



Paper Animatronics Workshop 2025

Paul H. Dietz
University of Toronto
Department of Computer Science
Toronto, Ontario, Canada
paul.dietz@utoronto.ca

Sarah Kushner
University of Toronto
Department of Computer Science
Toronto, Ontario, Canada
sak@cs.toronto.edu

Catherine Dietz
Veytel, LLC
Seattle, Washington, USA
cathydietz@veytel.com

Jennifer Ginger Alford
Southern Methodist University
Lyle School of Engineering
Dallas, Texas, USA
alfordg@mail.smu.edu

Elliot Mueller
StoryTech
Seattle, Washington, USA
elliottpmueller@gmail.com



Figure 1: A sample paper animatronics project. We learn a little about Meerkats directly from the source.

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Abstract

Kids (and many adults) often fail to see engineers and scientists as creative in the same sense as artists, writers, and musicians. This is understandable because STEM classes typically teach basic skills and then ask students to apply these to solve known problems to get to the one, correct, known solution. Creativity is explicitly discouraged.

With paper animatronics, we try to break this paradigm, showing kids that technology provides powerful tools for creativity. Students tell the important stories of history, culture, science, or just about any subject via their papercraft which they bring to life with motion and synchronized sound. Their characters literally talk, with mouths moving appropriately as they speak. Kids get that storytelling and papercraft are creative tasks, and they quickly come to see the animatronics parts as simply additional things with which to be creative. Here, the story is the point, with the tech playing an important, but supporting role.

In this paper animatronics workshop, you will make your own storytelling paper robots using our latest, easy-to-use, easy-to-afford, animatronics kits. Building physical things is surprisingly fun and engages learner creativity in a very different way than screens. Hopefully, this will spark your interest in bringing these sorts of technology-based, physical storytelling projects to schools in your community.

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1 Paper Animatronics

Paper Animatronics Kushner et al. [2024] is a project-based learning activity where elementary and secondary school students create characters and stories and bring them to life through papercraft with sound and motion! Like making posters or dioramas, paper animatronics can be used to reinforce learning in almost any subject.

Our programs have three levels of activities, allowing students to build their skills over time.

1.1 Voice Puppetry with PupCon (Early Elementary and Up)

In this activity, the child creates a simple paper character with a moving mouth, and attaches a Zip Servo (our high-speed linear actuator). The motor is then connected to our PupCon puppet controller board that moves the mouth up and down in real-time with a knob or automatically as the child speaks.

1.2 Two-Character, Scripted Shows (Middle Elementary and Up)

In this second activity, story and script take center stage as kids create a show with two characters talking to each other. Similar to the first activity, kids create two paper characters with moveable mouths connected to Zip Servos. They write a script for the two characters, and then use audio editing tools like Audacity to record and process (pitch shifting and other effects) their own voices. The resulting stereo audio file is copied to a microSD card and used to drive the two Zip Servos via our new TwoCon dual animatronic figure control board with an internal MP3 player.

1.3 Synchronized Shows (Early Secondary and Up)

In the third activity, we augment our paper shows using a microcontroller (e.g. Arduino), allowing a wide range of synchronized motions, lights and outputs. This provides a purposeful, gentle introduction to programming using a simple state machine. The TwoCon board includes a logic output which provides synchronization signals triggered by audio on the right channel. TwoCon boards can be synced together to create shows with large numbers of talking characters.

2 Workshop

In our SIGGRAPH hands-on workshop, participants will first create a simple paper character with a moving mouth. They will be able to speak through this paper robot in real-time using the PupCon controller.

In the second activity participants pairs will create a simple two-character show. They will record a conversation between the two characters, and use Audacity to create a stereo audio file. The TwoCon board features an MP3 player, and will drive the mouths of the two characters from the file. Time permitting, we will demonstrate how multiple TwoCon boards can be synchronized to create highly complex shows with many characters and additional programmed servo and lighting effects.

References

- Sarah Kushner, John Kanji, Paul H. Dietz, and Daniel Wigdor. 2024. Papertronic Puppets: Teaching STEM and Storytelling Through Creative Construction. In *2024 IEEE Frontiers in Education Conference (FIE)*. 1–9. doi:10.1109/FIE61694.2024.10892876