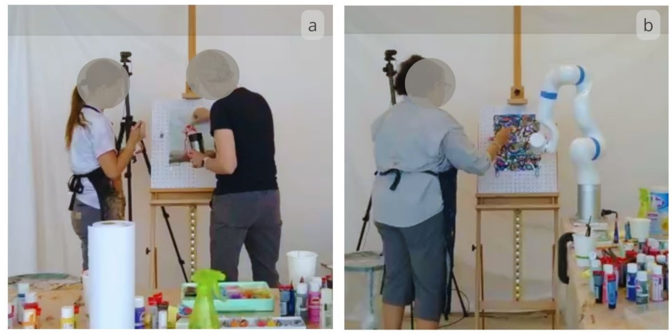

Fig. 1: Study conditions: (a) artist-artist collaborative painting; (b) artist-robot collaborative painting.

I. Introduction

ART has always been a mirror of the human spirit—an intimate expression of emotion, identity, and cultural context. As technology becomes increasingly intertwined with our daily lives, it also begins to shape how we create, perceive, and share artistic experiences. If art reflects who we are, and technology is increasingly embedded in how we live and create, then the artistic process itself inevitably evolves.

In recent years, robotic systems have been employed not only as tools in the hands of artists, but also as creative agents in their own. From algorithmically-generated paintings [1] to autonomous robotic brushstrokes [2], these technologies challenge traditional boundaries between the artist and the medium. Yet, while much attention has been devoted to the technical capabilities of robots in the arts, less is known about how artists themselves perceive and navigate their relationship with a robotic collaborator during the creative process.

In this work, we investigated how artists experience their relationship with a robot during a collaborative artistic creation. By positioning artists as stakeholders in this emerging landscape, we aim to shed light on the dynamics of human-robot co-creation. To achieve this, we conducted a longitudinal study where artists took part in collaborative painting sessions. Each artist performed a total of 6 painting sessions, 3 with another human artist and 3 with a robot (Figure 1). We conducted semi-structured exit interviews to understand how participants experienced the collaborations. The interviews explored their reflections on the nature of the interaction, the perceived agency attributed to the robot, the creative flow during the activity, and how they perceived the robot's ability to engage socially and contribute artistically to the painting.

The emerging results from this work directly contribute to a more nuanced understanding of human-robot collaboration in the arts and creativity, which accounts for both the lived experience of co-creation and the cultural embrace of robotically assisted artwork.

II. Related Works

A. Human-Human Artistic Collaboration

Collaborative painting between humans offers a rich context to explore social dynamics, such as co-presence, mutual adaptation, and interpersonal synchrony. Prior work has shown that such interactions are often experienced as fluid, dialogic, and emotionally engaging, supported by verbal and non-verbal coordination [3]. Abraham et al. [4] extended this understanding by demonstrating that even in the absence of rhythmic structure, visual coordination during joint painting can foster perceptions of harmony, empathy, and mutual understanding. Their findings highlight how co-creation in the visual arts can function as a powerful social signal, shaping how collaborators perceive one another and their shared work. This body of work provides a valuable foundation for interpreting how artists in our study experienced human collaboration.

B. Human-Robot Artistic Collaboration

The intersection of robotics and art has been a rich domain for exploring creativity and the evolving role of machines as collaborators or creators. Both early and contemporary works illustrate a wide range of approaches to human-robot artistic collaboration. For instance, Ken Goldberg's *Telegarden* explored the possibilities of telerobotic drawing and cloud-mediated interaction [5], while the *e-David* project—developed in collaboration with artist Liat Grayver—demonstrated the use of semi-autonomous systems in iterative painting processes [6]. Other artists, such as Leonel

Moura, have investigated autonomous swarm-based robotic painting [7], whereas Sougwen Chung's live performances emphasize the expressive and co-creative potential of human-robot interaction (HRI) in real-time artistic production [8].

Recent research in robotic art has moved toward approaches that highlight the creative process itself, treating the making of the artwork as equally important as the finished piece. Schürmann et al. [2] demonstrated that robotic brush-strokes can capture the variability and spontaneity of human movement, emphasizing adaptive and materially grounded co-creation rather than strict replication. Qin et al. [9] studied the creative practices of professional artists using robots, highlighting that creativity emerged from the interplay of human input, environmental context, and the acceptance of uncertainty as a generative force. Another example is the Human + Robot Painting Project [10], where pop surrealist artist Melkio used joysticks to teleoperate the humanoid robot Alter-Ego in the creation of abstract paintings. Taken together, these works reflect a shift from pure automation toward iterative, human-in-the-loop creations.

Peter Schaldenbrand's work on the FRIDA and COFRIDA robot systems introduced methods for robotic painting that leverage style transfer and generative modeling to produce novel artworks in collaboration with humans [1], [11]. His approach frames the robot as a co-creative partner capable of stylistic adaptation and expressive output through discrete turn-based painting. Our robot painting system builds on Schaldenbrand's work by extending it toward more collaborative, iterative painting, where the robot acts as an independent creative partner. This allowed us to explore its perceived role, agency, and presence within the shared artistic process.

C. Stakeholders' Perceptions of Robots

Understanding how people perceive and engage with robots can guide the development of systems that support creative expression and collaboration [12]. Increasingly, research emphasizes the importance of involving stakeholders early in robotics development [13]. Stakeholders differ from end-users in that they are directly impacted by the technology's role and purpose, not just its functionality, promoting acceptance by addressing the social dynamics inherent to HRI [14].

