

TenSeconds - A Collaboration Platform for Distributed Action Painting

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Abstract. We present the collaboration art platform "Ten Seconds Art". With this platform art interested people can participate in an art creation process. Up to four people can simultaneously create a piece of action painting art in real time by using an android smartphone app. The platform records accelerator values which are transformed to joint movements of a manipulator arm. This arm splashes color to a canvas and thus produces a picture similar to action-paintings. Users can view this process via webcam stream in real-time. With this work we want to discuss questions of amateur, distributed, everywhere, and bite-size creativity from the point of view of telerobotics.

Keywords: mobile app, amateur creativity, distributed creativity, robot art, action painting, telerobotics.

1 Introduction

Social and technological developments are often reflected by arts. Examples are the invention of new music instruments like synthetic sounds, or graphical techniques, such as intaglio printing plates by copper engravings, as well as contemporary movements in architecture with their specific stylistic elements. With the emergence of new media and wide-spread use of the internet, interesting new paradigms open a broad access to arts and influence the artistic practice. With our work we want to discuss four trends of new media (cf. Fig. 1): amateur, distributed, everytime-everywhere, and bite-size creativity. We describe these four trends and their influence on the development of our platform.

1.1 Amateur Creativity

Social media and web 2.0 technologies were a precursor to a participation process that in the end unified consumer and producer of digital artifacts in one person. The merge sometimes is called the *prosumers* or *producers* [2]. These emerging technologies provide an architecture of participation, not only by exploiting open source-like volunteering, but by pursuing the users' "selfish" interests to build collective value as an automatic byproduct [6] (e.g., *Napster* defaults the automatic share of data downloaded by its users). The driving force behind this development - Prada terms it *amateur creativity* [7] - is the experience of the user to be part of the collectivity, to participate in emotional interactions. This process is largely driven by service platforms, such as *YouTube*, *Flickr*, *Facebook*, or *WordPress* and leads to a state where the user no longer is solely the target of professionally created content, but also the origin of creative contributions.

As final product of the participation process, the border between artist and consumer fades. According to Alan S. Brown, we may distinguish five modes of participation in arts that can be measured by the level of creative control by the participant [1]:

- *Inventive Arts Participation* engages the mind, body and spirit in an act of artistic creation that is unique and idiosyncratic, regardless of skill level.
- *Interpretive Arts Participation* is a creative act of self-expression that brings alive and adds value to pre-existing works of art, either individually or collaboratively.
- *Curatorial Arts Participation* is the creative act of purposefully selecting, organizing and collecting art to the satisfaction of ones own artistic sensibility.
- *Observational Arts Participation* encompasses arts experiences that you select or consent to, motivated by some expectation of value.
- *Ambient Arts Participation* involves experiencing art, consciously or unconsciously, that you did not select.

While Brown [1] suggests that the predominant emphasis of professional cultural nonprofits is the fourth mode on the list, we present in this paper a participation platform for Jackson Pollock-style action painting, where users can join the creation process at the highest level of creative control (i.e., *Inventive Arts Participation*). The other modes could further be covered as we discuss in future work section.

1.2 Distributed Creativity

Collaboration is an important component in the participatory turn, since the success of participatory projects may depend on a feeling of belonging to a common group or of having a common identity [4]. Nowadays, there is a strong social trend towards collaboration, driven by people's desire to contribute to something larger than themselves [9]. The trend to open collaboration that follows the successful model of open source, can yet be observed in many different fields, such

as participatory journalism (e.g., *Slashdot*), or collaborative music sessions (e.g., *Flashmobs*, or the *Youtube symphony orchestra*¹). In the same way, as in the merge of consumers and producers, web 2.0 technologies, such as blogs and wikis, play a central role in the development of distributed creativity. Important for the success of contribution platforms are besides the "common interest" technical requirements that have to be met, such as ease of use, ease of contribution, and ease of interaction [9].

In our approach, we facilitate collaboration and distributed creativity by accounting for these requirements. Please note that we use the term collaboration not only in the sense of cooperation, but also to describe potential counteraction that appears by interaction and manipulation of different ideas and conceptions.



Fig. 1. Newly emerged paradigms build the foundation of the presented action painting platform

1.3 Everytime-Everywhere Creativity in a Virtual Studio

Tremendous increase of information circulation and communication between everyone, at everytime and everywhere shapes the actual and future evolution of our ubiquitous society (cf. [3]). We got used to have all information at our fingertips by using our smartphone's internet connection, no matter where we are. And it is "convenient and cool to carry our entire inventory of media and entertainment in our pocket. No matter if you are at home or on the road, access to your media entertainment library is just a touch of a button away" [10]. Even our office is omnipresent in the guise of Blackberries or Wi-Fi-connected laptops. The same way, technology enables us to be creative everywhere and everytime.

