DRAWN: Exploring Interaction Through Drawing as Collaborative Play

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Abstract
The idea for this project arises from the purposeful
intersection of three ideas: generative drawing,
collaborative drawing, and playful interaction. It
attempts to bridge the three through the creation of a
game, which has as an outcome both a drawing and a
human interaction. This research is carried out through
prototyping and testing, and founded in different
theoretical frameworks that allow for a back-and-forth
analysis between the different components and the
game as a whole. The project attempts to make
meaningful theoretical connections that may lead to
new ways of approaching drawing in the social context.

Author Keywords
generative drawing; collaborative drawing;
collaboration; playful interaction; drawing game;
interpretation of abstract drawings; interactive mark-
making; drawing machines.

1. Introduction
The concept of this project arises from the insertion of
a previous research topic into this seminar's framework
of "design for social interaction". The previous research
dealt with the creation of an analogous device for
executing shape grammars (George Stiny, Shape
Grammars, 1972) as generative, abstract drawing in a
visual, tactile way. Generative [art], as defined by Philip
Galanter, refers to any art practice where the artist
uses a system, such as a set of natural language rules,
a computer program, a machine, or other procedural
invention, which is set into motion with some degree of
autonomy contributing to or resulting in a completed
work of art ("What Is Generative Art? Complexity
Theory as a Context for Art Theory", 2003).

However, for this project, all explorations have been
conducted, again, without relying on digital computer
programing, but instead by using an analogous device,
a set of rules, and a user to execute them, thus
pushing the idea of "computing with our eyes and with
our hands" (Terry Knight, notes on lecture, MIT 2015).
The rules must be simple enough that they can easily
be remembered and executed, but carefully crafted in
consonance with the limitations of the device so that
the series of outcomes remains *interesting* (Figure 1).

Figure 1a: Drawing generated by a user of the hand-held shape grammars device

Figure 1b: Device with markers to apply spatial relations between shapes (silhouettes).

Figure 2: Drawing machine by design firm All Lovely Stuff

And they must remain interesting and unpredictable so the user remains engaged. Another bias of this paper is to favor the premise that the creative act can be successfully reduced to basic rules and that in the exploitation of those rules lies the grasp of an enormous design space. Exploring and archiving this design space is a natural consequence of using the device and applying the rules.

It is also worth mentioning *drawing machines*, which are at the heart of this topic. The breath of creativity in this field of generative-object design is unfathomable, and the success of the results is equally impressive and appealing in terms of their abstract and complex nature (Figure 2). However, these machines are carefully designed to perform on their own, and the artist/designer is usually removed from the actual production of the drawings, attributing the results to the pure *will* or workings of the machines, a tendency that is echoed in digital generative design.

This research project seeks to explore the concept of drawing as a gateway for social interaction in the form of play, while also investigating what is role of the human user in generative drawing.

2. Framework
DRAWN takes off from the idea that drawing can be a successful means for positive interaction. This notion is sustained by extensive research about the positive effects of drawing in learning. Drawing is studied as a tool to construct and express appropriated understanding, and is, in this perspective, a tool comparable to language (Janne Madsen, Collaboration and Learning With Drawing as a Tool). But what, then,

is communicated when the drawing is abstract instead of strictly figurative, like in the case of generative drawings? This genre of drawings moves away from concrete thinking, and, therefore into the realm of abstract, open-ended visualization that in turn sparks different kinds of thought. They expand consciousness without the need of employing known signs.

On this matter, and for the purpose of this game, there are two things to consider. First, that each one of this acts, even the most abstract, is an exercise of mark-making, which is deeply rooted in human nature as both a means of advancing thought, and of seeking permanence. Second, the measure of how valuable these markings are is tied to the assignment of meaning: Playing with mark-making and imbuing it with symbolic meaning was a huge intellectual leap for humankind (Thinking and Learning Through Drawing: In Primary Classrooms; Drawing to Play, Gill Hope, 2008). Even more so, mark-making is a huge part of the learning process for children, whom, by drawing, become agents instead of spectators. Among other things, drawing allows them to examine and display what has been created, and by assigning meaning and labels, the creation transcends the sheet of paper where it was conceived (Gill Hope, 2008). Making drawings can expose cognitive processes, particularly creativity and the emergence of ideas (Knight et al. citing Garner, 2008, p.23), and by "drawings", this paper assumes any kind. But is this only applicable to children?

