PaintBall – Coding Sports Into Art for Cross-Interest Computational Connections

Vishesh Kumar
vishesh.kumar@northwestern.edu
Northwestern University
Evanston, Illinois, USA

Safinah Ali
safinah@media.mit.edu
Massachusetts Institute of Technology
Cambridge, Massachusetts, USA

Marcelo Worsley
marcelo.worsley@northwestern.edu
Northwestern University
Evanston, Illinois, USA

ABSTRACT

In this demo, we present PaintBall, a tool that facilitates creative art creation and manipulation from movement data. It is designed as a public computation project aimed to foster conversation and connection between youth with different interests (specifically art, sports, or computing) at a community center around the shared activity of creating these rich visualizations and art pieces. We expect the design features of PaintBall – public art and tinkering work, cross interest engagement, and discrete artifact generation – to be key ideas that can be used across a variety of contexts and enable rich community development among youth by providing novel touchstones for conversation as well as reflection on these preexisting activities themselves. The following URL will host a working demo of this project – https://tiilt.northwestern.edu/projects/sportsense/paintball

CCS CONCEPTS

• **Human-centered computing → Systems and tools for interaction design**.

KEYWORDS

Sports, Movement, Computing, Art, Creativity, Collaboration, Social Learning, Public Computation, Community Centers, Informal Learning

ACM Reference Format:
Vishesh Kumar, Safinah Ali, and Marcelo Worsley. 2023. PaintBall – Coding Sports Into Art for Cross-Interest Computational Connections. In *Interaction Design and Children (IDC '23), June 19–23, 2023, Chicago, IL, USA.* ACM, New York, NY, USA, 3 pages. https://doi.org/10.1145/3585088.3594492

1 INTRODUCTION & BACKGROUND

In this work, we are building computing tools that connect sports and athletic movement to creative expression in the form of visual art. Constructionism [9] provided a conceptual anchor for educators, researchers, and designers to consider computing as a productive platform for learning other concepts – initially implemented for learning math concepts like geometry through Logo programming. A bulk of the following work centered the potential of computing tools (like Alice and Scratch among many others) aimed towards creative production like art and storytelling as engaging and effective mediums for learning computational concepts and ideas themselves [4]. Contemporary work in this space continues to extend this approach by further focusing on the creative production in spaces and practices that are culturally relevant and sustaining by complementing pre-existing values and interests of learners. Recent examples of this approach which inspire our work include TunePad which enables leveraging code to create and mix music [6], and DanceOn which enables young dancers to easily create visualizations and visual effects on videos of their dance [2].

A sports specific implementation of work that combines ideas from both TunePad and DanceOn is organized in Data In Motion [7] which involves showing finished tools and software applications productive for enhancing athletic experiences, training, and performances, and is then complemented by easy to implement wearable development experiences where learners are exposed to accessible ways of making and programming their own wearables. This project aims to support youth interested in the creation of sports technologies, as well as youth who center their athletic pursuits and mostly only want technology that serves those interests.

Many of the above-described platforms use creative production as an engaging product for developing computing skills (as in the case of Scratch and TunePad) or surface computing as a complementary activity that can enhance the central activity of interest (viz. DanceOn and SportSense). Extending these approaches, we believe that there is rich potential in developing computing platforms, tools, and activities that act as bridges across complementary interests, where the creative products are productive points of conversation and collaboration for youth with different interests.

This cross-interest collaboration is of key value from our experiences as educators and researchers in informal learning spaces where youth are allowed to pursue their own interests. Youth often self-segregate across pre-existing interests and social groups. While these self-organizations are key for youth developing deeper relationships and their own personal communities for interpersonal support, care, and growth, there is a dearth of tools and activities that support these youth in crossing activity boundaries and engaging with others with disparate interests.

Building on this noticing, and extending our work in the SportSense project, we present our current work on PaintBall – an athletic movement art creation tool – intended to enable youth interested in art and visualizations to engage with athletic youth in co-creating visualizations that represent the sport and athletic movement in novel ways. We imagine this work to be an introductory instance of a powerful idea – creating transparent flexible creative production tools that enable youth to engage with each other by connecting seemingly disconnected interests and activities. This not only

IDC '23, June 19–23, 2023, Chicago, IL, USA

ACM ISBN 979-8-4007-0131-3/23/06.
https://doi.org/10.1145/3585088.3594492

carries potential to expand the ways youth create and develop relationships with each other in such spaces, but also provide pathways to reconceptualize the activities themselves – creating new ways of understanding and engaging with different sports, as well as new ways of thinking about art and data.