As communication becomes ubiquitous, life becomes virtual, too. Terms such as virtual office, virtual government, and virtual banking describe the abstract and virtual environments derived from real-world places and actions. In this paper we use the metaphor of a virtual studio as the equivalent to the traditional studio. Users remotely control a robot in the virtual studio that becomes their tool to express their creativity. By using the telerobotics methodology, we transform this virtual creativity to a real-world object: an action painting.

¹ Youtube symphony orchestra 2011: <http://www.youtube.com/user/symphony>

1.4 Bite-Size Creativity

A consequence of the everytime-everywhere development is the demand of fast entertainment, and bite-size media. The *Wired* magazine is even convinced that “today, media snacking is a way of life” [5]. “Media snacking” describes the trend towards quick and instant consumption of media, such as a 30-seconds news clip, a one-minute game on the cell phone, or a randomly shuffled 3-minute song on the *iPod*. Similar as the before mentioned trends, this development is also driven by technology and particular platforms. Among the trendsetters are *Youtube* and *iTunes* [10]. Further, the bite-size trend is not only restricted to the snacking of media, but can be found in similar fashion in all kinds of activities. For example, we quickly make a reservation for the cinema, while waiting for the bus; or just communicate our latest thoughts to others using the 140 characters of Twitter messages during a conference break. The fragmentation of our daily life into small pieces of bite-size work and entertainment units is largely supported by apps: small manageable applications, ready for quick and instant execution. Apps also found the way into arts as a platform for bite-size creativity. The ZKM (Zentrum für Kunst und Medientechnologie Karlsruhe) for instance, recently organized the AppArtAward², a competition for the best artwork in app format.

2 Ten Seconds

The presented paradigms inspired us to create a new modern art platform – the ‘Ten Seconds Art’. This platform provides an easy, bite-size, and collaborative way of creating action art paintings. Technically, the Ten Seconds platform consists of three elements: an Android smartphone app, a painting robot and a connection server. Next, we present the interaction concept and the technical architecture.

2.1 Ten Seconds Interaction and Collaboration Concept

On the one hand our interaction concept has to manage the collaboration of several users spread over different places, while, on the other hand it has to provide intuitive interaction with the connected robot. Since we aim for bite-size creativity, our concept enable users to interact with each other with a minimum of training required. To facilitate amateur creativity, we provide a smartphone app that is accessible to everyone with a smartphone, thus everyone can become an artist. Further, we meet the requirements of the art creation process by four simple and intuitive steps:

1. Connection to the art server that is the access to the virtual studio
2. Staging of collaborating artists
3. Expression of artistic intentions by moving the smartphone for ten seconds
4. Viewing the aggregated movements of the robot via real-time webcam stream

² <http://www.app-art-award.org/>



Fig. 2. The four steps of our interaction concept, which are also the four screens (or activities) presented to the users of our app

These steps are repeated with different colors, and different artists, until the final piece of artwork is formed. Particularly notable are the limitations of hardware and time that shape the art creation process and render it exciting and interesting.

2.2 Technical Details

Smartphone App. The app is implemented using the Android operating system for smartphones. Four activities are implemented reflecting the four steps of art creation. The first activity shows the start screen of the app. Users have to push the 'Gib mir meine 10 Sekunden' button (german for "Give me my ten seconds"). When pushing the button the app checks for a free slot for the user on the server. If a slot is available the next activity is shown. In the second activity users can see which axes they are controlling. The axes are assigned by the server. For easy identification of user controlled axes we use *Gravatars*³. The user's Gravatar is depicted at the axes the user controls. The text 'Mach Dich bereit' ('Get ready') signals that collaborating artists have to pay attention to the start signal which is delivered by the server. This so called 'staging room' was implemented to raise the feeling of a special moment and to increase the concentration for the movement recording process. After the smartphone receives the start signal from the server, it vibrates for a short time and a stopwatch is shown that counts the ten seconds down. During these ten seconds we record the accelerator sensors and finally send the data to the server. In the fourth activity, users get an exclusive view of the robot arm movements via a webcam stream. Finally, the Ten Seconds Art app returns to the first activity and users can start over again.

³ Gravatars (Globally Recognized Avatars) are visual identifiers that generate a small avatar image based on the connection profile (like IP-address or email-address) of the user.