Recent studies have begun to explore how artists, i.e., stakeholders, perceive and engage with emerging technologies. A qualitative study with expert avatar designers revealed tensions around treating artificial intelligence (AI) as a co-creator and managing its iterative outputs [15]. Qin et al. [9] investigated the creative practices of professional robotic artists, showing how creativity emerges from the interplay of human input, context, and uncertainty. Their use of semi-structured interviews enabled a deep exploration of the experiences, illustrating the value of these methods in stakeholder research.

Qualitative methods, and semi-structured interviews in particular, are especially effective as they offer the flexibility to adapt to stakeholders' narratives while enabling researchers to access detailed, context-specific insights This approach aligns with our goal of understanding how stakeholders make sense of creative HRI, which is the focus of this research.

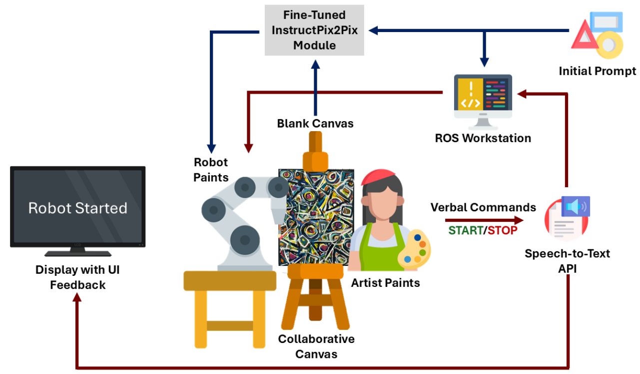

Fig. 2: System architecture of the robotic painting platform.

III. Our Contribution

This study investigates how professional artists, i.e., stakeholders, perceive the involvement of robotics in painting by comparing their experiences of collaborating with a human and with an autonomous robot. Through painting sessions and exit interviews, we gathered stakeholders' insights to inform the future design of human-robot artistic collaboration.

IV. System Overview

A. Hardware Setup

We now describe the robot system of the robotic platform implemented for this study (see Figure 2). The system utilizes a UF850 6-DOF robotic arm positioned in front of a canvas. The palette, water container, and cleaning rag are each mounted on fixed, 3D-printed holders designed specifically for easy access and repeatable positioning (see Figure 3). These components are arranged to optimize reachability while minimizing the chance of collision during painting operations.

B. ROS 2 Node Architecture

The robotic painting system was developed using the Robot Operating System (ROS) 2 framework to interface with the UF850 robotic arm. The core ROS 2 node architecture was deliberately kept minimal to improve modularity and clarity for future extensions. The node architecture integrates the `rclpy` client library and leverages the XArm Python Software Development Kit (SDK) for low-level control of the robot. The strokes are mapped to specific robot actions through state transitions. This allows an artist to engage with the system intuitively, without needing to interact with complex terminal commands or Graphical User Interface (GUI)s. The architecture also allows access to useful robot diagnostics such as joint angles, end effector pose, motion state, and torque using service calls and utility functions from the XArm SDK. This supports real-time monitoring and debugging via tools like PlotJuggler and RViz.

C. State Machine Architecture

A purposely streamlined ROS 2-based state machine was developed to govern the robot's behavior. The architecture was designed with only the essential states needed for this

Fig. 3: Close-up on robot painting tools displayed at the table: color palette, water container, and cleaning rag are each mounted on fixed, 3D-printed holders designed specifically for easy and autonomous robot access.

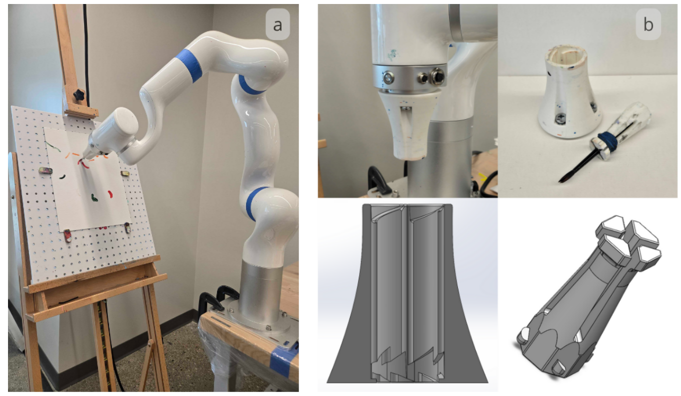

Fig. 4: (a) Robot painting on vertical easel with a fixed canvas size of 11x14in / 27.94x35.56cm; (b) Brush swapping mechanism. Top-left: mounted brush holder on the UF850 robotic arm. Top-right: main body and brush collet with a paintbrush. Bottom-left: internal cam-slotted geometry of the holder. Bottom-right: 3D model of the flexible brush collet designed for tool-free insertion and removal.

study, ensuring clear operation and seamless integration with the artistic interaction while preserving the flexibility for more complex workflows in future iterations. The state machine supports the following key states:

- `IDLE` – Default state where the robot waits for input.
- `GO_HOME` – Commands the robot to return to a default home pose.
- `PAINTING` – Moves the robot into canvas mode to begin or resume painting.
- `CHANGE_PAINT` – Moves the robot to the palette region to switch colors or clean the paint brush.

