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Painting a Picture of Accessible Digital Art

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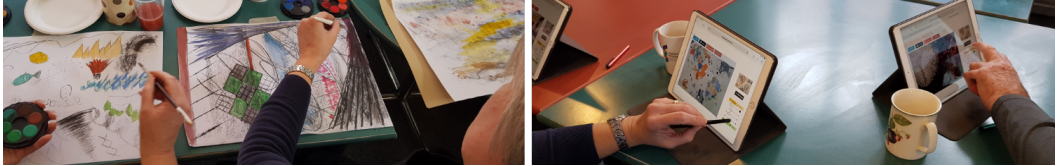STEPHANIE WILSON, Centre for HCI Design, City, University of London

Fig. 1. Inker is an accessible platform for creating digital art from physical art.

Visual creative forms, such as painting and sculpture, are a common expressive outlet and offer an alternative to language-based expression. They are particularly beneficial for those who find language challenging due to an impairment – for example, people with aphasia. However, being creative with digital platforms can be challenging due to the language-based barriers they impose. In this work, we describe an accessible tool called *Inker*. *Inker* supports people with aphasia in accessing digital creativity, supported by previously created physical artistic work.

CCS Concepts: • **Human-centered computing** → *Accessibility design and evaluation methods*; **Accessibility**; **Accessibility technologies**.

Additional Key Words and Phrases: Inker, aphasia, creativity, accessibility, painting, constrained creativity.

1 INTRODUCTION

Being creative supports expression and has substantial benefits to well-being and self esteem [2, 3]. Using digital technologies to be creative is often challenging for people with aphasia (a language impairment which can follow a stroke) due to the language-based barriers they experience [4]. Many community groups for people with aphasia involve visual art activities such as painting and drawing because they allow people to be expressive and to display their competencies without relying on language. However, these workshops rarely take advantage of digital art tools, which offer the potential benefits of being widely available, offering mutability (e.g., deletion) and supporting sharing and collaboration online. In this work we describe an accessible tool – *Inker* – which aims to support people with aphasia to create digital art. *Inker* allows users to develop physical art they or others have created, into a digital form through an accessible, constrained creative process. We briefly describe the design process of *Inker*, and its use in a creative workshop with people with aphasia.

2 INKER AND ITS DESIGN

2.1 Inker

Inker (Figure 2) is a prototype application which supports people with aphasia to engage in digital visual art. The version of *Inker* presented in this paper can be accessed here and is supported on most laptops and tablet computers. *Inker* uses the colour information from a selected picture to support visual creativity. When using *Inker*, a user presses down a finger or stylus on the drawing canvas. The colour of the brush is then matched to the colour at the same position in the selected picture (see Figure 2, top right). Drawing with this colour is then done in one of two ways:

(1) **Inking** uses a standard drawing algorithm, with a circular brush. Brush thickness is controlled with a slider.

(2) **Rubbing**: An area (depending on brush size) is populated with shapes (circles or squares) of a size and speed specified by a slider. This effect is analogous to spray painting with specific shapes, whose colour is determined by the original artwork.