2 CONTEXT & DESIGN

This project is borne out of working with a neighborhood community center next to a university in a Midwestern city, which hosts a variety of youth programming as well as an informal, unstructured space for community youth to socialize and hang out after school. This program, herein called YYA (since it is managed by the city's Youth and Young Adult (YYA) division of the city), supports K12 youth with adult supervision aimed only around ensuring interpersonal safety, and access to unrestricted snacks, till 7pm on all weekdays, for however long youth want to visit and participate. They are given access to a large gym space including 4 basketball courts, an adjacent large media room with a TV, gaming consoles, and board games, and a dance studio. Youth have been noticed to move across these spaces somewhat fluidly, though there are consistent patterns in who plays basketball on the courts and who uses the dance studios, with markedly gendered differences. We have experienced successful but limited engagement with these youth through programming similar to the Data in Motion camps described above – while they enjoy limited sessions with exploring sensor enabled gameballs and score tracking apps, they rarely choose to engage with setting them up and using these while playing by themselves. In response to this, our implementation of PaintBall is aimed at having a much lower setup barrier than other activities and technologies – wherein youth can simply pick up a pre-programmed wearable before starting their gameplay, and as they leave their gameplay experience, receive a visualization of their movement from this session at the click of a button [11]. This is intended to provide a minimal interaction representation of their activity that they can print or save and possibly make a collection of across sessions. Our design presents inroads for further exploration and cross-interest communication by youth through the design of presenting this visualization tool in the media room adjacent to the basketball courts, such that others in those rooms can also see the visualization regardless of the athlete's interest, and youth regardless of athletic participation can engage in extremely low barrier manipulation and customization of the visualization. This builds on a common pattern of social (learning) interactions being triggered and supported in the presence of visible engineering performances observed across interactive museum exhibits and public installations [8]. We are deliberately designing the visualizations to look like creative art pieces and not overtly metric based representations of movement, to actively invite artistic engagement rather than competitive engagement which is the most common response to presentation of metrics in such spaces [8]. A key concern that is handled by the implementation of this in the form of an opt-in shared wearable is the privacy around the engagement of youth in this space. Since most YYA attendees come from a variety of marginalized backgrounds, there is high priority given to not implementing tools that can introduce risks around security and surveillance for these youth. In awareness of the current and historical political and racial climate of the United States, and knowing how Black (and Brown) youth grow up in over policed and under resourced environments [3, 10], this is a critical concern that should be considered centrally in any similar designs and implementations. As a result, we have so far avoided the usage of camera-based data collection and art creation activities. Further revisions and co-design with youth and stakeholders at this venue is being conducted before deciding to implement tools resembling the kinds of video recording pose based artistic creations enabled in the DanceOn project.

2.1 PaintBall - The Tool

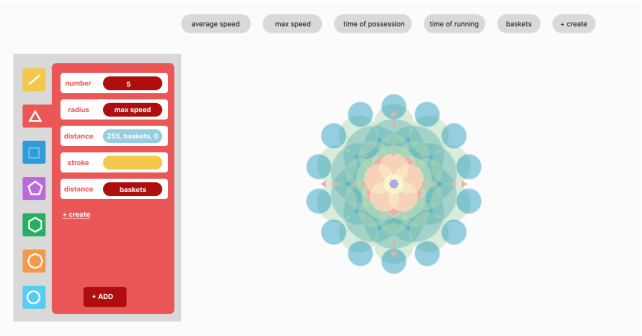

Figure 1: A screenshot of the PaintBall interface that allows youth to manipulate art created from their movement

Figure 1 shows a current view of the PaintBall interface that produces visualizations of movement data in different art styles (herein using a mixture of polar ellipses). This tool current uses the p5.js library to produce the art, and the interactjs library for the basic block-style drag and drop functionality. Currently, the data that is collected to produce art comes from micro:bits worn on the wrist or ankles using an attachment called the wear:bit [1].

We preload software on the micro:bit that collects movement data when turned on and sends it to the web based PaintBall tool as it is being used. This art piece is generated real time, and whenever the athlete stops playing, can engage with the created visualization either to print it, save it for their personal gallery, or manipulate it and play around with it. Our design and anticipation of this usage is modeled after the outfitting of spaces as done in Chicago Public Libraries by the YouMedia project, with the aim of supporting youth hanging out, messing around, and geeking out (HOMAGO) [5].

3 DEMO IMPLEMENTATION

PaintBall fits exceptionally well with IDC 2023's theme of rediscovering childhood – in a unique way of using complex technological methods but centering the expansion of playful creative expression of youth and participants over disciplinarily constrained practices and skills. In line with the description provided above, running PaintBall at the conference venue will be extremely easy, requiring just a large display and a laptop or touchscreen with (optional) internet access, and us bringing our own outfitted wearables which interested audience members can equip and move around the space for varying periods of time to obtain their own custom art pieces.