On a fairly related subject, Knight et al. analyze the results of their research on Intergenerational Collaborative Drawing, where they also use as prompts The Four Purposes of Drawing —perception,
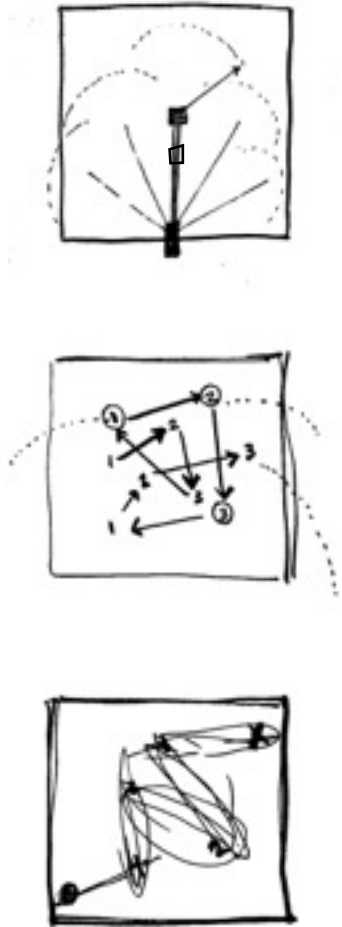
Figure 3a-3c: These sketches diagram the rules and sequence of the game. A pendulum containing the paint hangs from an L post that rotates about a base. The pendulum can also be adjusted to a position closer or farther from the base, covering great part of the

communication, invention, and action, as outlined by Adams & Baynes (2006) . Although they used drawing as a vehicle for a very specific group of participants and to answer very specific research questions, they did so recognizing drawing's potential in having multiple and simultaneous users and of assisting some type of interaction. They assert that "drawing collaboratively opened up clear avenues for verbal and visual communication between drawers". While they also note that art-based inquiry is still a fairly recent methodological development outside arts and design research, their work, along with many others's, is beginning to legitimize the connection between drawing and social interaction.

This paper does not intend to present extensive proof about the positive effects of drawing on children or adults, or champion the idea of collaborative drawing as a ground-braking research practice. It merely intends to suggest that there are connections between the two, and that these connections provide the appropriate framework to propose a *game*.

3. The Game

By inserting play in the equation, a necessary triad is created that will allow for the drawing to be both collaborative and generative. This game will provide the context for this specific drawing to happen, including the generative rules of the drawing, which are also, without the players being fully aware of it, the rules of the game (Figure 3). And by virtue of being a game, the players will find themselves truly *engaged* in an otherwise individual activity with an entirely individualistic purpose. Therefore, it is with every intention that the players are always referred to as a *team*, and to win the game, they must collaborate.

The key word is "engaged". In order for the interaction to occur and for the drawing to happen, the game needs to be interesting and direct enough. Both drawing and interaction are equally important outcomes. The drawing must be of a specific aesthetic that suggests playfulness and uniqueness, and that undoubtedly pleases the eyes of those who produce it. It should also carefully balance the controlled and the unexpected.

The prototype is based of a drawing, paint pendulum. These very simple machines, typically a container full of paint that hangs from a string with a nozzle acute enough to allow for a thin stream of paint (Figure 4). By pushing it, the pendulum enters simple harmonic motion and the paint drips on a canvas, graphically describing that motion over time. But however beautiful the product of this drawing machine might be, it proved to be everything but interactive, and definitely very predictable. So the game moved towards 1) giving the players more participation by making them constantly interact with the pendulum, 2) and introducing some sort of random element that would guide the drawing in a different direction every time the game is played.