An additional effect – mirroring – is used to create kaleidoscopic effects in each mode. This is done by reflecting the brush about a specified point (fixed to the centre in the version presented here). This is accomplished by taking the number of mirrors (m) from the slider (ranged $0 - 20$), calculating an angle: $\theta = m/2\pi$ and rendering a new brush for each m, rotating by θ.
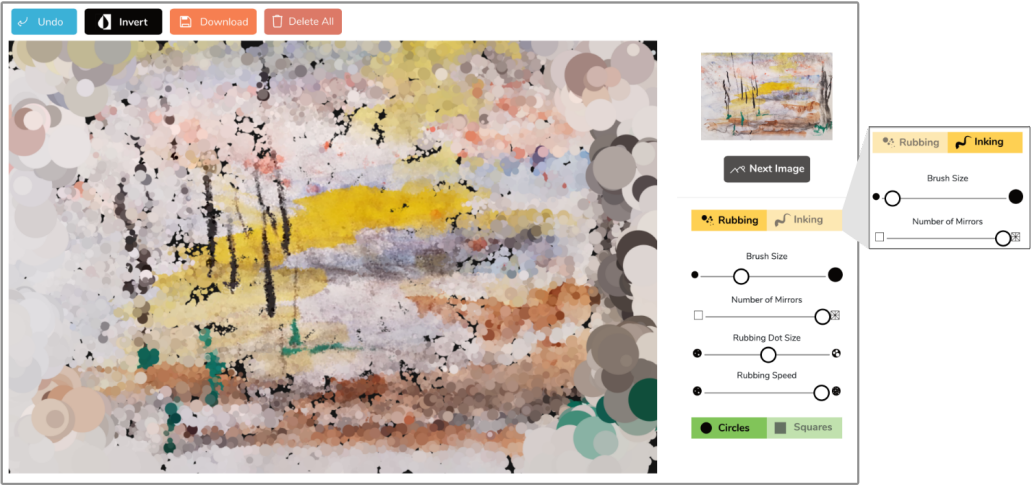

Fig. 2. The Inker UI shown in 'Rubbing' mode. Inking mode controls are 'popped out' on the right. Sliders affect brush size, number of mirrors, the size of the 'rubbing dots' and the speed at which the rubbing dots are placed on the canvas. The 'next image' button cycles through available images. The image on the canvas demonstrates the rubbing effect, with a greater 'rubbing dot size' towards the edges of the canvas. Functions such as 'undo', colour inversion, downloading of canvas and 'delete all' are also provided.

2.2 Context and Designing Inker

Inker is one of several technologies our research team have developed over the past three years through co-design with people with aphasia. We have seen positive results in approaches which utilise creative constraints. For example, *MakeWrite* [5] supports users in raiding existing texts to create new pieces of creative writing. Similarly, *Comic Spin* [8] supports reuse of existing pictorial and textual information to create comics. *CreaTable* [6] supports a creative process which uses tangibles to support multi-media content creation. *Creatable* utilises creative constraints in the

form of a time-based looping effect to support users with aphasia in creating digital content. *Inker* draws on this notion of constrained creativity and applies it to digital visual art. Building upon creativity support tools for visual art, such as Benedetti et al. [1], Inker is an application for people with aphasia to utilise previously created physical material to make compelling digital art.

The initial conceptualisation of *Inker* was inspired by past experiences of co-designing creative tools with people with aphasia. We were motivated by the work of artists with aphasia who have excelled in creating beautiful art *without* technology. In particular, a member of our co-design team, Carol[1], who has severe aphasia, is an accomplished artist. He sells his art and displays it in galleries. However, Carol and other people with similar aphasia profiles report that they find tools for digital creativity challenging due to their linguistic and multi-step nature [4]. *Inker* combines the notions of visual art and constrained creativity with a view to supporting a transfer of artistic ability from the physical (e.g., a painting) to the digital domain.

2.3 Initial Co-Design Sessions

We initially explored pre-existing technologies for digital creativity within co-design sessions. We worked with three co-designers with aphasia (Carol, Charlie and Robin) who all experience moderate to severe aphasic language difficulties as a consequence of stroke. We first explored the existing tool Autodesk Sketchbook – a sophisticated sketching application for tablet computers. Co-designers with aphasia found the complex interface challenging, but generally succeeded with support from members of the team who had used the app before. In particular the 'Symmetry' function, which mirrors a user's brush to make patterns, proved enjoyable – allowing users to accomplish a lot of complex and beautiful patterns in a lightweight way. Following the session, we reflected on what could make a visual art application more accessible. Inspired by our previous success with constrained creativity approaches, we decided that it would be useful to support people in creating visual art from previously created art. This meant that many of the complex interactions within digital art interfaces can be delegated to real-world interactions (e.g., physical painting techniques). This also offered the possibility that those who might not consider themselves artistic could make use of a 'starting point' by incorporating the visual art of others.