In this study, only two voice commands were actively used: `start` and `pause`, allowing the artist to initiate or halt the robot's painting actions with minimal cognitive load.

D. Vertical Easel Support

In this study, the robot painted in a vertical easel showed in Figure 4 (a). To enable the robot to paint effectively, a coordinate transformation was implemented to map on-table canvas coordinates to on-easel canvas coordinates. Before runtime, the center position and orientation of the easel in the robot's base frame are manually calibrated. During operation, points specified in the flat, screen-based coordinate system are first scaled to match the physical dimensions of the easel canvas. These points are then rotated and translated to align with the calibrated easel frame. This transformation ensures that drawings defined in a top-down frame are accurately projected onto the vertical surface, allowing the robot to execute painting motions aligned with user intent.

E. Brush Swapping Mechanism

We developed a custom-designed brush-swapping mechanism through several design iterations. The final version V3.1 is mechanically inspired by the retractable ballpoint pen [16] mechanism and allows for quick, tool-free brush changes. The setup consists of two primary components: a *main body* mounted on the robot's end effector and a *brush collet* that securely holds the brush. Figure 4 shows a collage of the final printed mechanism and Computer-Aided Design (CAD) model, highlighting the simplicity and versatility of the design.

The collet is split into four flexible sections and features slanted nubs that allow it to snap into position inside the main body, providing a stable and repeatable interface that can accommodate a range of brush sizes and shapes. Although the robot is not currently programmed to perform autonomous brush changes, the mechanical system is designed with that future capability. For now, the system enables the human artist to easily swap brushes between painting segments by pressing the collet into or out of the main body with a simple push-pull motion.

F. Voice Integration

The audio subsystem enables real-time voice command recognition for robot control, allowing hands-free natural language communication between the artist and the robot arm. The module is responsible for capturing the audio input, transcribing it to text, and interpreting it into the intended commands for the robot. We used AssemblyAI's [1] transcription Application Programming Interface (API) for real-time speech-to-text transcription. The audio is captured through a RODE Wireless GO II microphone, only processed at final transcription events at the end of each spoken utterance. Once the complete command is transcribed, a zero-shot classification model labels the user's intent from a predefined set of commands (e.g., `start`, `stop`, `draw`). The commands are then published through ROS for the robot to act upon.

G. Visual Feedback Interface

To support clarity and accessibility during the interaction, the system included a full-screen interface that displays real-time status updates to the artist (see screen on Figure 7(b)). The interface provides immediate visual feedback in response

[1] https://www.assemblyai.com/

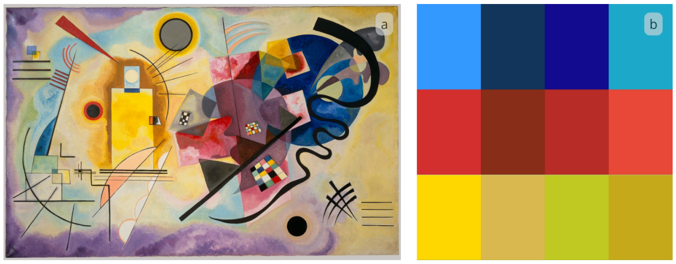

Fig. 5: (a) *Gelb Rot Blau*, Vasilij Vasil'evič Kandinskij, 1925. Collection of Centre Pompidou, Paris, France; emblematic example of his color theory linking primary colors with geometric forms, which inspired the experiment set up. (b) Color set-up inspired by Kandinskij's theory for this experiment.

to voice commands, such as `Robot Starting` and `Robot Paused` to help the participant confirm if the system has recognized their voice command properly. The interface was built using Python's Tkinter library and runs in parallel with the transcription system through multithreaded execution to ensure interface responsiveness simultaneously with continuous audio streaming and processing.

H. Abstract Dataset and Model

To support abstract-art painting and styles, we built a custom dataset and fine-tuned an image-translation model tailored to robot painting. We collected a diverse collection of abstract artworks from the Kaggle Abstract Art Gallery [2], sourced from WikiArt. We then prompt-engineered GPT-4 (ChatGPT 4.0) to generate descriptive text labels for each image, creating 300 image-text labels for training. The CoFRIDA framework provided stroke-level painting data by simulating the robot's painting process, generating both partial-progress and completed canvases [1], [11]. While CoFRIDA is originally designed to produce paintings that accurately depict their subject matter with coherent stroke patterns and layering, our work adapts this approach specifically for abstract art by fine-tuning the InstructPix2Pix Module on a curated dataset of abstract works from Kaggle paired with GPT-4-generated captions. This specialization enables the model to generate abstract-style transformations suited for robotic execution in iterative and collaborative painting scenarios.

I. Artistic Framework

The robot was programmed to draw circle-inspired shapes in the first session, square-inspired in the second, and triangle-inspired in the third. This setting was inspired by Bruno Munari 's [17] exploration of geometric forms (see Figure 6). In the 1960s, Italian designer Bruno Munari published visual case studies on Circle, Square, and later Triangle, associating each with specific qualities: the circle with the Divine, the square with safety, and the triangle as a key connective form. Associated to this, at the Bauhaus, the Russian-French artist Vasilij Vasil'evič Kandinskij explored geometry's psychological and spiritual effects, viewing the triangle as active and aggressive, and the square as peaceful and calm [18].