In terms of the medium, many testing was done in order to find one that was easy to use and also unpredictable, from pens and markers, to brushes and different kinds of paints (Figure 5). Paint was eventually chosen for its many attributes, in this case tempera. It suggested very easy mechanics, like those of the drawing pendulum. It also allowed for inserting the element of time, by being able to "run out of paint" while in the game. And finally, its fluid nature offered two major aesthetic advantages: the possibility of employing different colors by player and having them

Figure 4: Simple paint-pendulum project (childrensartclub.com)
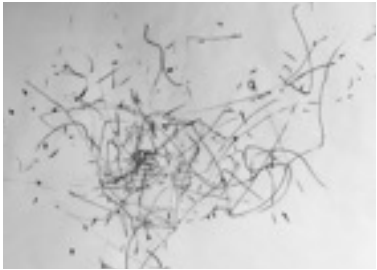
mix on the canvas; and the spontaneousness related to its ability to flow when poured. Still, many testing had to be done to thin it to a point where it worked for the game, and also, many iterations to find the "right" rules.

The following is the final set of rules with which the second and final round of non-expert testing was conducted:

Each player in the team will be given a cup with paint and three marking objects (frogs). The START and END will be pre-assigned on your canvas as a O and X. By throwing the markers in order and letting them fall on any location on your canvas, you'll determine a path to follow, from O, to each marker, and finally to X. A guideline is traced just to keep the sequence. Think of "connecting the dots". Players will take turns to load the pendulum with paint and, by blowing on it to make it swing, they'll each try to hit both their starting and ending targets on the same swing with at least one drop of paint. The teams can't refill their paint cups to complete the path. Each player is allowed to adjust the pendulum's position over the canvas in any way (XYZ) before making it swing.

4. The Drawing
The creation of a drawing as necessary outcome of this game has been a premise present from the very beginning, for reasons outlined in the introduction of this paper. However, the implications that this has for the game have been under continuous discovery. Each drawing that is generated cannot be reproduced, given the multiplicity of variables. The drawing is unique, and it tells a unique story about two or more people and the game that they played. The order of play, the colors

chosen, the place where the canvas is set, the failed and successful strategies, and even the time it took, are all embedded in the drawing. It is, above all, both memory and evidence of the interaction.

As explained before, the game has been set up so that, for every occurrence, the drawing is aesthetically interesting (Figure 6). Every play alters the outcome dramatically and unexpectedly. There is such pure visual appeal in the intricate texture and color of the flowing wet paint that the players will stop to admire it, and excitement will build with this intricacy— an intricacy in constant dialogue with the primal simplicity of the actions that generated it (Figure 7).

There is both intent and calculation in every move, while there is also computation of simple rules. Players attempt to reconcile amount of paint, intensity of blows, momentum, direction, and geometry, all visually. However, the game tries to rid the players from the responsibility of authorship or control, by which follows and acceptance of whatever the outcome is. The need to overthink one's move as a design decision in relation to the live composition is replaced by the simple objective of successfully hitting the targets, leaving room for enjoying the interaction with the other team member(s). Therefore, as important as the drawing is for this project, it doesn't steal attention away from the playful interaction.

But is the drawing art? This is not a concern or a question that this project tries to answer, but it might as well be addressed. A bystander during one of the tests called the drawing a "Neo-Pollock", probably half-joking. It is probable that with better prototyping, the final product could reach levels of aesthetic complexity
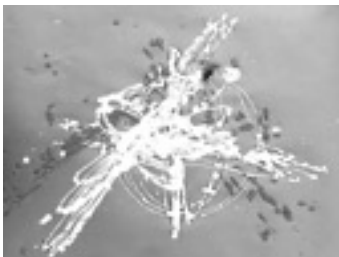
Figure 5a-5e: Compilation of testing results of different mediums and rules.

closer to that of a Pollock painting, but styles aside, this game lies at an interesting in-between space. It isn't as mechanical and detached as a drawing machine, or as subjective as an expressionist painting. However, it might be no more artistic than a pre-school child's paint-soaked hand-print: just an act of mark-making that acquires meaning when explicitly given one. It is up to the players to decide what should become of their collective mark-making after the game has concluded, and they've waited over a day for it to set. Wether hung on a frame, or lost in a drawer, it is likely, though that the memory of the game will fight to stay around.