In the next session, we explored an initial version of *Inker*. We included a selection of stock photography in the app to support the 'raiding' of existing content. We explored a number of features on iPads including 'inking', 'rubbing' and mirroring effects. We also implemented 'dynamic brushes', which changed the size of the brush dependent on velocity and other filtering effects. In general, the co-designers took to the app quickly. However, some of the features required additional explanation, the UI was cluttered and the number of options was sometimes overwhelming. We removed features which were used less (e.g., dynamic brushes, filtering) and reduced the clutter by making separate 'inking' and 'rubbing' modes with toggle-able visibility (see Figure 2).

3 CREATIVE PHYSICAL AND DIGITAL WORKSHOP

Following the co-design phase, we ran three physical and digital creativity workshops to explore different types of visual art. The workshops were run at a support group for people with aphasia. Nine participants (aged 47–68) with a range of aphasic difficulties, engaged in the workshops.

The first two sessions involved activities for creating physical art. These were facilitated by an artist, with experience of running art groups with people with aphasia. Sessions explored 'mark making'. A range of charcoal materials were provided to support a range of textures and shapes. The focus was for people to explore the materials and make marks on paper. The participants later added watercolours to their art (see Figure 3, left).

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[1]Pseudonyms are used throughout this work to maintain anonymity.

For the third session, we imported digital versions of the physical artworks into the *Inker* tool. Each participant used a tablet computer (iPads, iPad Pros, Samsung Galaxy Tab) for the session and was given a tutorial on use of the app from a speech and language therapist-technologist. Participants used the app for approximately 30 minutes, with support from members of the research team and the group's volunteers.

We captured feedback from the participants via a short questionnaire with responses given on a 5-point Likert scale, facilitated by trained speech and language therapists, as in our prior work [5–7]. Participants used visual (thumbs up, thumbs down) indicators on the questionnaire sheets to support feedback, and multi-modal communication – such as handwriting, gesture, reading aloud questions – for additional feedback where required.

Fig. 3. Art created in the sessions. Left shows a piece created by a workshop participant with watercolour and charcoal. Middle shows a psychedelic picture created with the 'mirroring' effect and mixture of 'inking' and 'rubbing' tool. Right shows a combination of pictures combined with the 'rubbing' setting. One can see elements of one piece of the original art (left) in the right side of this third image

3.1 Workshop Outcomes

Each participant created several pieces of digital art during the session. Some participants used the 'inking' tool more, some the 'rubbing' more. Some examples of physical and digital art created by the participants are shown in Figure 3. Some participants decided to work from their own paintings in *Inker*, others used a range of pictures to build up a collage (e.g., Figure 3, right). An initial analysis of the Likert data and feedback comments indicates that all participants either agree or strongly agree that they '*did something creative with Inker*' (9/9). Two-thirds of participants (6/9) felt that the app was '*easy to use*'. Others initially found challenge in differentiating the two styles of brush included within the tool: "*[I] Needed to understand what rubbing/inking [meant]*" (P8). Two-thirds of participants were '*proud of their creation*' (6/9). All participants reported enjoying the app in general, but the overall impression was that they would have liked more time to learn it. For example, P6: "*Need time to get used to the app, but seems great*". Several expressed that they wished to use the app at home, so were given the URL to use the app on their own devices. Participants used the app in the weeks after this workshop and provided us with some positive feedback.

4 CONCLUSION

In this poster we have described our initial work on a novel approach to accessible digital creativity. People with aphasia find many tools for digital creativity to be challenging, but can excel in physical art activities such as painting. We believe that the approach of combining physical and digital skills in tandem might widen access to digital creativity in visual and non-visual art forms for people with a range of disabilities. We have provided further insight into the use of constrained approaches for accessible and quickly learnable technologies for creativity. Finally, we see the power of borrowing from existing images in enabling those who do not consider themselves to be 'artistic people' to engage in compelling and novel art.

5 ACKNOWLEGEMENTS

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