[2]https://www.kaggle.com/datasets/bryanb/abstract-art-gallery

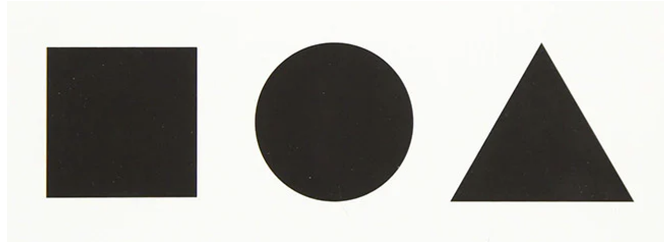

Fig. 6: Studies of geometric shape by Bruno Munari [17] described in Section IV-I.

In our study, we sequenced the robot's color–shape associations across three painting sessions. Initially, it was given four acrylic colors: blues for the circle, reds for the square, and yellows for the triangle. These associations draw on Kandinskij's synesthetic theory (Figure 5 (a)), linking primary shapes to specific colors, while the focus on forms derives from Munari's visual design work. The digital versions of the selected colors are shown in Figure 5(b).

J. Stroke Generation and Management

To support reproducibility and uninterrupted painting sessions, the robot executed pre-generated stroke sequences rather than generating strokes in real time. Each stroke was represented as a sequence of waypoints in the robot base frame. Before human-robot artistic sessions began, we generated strokes based on the artistic framework described in Section IV-I and saved them as serialized session files. For each session, we preloaded the corresponding circle, square, or triangle stroke sequences, allowing the robot to immediately begin painting without additional computation. This approach also ensured that the same stroke sequences could be replayed across multiple participants, maintaining consistent behavior during the human-robot trials, essential to compare the experiences that artists had with the robot. The stroke library contained enough pre-generated motions to support painting sessions lasting over an hour without requiring live generative computation or system restarts.

V. Study Method

A. Goal and Research Questions

Our study adopts an exploratory approach and constitutes, to our knowledge, the first attempt to (1) directly compare human–human and human–robot collaborative experiences within an artistic context, and (2) collect artists' reflections and perspectives after engaging in direct interaction with a robot during several painting sessions.

Given the novelty of the topic and the limited existing empirical evidence in this specific domain, the study does not advance formal hypotheses, but instead is guided by the following Research Questions (RQ) aimed at uncovering emergent patterns:

- RQ1: *How do artists perceive the experience of collaboratively painting with a robot compared to collaboratively painting with a human?*

- RQ2: *How do artists experience the creative flow with a robot and with a human artist?*
- RQ3: *What are the artists' perceptions of robot agency during the painting production?*
- RQ4: *What are the artists' perceptions of the robot's capabilities for interaction and painting?*

B. Participants

Participants were recruited through targeted outreach to local artists, painters, and galleries in Ann Arbor and Detroit areas. Individuals were asked to complete an eligibility questionnaire through the platform Qualtrics (available on OSF in Appendix_a [3]), which allowed us to select only professional artists working within the context of abstract art. All participants read and signed an Informed Consent. The research has been approved by the University of Michigan's Institutional Review Board (IRB) [HUM00273497]. Upon completion of all experimental sessions, participants received compensation of 300$. From this initial contact network, we were able to recruit 8 participants who met our eligibility criteria and agreed to take part in the study. These participants are described in Table I. In our sample, only one participant (A8) had previously interacted with a robot, while four artists (A1, A2, A3, and A8) reported having collaborated with other artists in painting before.

C. Procedure

This study employed a within-subjects design where each participant engaged in six painting interactions: three with a human artist (H-H) and three with an autonomous robot (H-R). To capture the emergence of familiarity and learning, session order was not counterbalanced: all participants first performed the H-H collaborative painting sessions and then the H-R ones.

The sessions were conducted on separate days, with a minimum interval of one day between them. The reasoning behind this is to provide artists time to elaborate and reflect on their experiences before moving to a new H-H or H-R session. Overall, the study spanned three weeks. The interactions were held in the University of Michigan. Each interaction required approximately one hour or one hour and a half.

Participants received the instruction to create one final art piece to represent the outcome of the H-H collaboration, and one final piece to represent the outcome of the H-R collaboration, to be selected after the third session of each condition. In both conditions, participants were required to collaborate in the artistic product with their partner, either the human artist or the robot. No specific guidelines were provided regarding the type, style, or medium of the artwork. Participants were free to produce as many pieces as they wished throughout the sessions, with no limitations on format or quantity. The experimenter was available to clarify any questions about the process but was not present in the room during the creative sessions, to preserve the spontaneity of the interactions. In the first session, participants were informed they would be provided with painting materials and that they were free to bring any additional supplies they considered necessary for the artwork creation. Furnished painting materials included: a canvas (size: 11×14 inches / 27.94×35.56 cm), acrylic and watercolor paints in multiple shades, pencils and markers, brushes of various sizes, glue, and cleaning supplies. Materials brought by the artists included paints of different shades and types (e.g., oil), palette knives, brushes, and stickers.

[3]https://osf.io/yhca7/

TABLE I: Demographics of Participants.