5. The Test
5.a Mechanics. All testing was done with graduate students of the MIT School of Architecture and Planning. The players were very enthusiastic about the markers they threw on the canvas, in this case colored frogs, which were compared to Monopoly characters and probably added a tactile dimension and self-identification. Maneuvering around the pendulum post was somewhat cumbersome, and it hindered free movement around the canvas. At least one player complained about the quick flow of the paint, but since most players didn't, this might just be something the players need to learn to control. Also, one player mentioned that being able to adjust the pendulum so often made the game too easy. It's worth considering to fix the pendulum's position at every other turn.

5.b Interaction. Camaraderie was present in every test, through players cheering each other on and sharing enthusiasm after successfully hitting each target. Even when they made mistakes or missed the targets, laughter was a common factor. They would still admire what the "mistake" had contributed to the drawing.

When interviewed, all players agreed that having a partner was what made the game fun, and that they wouldn't prefer to play by themselves. A few players mentioned that they learned how to improve their technique by watching the other person play. Also, the player whose turn wasn't active would still participate by discussing what the next move should be. Both players would pace around the canvas to come up with the best strategy. During these moments of play analysis, the game would be paused, without urgency to continue. Even bystanders would try to contribute to the strategy. Some would stay and watch the development of the game and cheer the players on. "It almost like watching a sports game." After some getting-used-to, the players embraced the physicality of blowing on the pendulum. This was both silly and challenging, which added humor to the interaction.

5.c Drawing. All the players seemed to like or at least be interested in the drawing they were creating, and would often get really close to the canvas to examine the nuances of the process and take pictures of it. After each swing, players would step away to watch the movement of the pendulum and witness the outcome of the spilling of the paint, like one would when throwing dice. They would exclaim words like beautiful, interesting, wow, cool, etc. In general, they were proud of the fateful outcome of their game. Some players imagined different scenarios where they could play the game, like at a bigger reunion (Figure 8), or in their studios to take a break during a work-night (as all testers were architecture students). They also began to fantasize about a bigger canvas, on a larger table, and a pendulum that hung from the ceiling. They mentioned watercolor or powder as alternative mediums with different aesthetic implications.

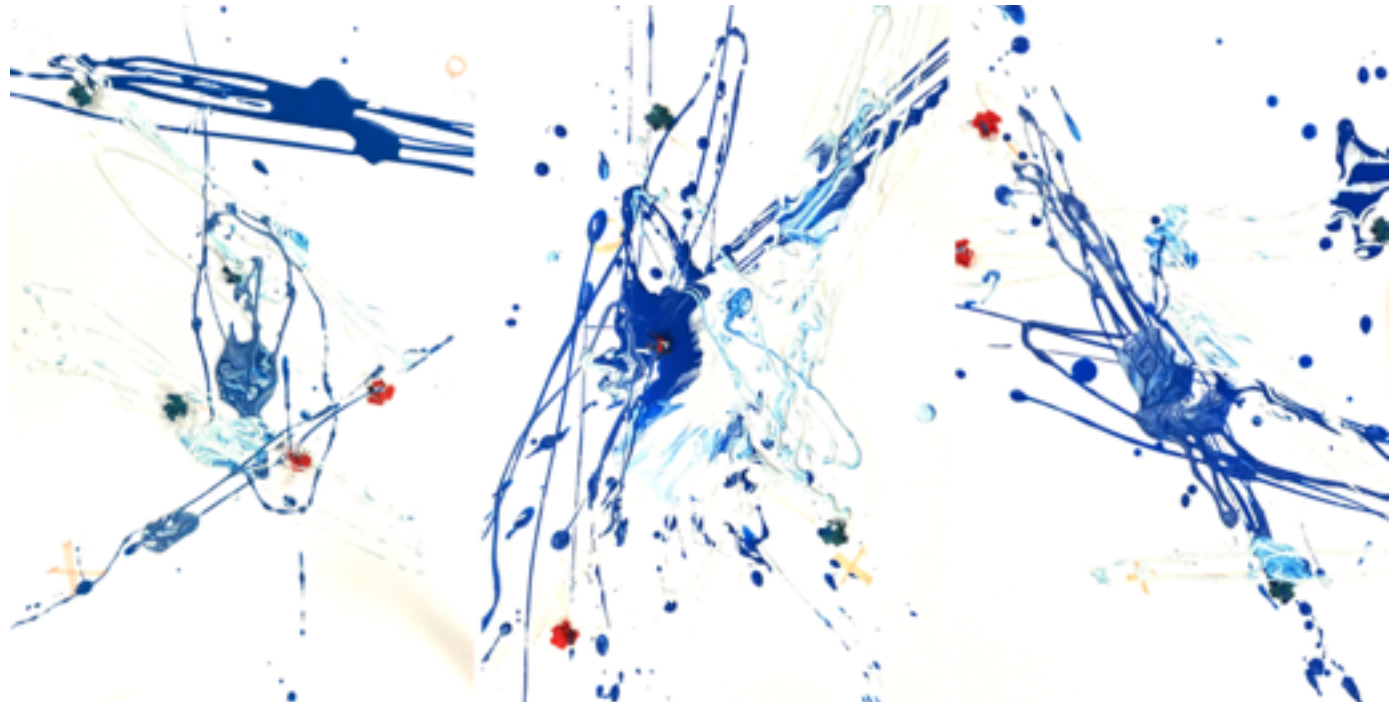Figure 6a-6c: Results of three different games .

