danceON and softWEAR: Education-level creative coding and programmable wearables

Yoav Bergner
yoav.bergner@nyu.edu
New York University
New York, USA

Willie Payne
william.payne@nyu.edu
New York University
New York, USA

Kathleen McDermott
kmcdermott@nyu.edu
New York University
New York, USA

Kayla DesPortes
kayla.desportes@nyu.edu
New York University
New York, USA

ABSTRACT

Our research collaborative has been exploring movement computing educational technology experiences. That is, we have been building tools that simultaneously support both movement and computing learning objectives at entry-level. We will demo two products in development. danceON is a domain-specific language and a web app that allows users to create interactive graphics overlaid on video from pre-recorded or live (webcam) sources. softWEAR is a solderless and breadboardless ecosystem using sensors, LEDs, and the Adafruit Trinket M0. It is designed to support a workflow from ideation, prototyping, and iteration to a durable, wearable final project embedded into clothing or accessories.

KEYWORDS

movement computing education, creative coding, wearables

ACM Reference Format:
Yoav Bergner, Willie Payne, Kathleen McDermott, and Kayla DesPortes. 2022. danceON and softWEAR: Education-level creative coding and programmable wearables. In *8th International Conference on Movement and Computing (MOCO'22), June 22–24, 2022, Chicago, IL, USA.* ACM, New York, NY, USA, 3 pages. https://doi.org/10.1145/3537972.3538015

1 MOVEMENT COMPUTING EDUCATION TECHNOLOGY

While professional artists and researchers continue to push the frontiers of movement and computing, a number of notable educational efforts are aimed at young learners and novices. Some examples include STEM from Dance (stemfromdance.org), an afterschool program that teaches physical computing and programming, culminating in a tech-enhanced live performance; Embodied Physics (terc.edu/projects/embodied-physics), a project targeting kinesthetic knowledge of physics through dance; and Dance Party (athletesforcomputerscience.org/dance-party.html), a block-based environment for choreography with animated sprites. These experiences hold particular promise for broadening participation in technical and computational disciplines by appealing to young learners who are passionate about artistic and/or athletic movement.

Our research collaborative has been exploring related movement computing educational technology experiences [1–4]. That is, we have been building tools that simultaneously support both movement and computing learning objectives at entry-level. A recent iteration of this work is danceON [5], a domain-specific language and a web app that allows users to create interactive graphics overlaid on video from pre-recorded or live (webcam) sources. We are also at work on a wearables project called softWEAR.

The purpose of this demo is to showcase these two developmental projects, get feedback from the MOCO community, and catalyze partnerships for future work.

1.1 danceON

danceON enables users to upload dance videos (or use their webcam) and write code that creates responsive animations based on pixel location data and pose-detection data (see Figure 1). The live coding environment implements a Domain Specific Language (DSL) that updates the video panel with animations as the user is coding, allowing the user to quickly test and iterate on their code. The web-based IDE provides feedback to users as they are working. Users can toggle between overlays to gather information on pixel location and pose-detection to assist them in making decisions as they work. Design considerations and core features of danceON are detailed in [5].

A sample of creative outputs generated by high school students using danceON is shown in Figure 2

1.2 softWEAR

softWEAR is a solderless and breadboardless ecosystem based off the Adafruit Trinket M0. It is designed to support a wearables workflow from ideation, prototyping, and iteration to a final project embedded into clothing or accessories. The controller is programmable in Arduino, make:code, and micropython. The system is extensible with QWIIC boards from SparkFun and AdaFruit.

Current sensing capabilities of the system include capacitative touch and IMU, while output capabilities include neopixel LEDS and a vibration motor. The system is designed to be small enough to fit into the clothing worn by cheerleaders and dancers. See Figure 3