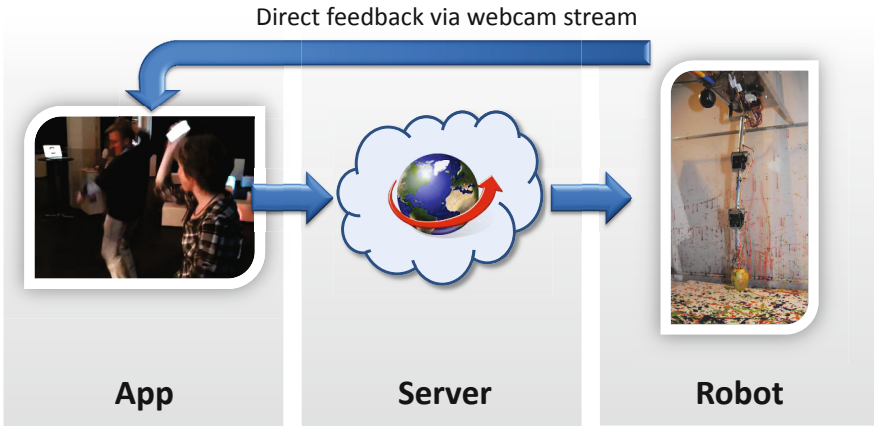


Fig. 3. The art creation pipeline: After login, users move their smartphones. These movements are recorded and sent to the art server which transforms the accelerator sensor values to the movements of the axes of the robot. The art creation process can directly be viewed via webcam stream.

Server System. The Ten Seconds art server is based on a apache web server system. The main functions of the server are user management, handling of the accelerator sensor value coming from the app and sending the webcam stream to the Ten Seconds artist or other viewers. Also, the single steps of the art creation process are controlled with a web-based administration tool.

Painting Robot Platform. The robot manipulator arm is installed upside down on the ceiling of its protected working environment. Fig. 4 shows the painting robot platform. Based on experiences during the development of the robot system JP [8], we have chosen a very simple and robust architecture with four joints driven independently by servo modules. The working environment has a basal area of DIN-A0 paper size. A rubber hose transports the fluid color from outside the working environment to a small color container at the end effector of the manipulator arm which has the possibility to swing freely. Thus, every painting is unique.

The robots' angular history is prescribed by an algorithm which transforms the accelerator sensor values from a three dimensional Cartesian smartphone space to the joint space of the robot system. In case of one user, all three sensor axes of a user are mapped to single robot joints. The angular history of the fourth robot joint is prescribed by a superposition. In case of two users axes with the highest and second highest alteration rates are separately mapped to robot joints. When painting with three users, every user controls one axis, the fourth axis again is a superposition of all users' movements. Four users separately control four axes.

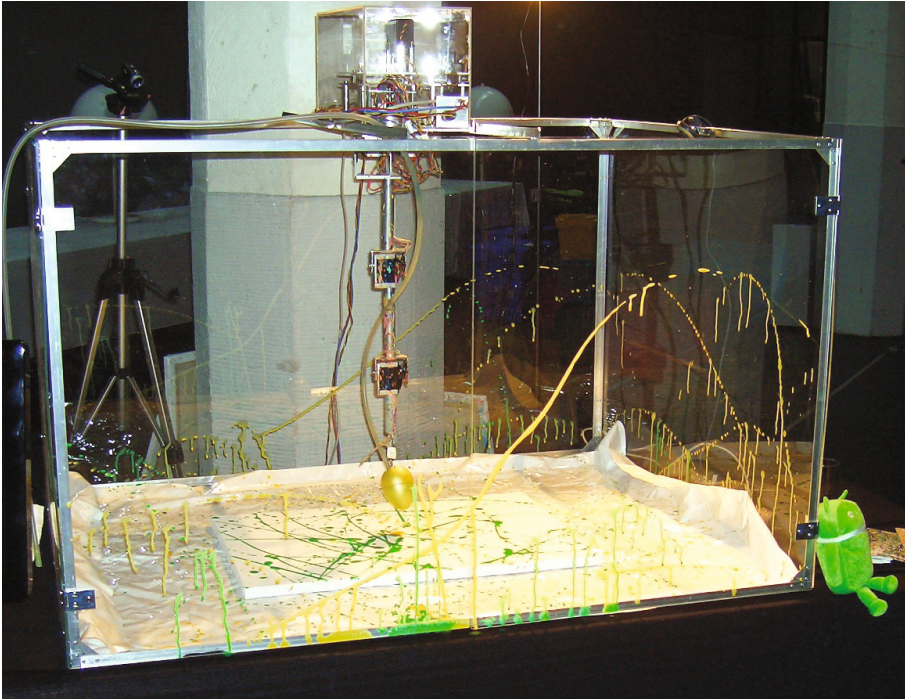


Fig. 4. The painting robot is installed upside down on the ceiling of its protected working environment, has four degrees of freedom, and is driven by servo motors