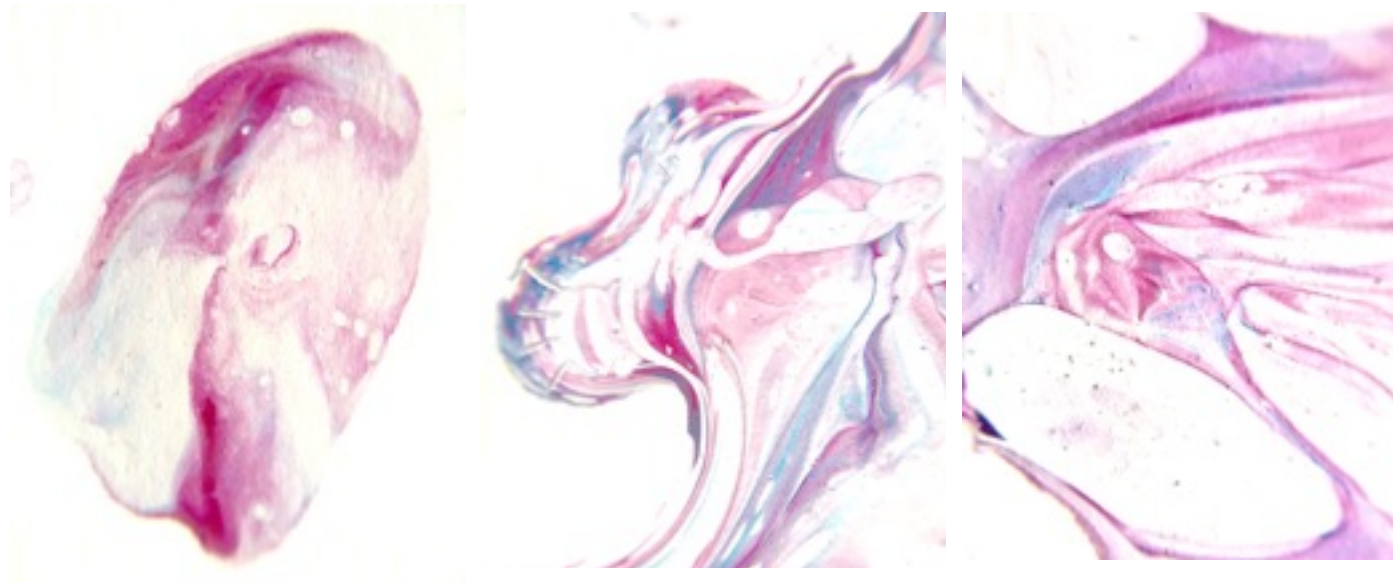Figure 7a-7c: Details of a drawing created by a 3-player game.