MOCO'22, June 22–24, 2022, Chicago, IL, USA

ACM ISBN 978-1-4503-8716-3/22/06…$15.00
https://doi.org/10.1145/3537972.3538015

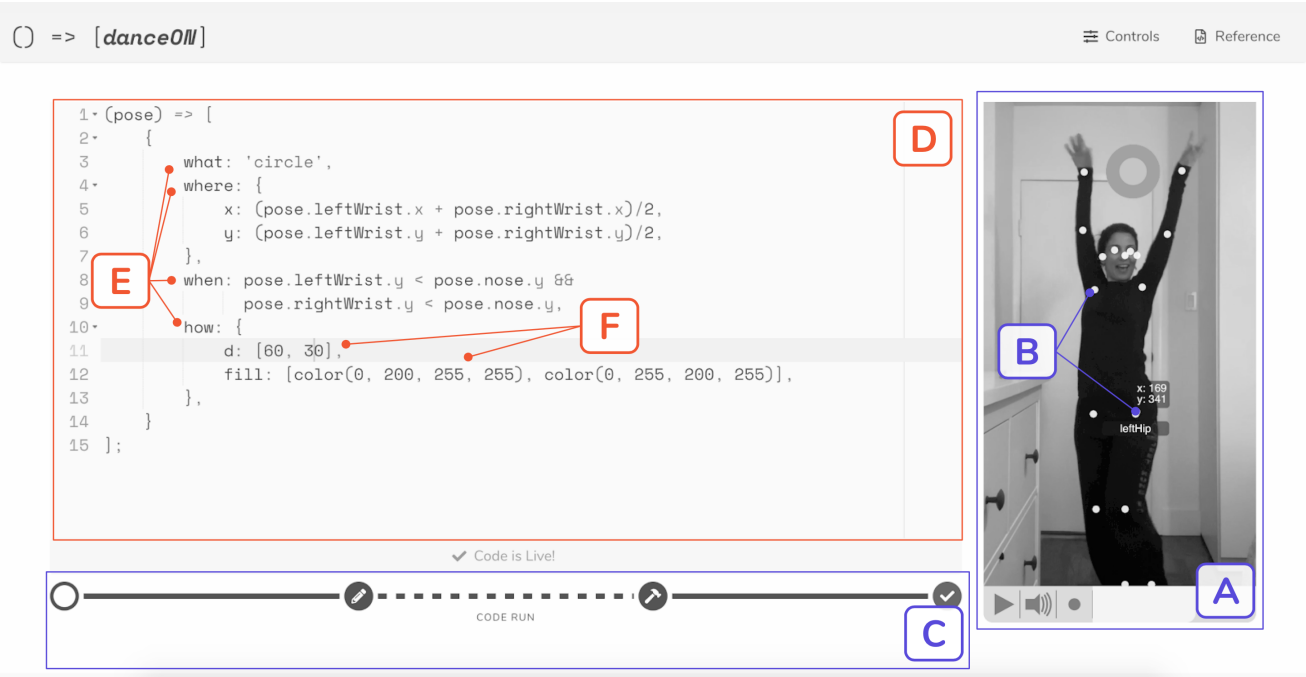

Figure 1: danceON IDE: A. Video/webcam player with built-in pose detection and classification; B. Skeleton and Cursor overlays; C. Live coding environment features including feedback bar; D. Code editor; E. Natural language object properties, F. Automatic lifting or list handling

Figure 2: Animations coded in danceON to original choreography by high school student teams.

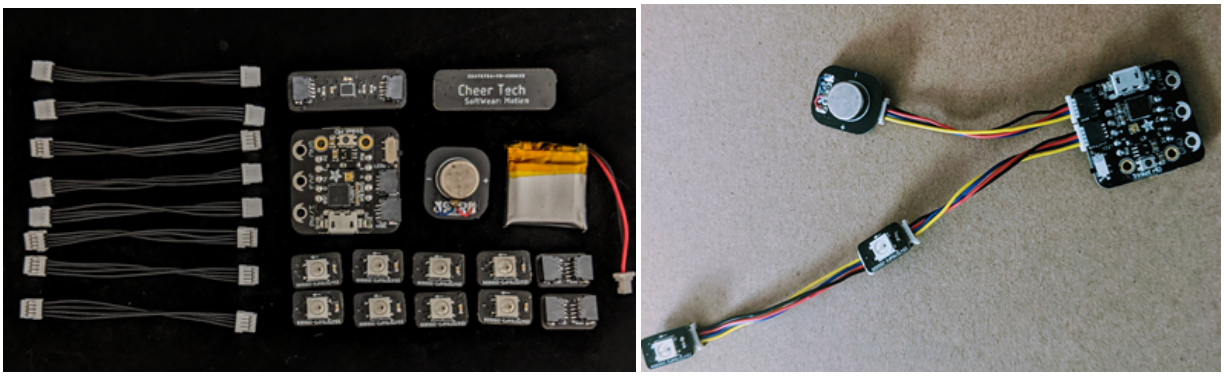

Figure 3: softWEAR system includes: controller, motion sensor, led lights, vibration motor, connectors

Usability studies are currently underway to inform future improvements to the physical computing wearable hardware ecosystem. This study is the first phase of research designed to foster wearables-based physical computing education and innovation,

and determine how novices can understand, choreograph with, and make use of concepts in computer science and work with hardware platforms when applying it to artistic expression in cheer and dance performance. Learning to program, even with "beginner-friendly" tools is non-trivial. Our conjecture is that by steeping the computer programming learning in with current passionate practices such as cheer and dance we will see authentic engagement in learning how to create wearable technologies.

ACKNOWLEDGMENTS

This project is generously supported by the National Science Foundation (STEM+C 1933961).

REFERENCES

[1] Yoav Bergner, Deborah Damast, Allegra Romita, and Anne Marie Robson Smock. 2020. Movement Computing Education for Middle Grades. In *Proceedings of the 7th International Conference on Movement and Computing*. 1–5. https://doi.org/10.1145/3401956.3404238

[2] Yoav Bergner, Shiri Mund, Ofer Chen, and Willie Payne. 2019. First steps in dance data science: Educational design. In *Proceedings of the 6th International Conference on Movement and Computing (MOCO 2019)*. https://doi.org/10.1145/3347122.3347137

[3] Yoav Bergner, Shiri Mund, Ofer Chen, and Willie Payne. 2021. Leveraging interest-driven embodied practices to build quantitative literacies: A case study using motion and audio capture from dance. *Educational Technology Research and Development* 69, 4 (2021), 2013–2036. https://doi.org/10.1007/s11423-020-09804-2

[4] Kayla DesPortes, Monet Spells, and Betsy DiSalvo. 2016. The MoveLab: Developing Congruence Between Students' Self-Concepts and Computing. *Proceedings of the 47th ACM Technical Symposium on Computing Science Education - SIGCSE '16* (2016), 267–272. https://doi.org/10.1145/2839509.2844586

[5] William Christopher Payne, Yoav Bergner, Mary Etta West, Carlie Charp, R Benjamin Benjamin Shapiro, Danielle Albers Szafir, Edd V Taylor, and Kayla DesPortes. 2021. danceON: Culturally Responsive Creative Computing. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–16. https://doi.org/10.1145/3411764.3445149