ID	Age	Gen.	Style	Exp. (yrs)	Paired
A1	61	F	Abstracted Realism	30	A3
A2	70	F	Abstract	25+	A4
A3	27	NB	Fantasy mixed media illust.	12	A1
A4	63	M	Interdisciplinary	40+	A2
A5	63	M	Abstract and Figurative	20+	A6
A6	61	M	Abstract and Figurative	30	A5
A7	34	M	Illustrative and Abstract	20	A8
A8	65	F	Figurative and Impressionistic	50+	A7

At the end of each painting session, the research team took high-quality photographs and copies of all materials created by the artists (see Figure 8). Artists retained ownership of the original pieces. At the end of all six painting sessions, participants took part in a semi-structured interview that captured their views of the H-H and H-R experience in painting productions.

D. Experimental Setup

A classroom in the University of Michigan (Robotics Building) was equipped with curtains to recreate an environment as close as possible to an artist's studio, as shown in Figure 7.

As artists entered the room, they found a vertical easel, a selection of paints, a table for placing materials, canvases, brushes, and cleaning supplies. In the H-R experimental sessions, the robot was already present in the room, with the color settings described in the previous section. Artists were given full creative freedom and were therefore allowed to modify the colors initially proposed by the robot. However, they were not allowed to alter the robot's behavior. The only actions available to them were to stop and restart the robot. This enabled them to work on the canvas independently (if they wanted), change brushes, or take breaks as needed.

E. Measures: Semi-Structured Interview

After the last session of the experiment, participants took part in a semi-structured interview aimed at exploring their subjective experience, reflect on the collaborative process, and their perceptions of the robot's role in artistic creation. Interviews were conducted in person and audio-recorded for transcription and later qualitative analysis. All transcriptions and interview questions (Appendix_b) are available on OSF [3].

The semi-structured interview included two primary sections: 1) Demographic and experiential background, and 2) Open-ended reflections on the co-creative painting sessions. In the first section, participants provided information on their age, artistic background (e.g., type of art, years of experience, primary location), and prior experiences with robots and artistic collaboration. The second section focused on participants' subjective experiences during the co-creative process with the

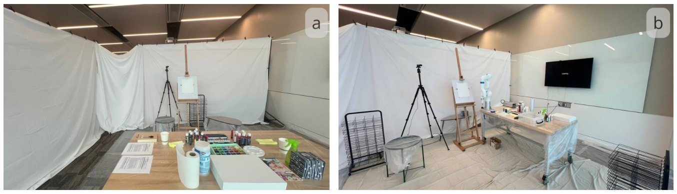

Fig. 7: Experimental studio set-up: (a) human-human artist collaboration; (b) human-robot collaboration. The two configurations of the studio were created in the same room.

robot. Rather than strictly adhering to predefined theoretical constructs, the questions were designed to elicit rich, open-ended responses related to collaboration, agency, creativity, communication, and technological expectations [19]. All interview questions are available on OSF in Appendix_b..

VI. Qualitative Analysis

We conducted a reflexive thematic analysis [20] of the eight interviews. The thematic structure informed by the four main research questions shaped the analytical focus. While the analysis remained open to unexpected insights, the coding process was deductive. The analytic process followed the key phases: we began with familiarization through repeated reading of transcripts, followed by initial coding aligned with each research question. Codes were reviewed and grouped into broader thematic categories that reflected shared meanings across participants. Final themes were refined to ensure internal coherence and clear distinctions between categories. All transcripts (N = 8) were analyzed using MAXQDA software. This approach enabled us to identify five main themes: (1) Comparing Human-Human and Human-Robot Collaboration in Painting Production, (2) Perceived Agency of the Robot, (3) Creative Flow, (4) Robot's Capabilities: Social Interaction, and (5) Robot's Capabilities: Painting Techniques.

VII. Results

A. Theme 1. Comparing Human-Human and Human-Robot Collaboration in Painting Productions

The comparison between H-H and H-R collaboration revealed distinct experiential differences. H-H interactions were often described as intuitive and socially engaging, while H-R collaborations felt more reflective. Notably, some participants appreciated the robot's lack of emotional demands, noting it allowed them greater creative freedom.

Co-presence and human exchange emerged as a key aspect of H-H collaboration. Participants emphasized the value of communication with their human partner, which facilitated mutual understanding and fostered a sense of intimacy. As A8 explained, *"With A7, it was more personal because as we painted, we talked and we got to know each other. So it was a more friendly environment, whereas with the robot, it's kind of sterile."* Similarly, A2 recalled, *"What I most remember and enjoy is getting to know him [referring to A4] through the painting process."* Even when stylistic differences emerged, they were negotiated through human sensitivity and mutual respect, A5: *"It was an adjustment. It was fun. I felt like I had to... I wanted to... respect the other artist. [...] We were both careful about that, but we had very different styles."*.

In contrast, **anticipation and strategy with the robot** were central to the H-R interaction. Participants described the need to observe the robot and anticipate its behavior. As A8 noted, *"I observed it first and tried to pick up some rhythms from it. [...] I was trying to anticipate what it was gonna do."* Some participants articulated deeper **reflective dimensions**, especially with the robot. Unlike the H-H interactions, collaborating with the robot was seen as prompting for more introspection. As A2 observed, *"With the robot, I was thinking a lot before interacting with it."*.