Figure 8a: One player tries to explain the other how to hit the target so they can win.
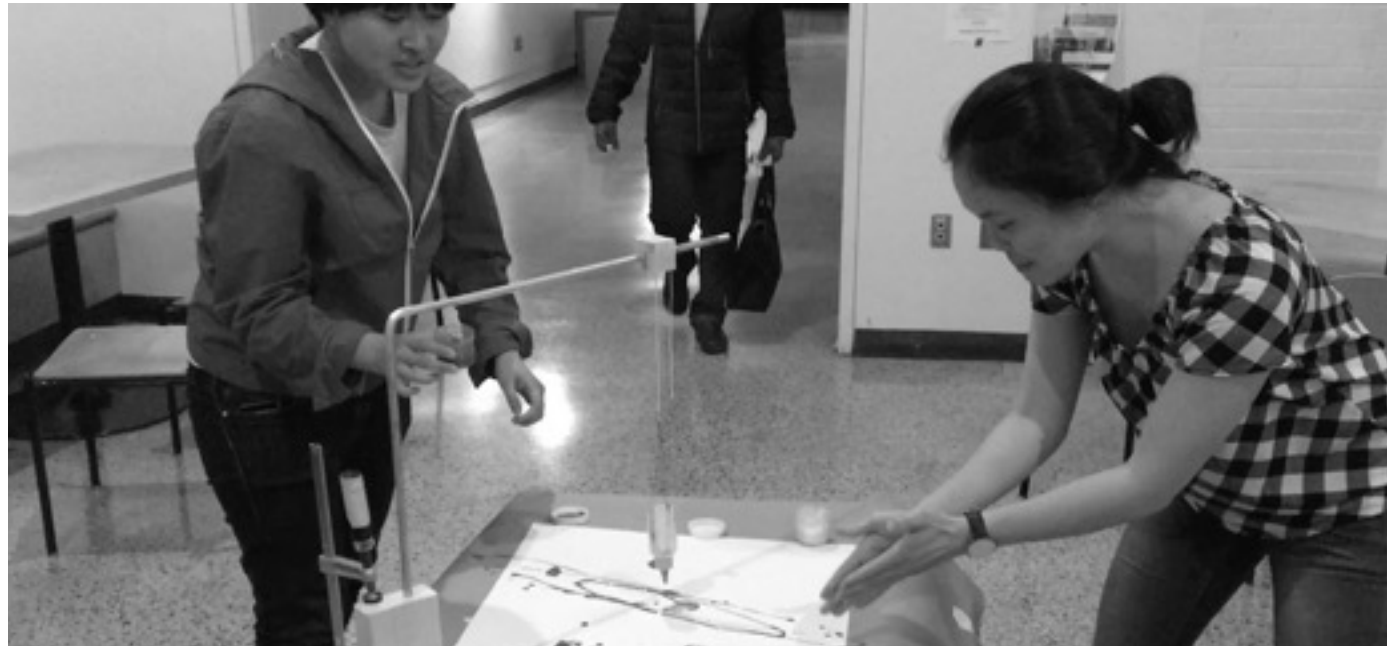

Figure 8b: Two players and an observer laugh after missing one target.

6. Conclusions

This brief research project has indeed resulted successful as a first step in trying to bridge analogous drawing, generative drawing, and social interaction, or at least in answering the question: is it possible? The testing results show that *it is* possible to obtain appealing visual outcomes as the result of multi-player interactions, while also removing, for reasons already discussed, the premise of "consciously making art together". And even though "making art" was not the object of the game, the existence of a tactile, visually appealing memory of the act of playing, and of what was thought and said while physically and spatially engaging, positively underscores the interaction.

Still, further testing and observation may be necessary to answer the following questions:

Can this game survive outside of a "creative" environment and result appealing for people with other backgrounds?

Does the audience need to be of a particular age to be able to engage in abstract thought and hence enjoy the game?

Is the physical artifact important or is its current precariousness part of the dialogue between the primal and the complex?

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