3 Discussion and Future Work

In this paper we presented the art collaboration platform 'Ten Seconds Art' for creating modern art paintings inspired by Jackson Pollock's action painting. Based on the three elements smartphone app, server and robot, art-interested people are able to create their individual pieces of art in four intuitive steps. A webcam stream gives a direct feedback of the creation process.

Ten Seconds Art was presented at the first AppArtAward of the Zentrum für Kunst und Medientechnologie in Karlsruhe (Center for Art and Media, Karlsruhe) in July 2011. Due to great interest we performed a second time at the Karlsruher Museumsnacht (Open Night of Museums) in August 2011. During both events several hundred people saw the art platform and fifteen paintings were created by visitors (cf. Fig. 5).

We observed that visitors were able to handle the Ten Seconds app after only a short introduction. We ascribe this effect to the high conformity to users' expectations of our app. Further, both children and adults were fascinated and excited to create pieces of art in this technical and playful fashion. This shows that our approach to create art by a collaboration platform for distributed action painting is a broadly accepted way for amateur creativity.

For a deeper understanding of the influence of our collaboration platform on the artistic practice, we conducted a survey with associates of the ZKM that were involved in the AppArtAward. We asked questions to determine if our approach to arts is suitable to cope with the introduced paradigms of new media. In summary, the participants agreed that the bite-size period of 10 seconds suits very well our approach of participatory creativity (one participant suggested an extended period up to 30 seconds for introduction). The impact of collaboration to the experience of the art creation process of our platform was expected to be high, since the final result is a collectively produced artifact with apparent traces of the own contribution (assuming different colors for each participant). Moreover, the robot is considered as a partner in the art creation process. Subsequently, we reflect some relevant feedback of our survey:

“In principle, the robot represents the tool (extended, modified arm with brush). The participant (human) is the artist who generates the painting by his movement.”

“On the one hand, it [the ten seconds art] reflects the aesthetic aspect of the human computer interaction concept. On the other hand, the paintings are clearly evocative of the action paintings of Pollock, but as post-modern version.”

“[In the future,] I expect that we will be commonly confronted with the combination of Smartphone, human, and some controllable mechanism.”

Future work will include intensified use of social media techniques. By using mechanisms for feedback and ranking of created action paintings even more levels of creative control will be introduced to our platform.

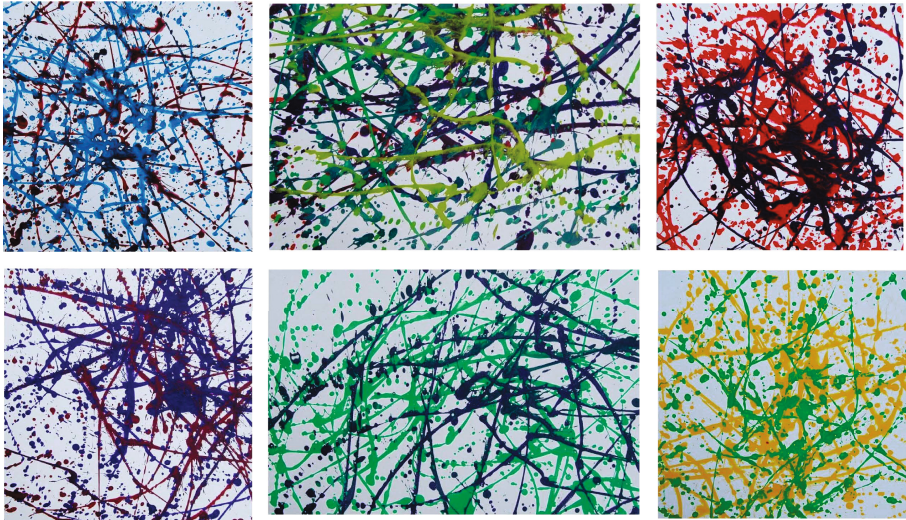


Fig. 5. Action paintings created by Ten Second painters during the ZKM AppArtAward 2011 and KAMUNA 2011 in Karlsruhe

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