Finally, participants frequently referred to **creative freedom and negotiation** when comparing the two experiences. Some participants felt freer working with the robot, as they did not have to manage interpersonal dynamics or consider the potentially conflicting perspectives of another human artist. This made the interaction feel less intimidating and more personally expressive. The robot was sometimes described as a **neutral tool that encouraged creativity**, as A1 mentioned: *"With the robot, it was more like you having a robotic assistant doing things that also pushed your creativity a bit."* . For others, this lack of negotiation opened space for full control over the creative process. A5, for example, : *"Maybe I felt freer to be completely in control, because the robot was making random marks, so it was going to be up to me to make the work interesting. Whereas with the other artist, we were both trying to show mutual respect and not dominate one another, so maybe that inhibited the creativity a little bit."*. It is interesting to note in this quote A5 perceived the robot as doing "random marks" on canvas, when in fact, the robot was following its own artistic framework.

B. Theme 2. Perceived Agency of the Robot

Participants reflected on the role of the robot in the artistic process, oscillating between viewing it as a passive tool or an autonomous collaborator. **Balancing control and autonomy** was a recurring topic in the interviews. Several participants expressed a desire for a mixed-mode collaboration in which both the human and the robot could initiate actions. As A8 remarked, *"I would like to give the robot the opportunity to choose [what to do] and then I would choose as well."* Similarly, A2 noted, *"If I could negotiate with the robot to start and stop, or do this or do that, I could imagine what I might do."*

Interest in **reciprocal interaction and initiative** was common. Some participants wanted the robot to not only respond to input but also to initiate actions or offer suggestions. For example, A3 imagined a scenario where the robot could act like a peer: *"Sometimes it's nice to just have somebody pick one. I could just hold them up to the robot [...] it could point to one [i.e. artistic piece]."* Similarly, A1 expressed curiosity about a robot that could interrupt routines to challenge artistic habits: *"If I was getting complacent, maybe have it decide to switch things up."*

Metaphorical framings were often used to describe the robot's actions and role. A3 stated: *"It was like working*

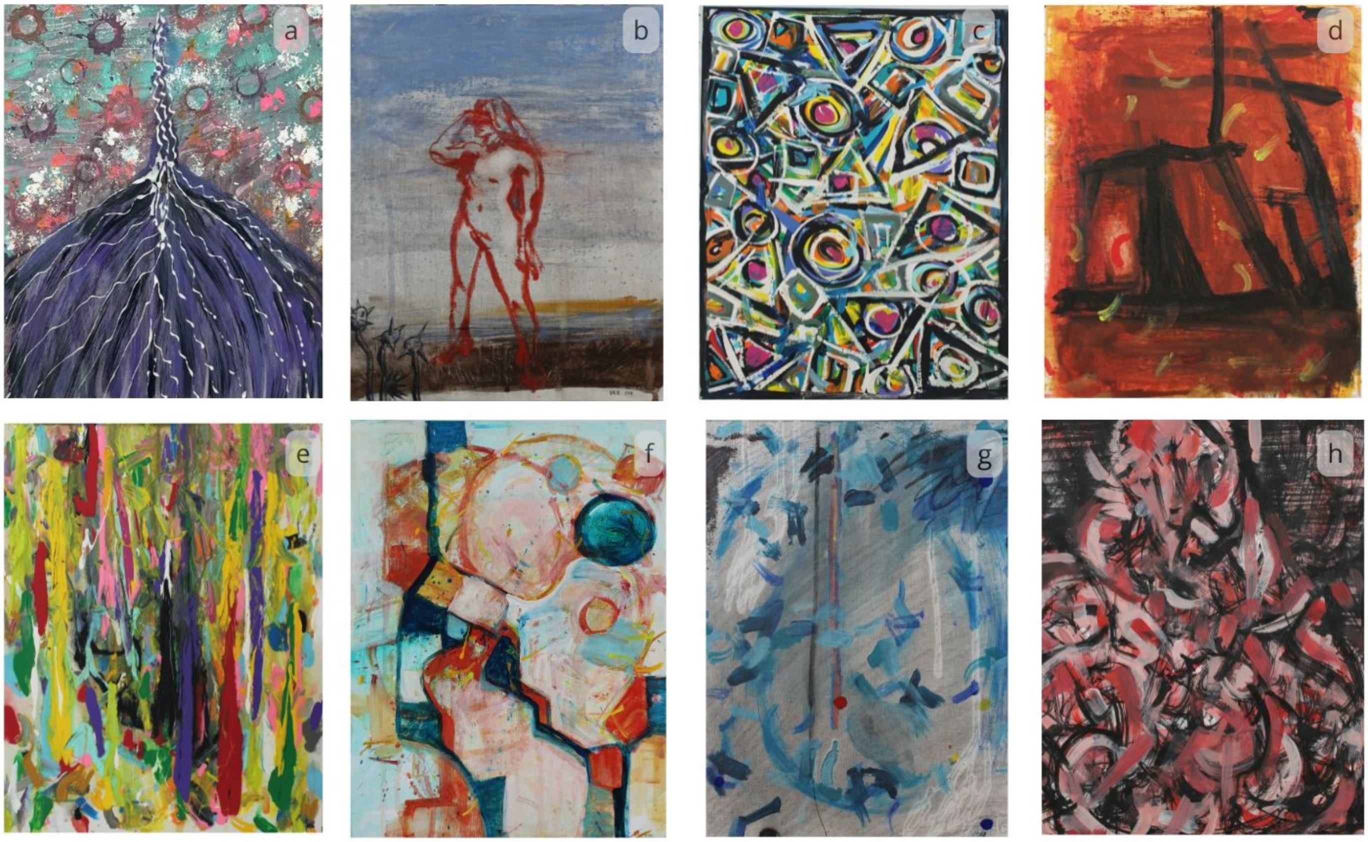

Fig. 8: Artworks produced by artist collaboration (a and b) and by collaboration with the robot (c-h) during this study.

with a cart on a track.". A7 instead expressed, *"I would compare it to drawing outside and the wind blowing, like drawing a tree and the leaves moving."* Notably, some artists paralleled the experience as painting with children, like A4 *"it reminded me when I was painting with my daughters when they were very, very young age. Just observing."* and A8 *"It's making brushstrokes and choosing top or bottom, like when a child paints."*. The connection with child-like experiences denotes the non-judgmental space held in H-R interactions compared to H-H interactions. Additionally, it also denotes a robot that is technically more limited than a human in its painting technique.