We would be particularly enthused by the possibility of enabling tinkering with the art parameters of the created visualization at another (near or far away) computer opening the possibility of "programmers" and "athletes" (i.e., people with the wearable) needing to communicate with each other to negotiate what version of the art piece is of shared interest.

4 FUTURE WORK

So far PaintBall is only in an early prototype stage, but we intend to implement and test it in the context of the aforementioned community center, prioritizing the ways that it actually invites participation from other youth not playing on the court, and especially if it enables conversation between the athletes and non-athletes. We aim to do this testing in a semi-supervised manner, being present there and collecting data on the extent and kinds of scaffolding needed for youth to effectively engage with this design.

We are also interested in seeing the extent to which PaintBall can be used by the youth who most often engage as dancers in this space. While our design is not yet oriented towards them – especially since the dance studio is located significantly far away from the media room and access to displays which would support easy technological engagement by youth – it would be particularly exciting if PaintBall is able to invite excitement and interest from youth engaging in different kinds of movement in these spaces.

Another key feature we intend to build includes creating accessible ways of engaging with the data processing layer in PaintBall. How can we expose the code (or computational concepts and tools) that converts raw accelerometer data from the micro:bit and other wearables, to different movement measurements like steps, heights of jumps, in a way that is also playful as well as comprehensible for youth. The ability of surfacing these unique lenses into data thinking and literacy for these youth is another potentially powerful avenue for PaintBall (and similar projects).

Lastly, we are most excited about how this idea can be translated and extended across different combinations of activities and interests, by us for this community center, and by different researchers and designers in response to the spaces and youth that they work with. How can computing create more such public use tools that bridge locally prevalent activities and interests, extending the already powerful idea of public computation [12].

REFERENCES

[1] [n. d.]. 2. Wear:bit — ELECFREAKS WIKI. https://www.elecfreaks.com/learn-en/microbitKit/smart_coding_kit/wear_bit.html#introduction

[2] Francisco Enrique Vicente Castro, Kayla DesPortes, William Payne, Yoav Bergner, and Kathleen McDermott. 2022. AI+ Dance: Co-Designing Culturally Sustaining Curricular Resources for AI and Ethics Education Through Artistic Computing. In *Proceedings of the 2022 ACM Conference on International Computing Education Research-Volume 2*. 26–27.

[3] Erin Cederberg. 2016. Over-policed and Under-protected: Police Brutality and the Demonisation of the African American Male. *UBC Sociology Department website: http://soci. ubc. ca* 8 (2016), 25.

[4] Shuchi Grover and Roy Pea. 2013. Computational thinking in K–12: A review of the state of the field. *Educational researcher* 42, 1 (2013), 38–43. Publisher: Sage Publications Sage CA: Los Angeles, CA.

[5] Kelly Hoffman, Mega Subramaniam, Saba Kawas, Ligaya Scaff, and Katie Davis. 2016. Connected libraries: Surveying the current landscape and charting a path to the future. (2016).

[6] Michael Horn, Amartya Banerjee, Melanie West, Nichole Pinkard, Amy Pratt, Jason Freeman, Brian Magerko, and Tom McKlin. 2020. TunePad: Engaging learners at the intersection of music and code. (2020). Publisher: International Society of the Learning Sciences (ISLS).

[7] Stephanie T. Jones, JaCoya Thompson, and Marcelo Worsley. 2020. Data in Motion: Sports as a site for expansive learning. *Computer Science Education* 30, 3 (2020), 279–312. Publisher: Taylor & Francis.

[8] Leilah Lyons, Michael Tissenbaum, Matthew Berland, Rebecca Eydt, Lauren Wielgus, and Adam Mechtley. 2015. Designing visible engineering: supporting tinkering performances in museums. In *Proceedings of the 14th International Conference on Interaction Design and Children*. 49–58.

[9] Seymour Papert and Idit Harel. 1991. Situating constructionism. *constructionism* 36, 2 (1991), 1–11.

[10] Christina Payne-Tsoupros and Najma Johnson. 2022. A DisCrit Call for the Abolition of School Police. *DisCrit Expanded: Reverberations, Ruptures, and Inquiries* (2022), 112. Publisher: Teachers College Press.

[11] Mitchel Resnick and Brian Silverman. 2005. Some reflections on designing construction kits for kids. In *Proceedings of the 2005 conference on Interaction design and children*. 117–122.

[12] Pratim Sengupta and Marie-Claire Shanahan. 2017. Boundary play and pivots in public computation: New directions in STEM education. *International Journal of Engineering Education* 33, 3 (2017), 1124–1134.