C. Theme 3. Creative Flow

Participants described a wide range of experiences when collaborating with the robot, including moments of **inspiration, surprise, and frustration**. For some, the interaction with the robot disrupted their usual creative rhythm, requiring adaptation and patience. As A7 noted, *"I found myself a bit frustrated by its decisions [...] maybe it's just because I didn't understand what it was doing"*. A4 pointed out: *"It was unhelpful, mostly unhelpful [...] trying to adapt to something you have basically no communication with."*. However, many participants also reported entering a state of creative flow during the sessions with the robot. A2 reflected, *"There was just enough structure but not too much structure in the mark-making so that I could imagine covering it, extending the lines, playing with the color, all sorts of things"*.

Several participants emphasized that the robot, while not creative in itself, acted as a catalyst for their own creativity. As A1 put it, *"It really inspired me to work differently than I normally do, to respond to things I wouldn't usually respond to"*. A1 further described the robot as *"a complementary person that was saying, 'why don't you try this?' instead of me just doing what I normally do."* A6 described the process as both **disruptive and generative**: *[the robot] "Integrated and disrupted at the same time, because that's what creative process is"*. Others found the robot's limitations to be a source of creative tension. A5 explained, *"It was mostly for me just trying to make an interesting work of art while combating sort of randomness"*. It is interesting to note that while many participants did not ascribe creative skills to the robot, they recognized a sense of its creative style.

D. Theme 4. Robot capabilities: Social Interaction

Participants expressed a range of expectations regarding how the robot should communicate and respond during artistic collaboration. **Learning and adapting within an interaction** appeared in subtle forms. Participants frequently mentioned adjusting their speech or expectations to better collaborate with the robot. A1 acknowledged, *"I figured out how it would react better if I spoke more clearly."*

Additionally, the **desire for expressive and multimodal communication** with the robot was a consistent theme. Several participants envisioned the robot using not just speech, but also non-verbal cues to enhance collaboration. As A8 noted, *"I* *guess [...] music. Because music enhances the mood."* Others proposed technical augmentations, such as pointing mechanisms or gesture-like behaviors. A7 suggested, *"It would be nice to have it indicate what it's seeing [...] like pointing a laser at an area."*

Participants reported **mixed comfort with verbal interaction**. While some welcomed the idea of the robot talking, finding it potentially enriching: *"That would be great. I would love it if it talked to me,"* stated A1. Others, however, found the idea less appealing as A7 explained, *"That would, for me personally, be unsettling."*

E. *Theme 5. Robot's Capabilities: Painting Technique*

Participants engaged both critically and imaginatively with the robotic painting system, acknowledging its **mechanical precision alongside artistic limitations**—often using this contrast as a starting point for envisioning more co-creative possibilities. The most frequently mentioned limitation was the robot's **restricted and repetitive movement**. Participants were generally expecting more from the robot's capacity and noted its gestures were often predictable and lacked organic variation. As A8 stated, *"It was limited because it's just brush strokes. [...] It didn't do a continuous line or [...] organic shapes."* Similarly, A3 remarked, *"It moves along this certain track [...] the marks themselves are fairly predictable: curve, curve, curve, curve."* Others, like A4, emphasized how little motion was involved: *"The robot has this motion, very little motion."* or also, *"Then I realized, okay, the robot has a very limited motion. It goes six times into the canvas. It puts six brush strokes. They could be different brush strokes. And then the robot goes back, cleans up to use another color and does the same process again and again, but in a different part of the canvas."* It is interesting to note how the artists carefully studied the robot's actions and dynamics of painting to be able to predict and collaborate with it.

The robot's **limited expressive range** was a recurring critique. As A5 commented, it was: *"very sophisticated in its mechanical movements, but really primitive in its mark-making,"*. Despite these constraints, many participants used the experience as an opportunity to imagine what a more advanced robot could do. A recurring idea was to **expand the robot's technical and material capabilities**. Artists envisioned a system that could handle not only brushes but also pencils, markers, palette knives, or airbrushes. As A8 put it, *"I would like for it to be able to not only just handle a brush, but to use other instruments as well."* A3 expressed interest in modular customization: *"I would absolutely love for it to have 20 more attachments."*

Control over **mark-making parameters** such as pressure, direction, and speed was also seen as critical for enhancing creative expression. A1 emphasized, *"Pressure is really important in a lot of ways. You can tell it, I want you to really be light with this area or I want you to really press into this."* Others, like A2, desired a broader range of strokes, including circular, sweeping, or calligraphic gestures.

Another frequent aspiration was for more **adaptive and responsive behavior**. A5 imagined the robot equipped with computer vision that could interpret the canvas and adjust accordingly, envisioning a system that could *"help me achieve the optimum amount of contrast."* Some imagined a more advanced robot as a smart studio assistant, able to work on backgrounds or repetitive tasks overnight (A4, A6), while others hoped it could emulate specific artistic styles or respond to reference materials, as A2 mentioned, perhaps the robot *"Could you do the background like the artist Monet?"* While it's interesting to consider the robot as a historically and contextually aware agent, this also raises the question of copyrights. Would artists really want a robot that can copy another artist's style?

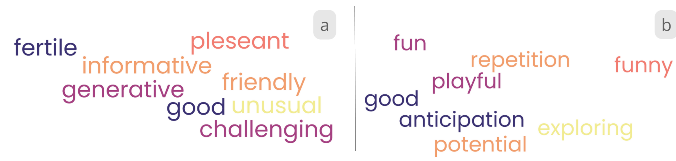

Fig. 9: Outcomes of the single-word to describe the interaction sessions: (a) words for human-human collaboration; (b) words for human-robot collaboration.

F. *Word Cloud*

During the interviews, participants were asked to describe the interaction with the other artist using a single word, and to do the same for the interaction with the robot. The results are reported in the Figure 9. Mirroring the results that emerged from the thematic analysis, the concepts in the wordcloud reflect how H-H collaboration appears more **cognitively and socially engaging**, while H-R collaboration is framed as **playful and explorative**.

VIII. Discussion

This study offers a rich, situated exploration of how professional artists perceive and experience collaboration with an autonomous painting robot, compared to working with another human artist. Through thematic analysis of semi-structured interviews, we identified challenges and opportunities of human-robot artistic co-creation. These findings contribute to an emergent understanding of creative HRI that moves beyond output quality to consider relational, affective, and cognitive dynamics.

One of the most striking findings is the different nature of **collaboration** experienced in the two conditions. H-H sessions were often described as socially rich, intimate, and dialogic, facilitated by mutual adaptation. This aligns with prior research showing how synchrony and interpersonal interaction enhance rapport in joint artistic activities [3], [4]. In contrast, H-R collaborations were experienced as more reflective, self-driven, and structured, but also playful. While the robot lacked emotional responsiveness, this absence also allowed some participants to feel greater freedom and control over the creative process, and eventually even feel less intimidated and experience more fun. The robot was often seen as a playful, neutral partner, removing the social pressures that could sometimes emerge in H-H collaboration.

A key theme is the ambivalent perception of the **robot's agency**. Some artists viewed it as a mere tool, others as a more autonomous collaborator. Several participants expressed a desire for more fluid agency-sharing, envisioning systems where both human and robot could take initiative or alternate control. Others preferred retaining clear control and saw autonomous behaviors as intrusive. This diversity of preferences suggests the value of flexible, mixed-initiative systems where levels of autonomy can be adapted to the user's goals and comfort.

Participants also employed metaphors to make sense of the robot's role. These framings illustrate how H-R artistic interaction is not only functional but deeply interpretive: artists are continuously trying to "read" the robot's behavior and situate it within their own meaning-making processes. Notably, a similar metaphor emerged in the collaborative painting experience between the Alter-Ego robot and artist Melkio, who described the interaction *"as if I were painting through a 3-year-old child."* This parallel highlights how the child-like framing may capture both the perceived playfulness of the robot's contributions and its limitations. The dimension of the "game" or 'fun" in the H-R collaboration is also evident from the wordcloud results.

The impact of the robot on artists' **creative flow** was multifaceted. For some, the robot disrupted their usual rhythm, requiring patience, adaptation, and new strategies. For others, it became a source of surprise and inspiration. The structured behavior of the robot challenged conventional patterns and sometimes led to unexpected aesthetic decisions. These accounts support recent perspectives that emphasize disruption, uncertainty, and constraint as generative forces in creativity, similar to what was found previously [9], [15]. Even when the robot was perceived as limited or repetitive, several artists described moments of improvisation and transformation that arose precisely because of these constraints.

Artists also expressed a broad range of expectations for how the robot could support **more interactive and expressive collaboration**. These included desires for multimodal communication, contextual responsiveness, and adaptability to the evolving artwork.

IX. CONCLUSIONS

This study explored how professional abstract artists perceive and experience collaboration with an autonomous painting robot, in direct comparison with human artistic collaboration. We identified nuanced perspectives on creative agency, flow, social presence, and the perceived limitations and potentials of robotic co-creation. Our findings suggest that while H-R collaboration lacks the emotional reciprocity and richness of H-H interaction, it can nevertheless serve as a productive space for reflection, inspiration, experimentation, and creativity.

Artists were not merely passive users of the robotic system: they actively constructed meaning around the robot's actions, incorporated its gestures into their practice, and imagined future enhancements that would allow for more expressive, dialogic interactions. The insights from our research can meaningfully inform future implementations of robotics in art. By relying on the desires and needs reported by these artistic stakeholders, we can support more attuned technological developments in the artistic domain.

This work represents one of the first attempts to foreground the perspectives of domain experts as key stakeholders in the development of autonomous robotic systems for the arts. It also stands out by adopting a long-term engagement approach, allowing participants to interact repeatedly with the system over time, rather than relying on one-off encounters, as is common in HRI studies. Finally, this study embraces a multidisciplinary framework that integrates artistic practice, robotics, and qualitative research methods, contributing to an increasingly diverse and ecologically valid vision of HRI.

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