Ozobot Art—OzoArt!

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Topics

Robotics, Computer Science,

Programming

Ages

Grades 6 – 12

Duration

1 hour

Activity: Ozobot Art—OzoArt!

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Introduction

Most everyone enjoys two-dimensional visual art in some form or another—from watercolor, oil, pencil, pastels, and acrylics to graphic art created on the computer. Throw in an Ozobot Bit, a camera, and a little OzoBlockly code and you can have your students *creating* unique and beautiful *OzoArt* pieces in no time at all! The camera can be a fancy DSLR (digital single-lens reflex) or as simple as the camera on an iPhone. This document will provide examples and some hints for creating OzoArt regardless of which type of camera your students may be using. The key to creating the art is the ability to take long exposures of Ozobot's motion and changing LED colors as it moves. Ozobot can make use of *Movement* category or *Line-Following* category OzoBlockly code. In either case, students can be challenged to use their innate creative genius to come up with some eye-catching OzoArt.

Creating OzoArt with a DSLR Camera

 A DSLR camera probably provides the greatest flexibility in settings for creation of OzoArt, resulting in some very striking images. An example of an image created by the author is shown in Figure 1.
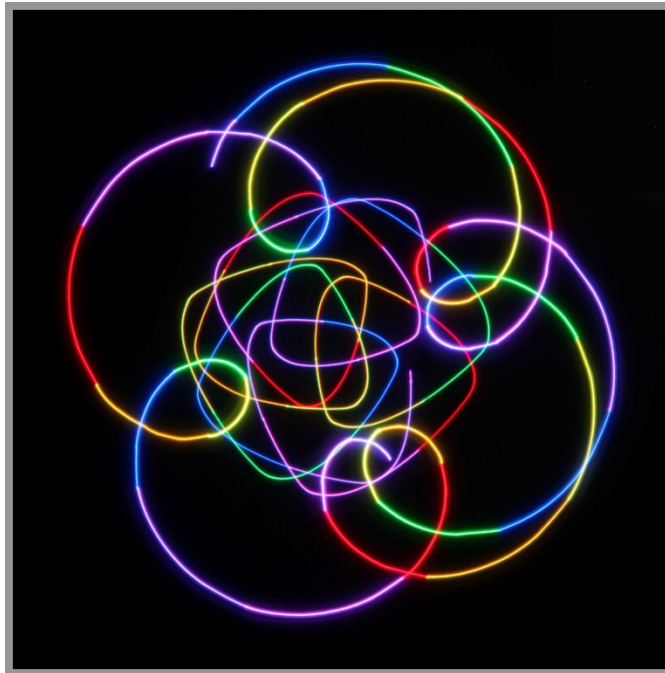

Figure 1

A darkened room and a stationary camera are essential. The image is a 30-second exposure, with an ISO setting of 100 and an aperture setting of f/22 (very small opening). Figure 2 shows the setup for creating this image.

Figure 2

There are two Ozobot Bits, one on a circle and the other on a square. Their OzoBlockly programs cause the LED to change colors at each of the intersections in ROYGBIV order. The circle and square are taped to a 16" cardboard cake holder. The cardboard is taped centered on a turntable that rotates uniformly once every 20 seconds. The DSLR camera is mounted to a tripod and is facing dead center on the cardboard. The resulting image therefore consists of the *combined motion* of the turntable and the Ozobot Bits moving on their respective OzoMaps.

Note that this image was obtained with the Ozobots and the turntable all rotating counterclockwise as viewed from above. All three rotations in the same direction seemed to provide the most esthetically pleasing images. Also, from the scientific point of view, the small loops on the Ozobot trail on the circular map demonstrate retrograde motion—regions where Ozobot is actually moving backwards relative to a stationary observer on the ground.

The ozocode file used to produce the image of Figure 1 is found in the accompanying file *iPhoneOzoArtNumber4.ozocode*.

Creating OzoArt with an iPhone Camera

The iPhone camera and its associated camera app do not have the capability to produce long exposure images. But there are a number of third party apps available in the App Store that provide this capability. The author of this paper found an app called *Slow Shutter Cam* from Cogitap Software, available for download ($1.99), to be nice for capturing Ozobot LED trails.   Figure 3 shows the most important screens for this app.
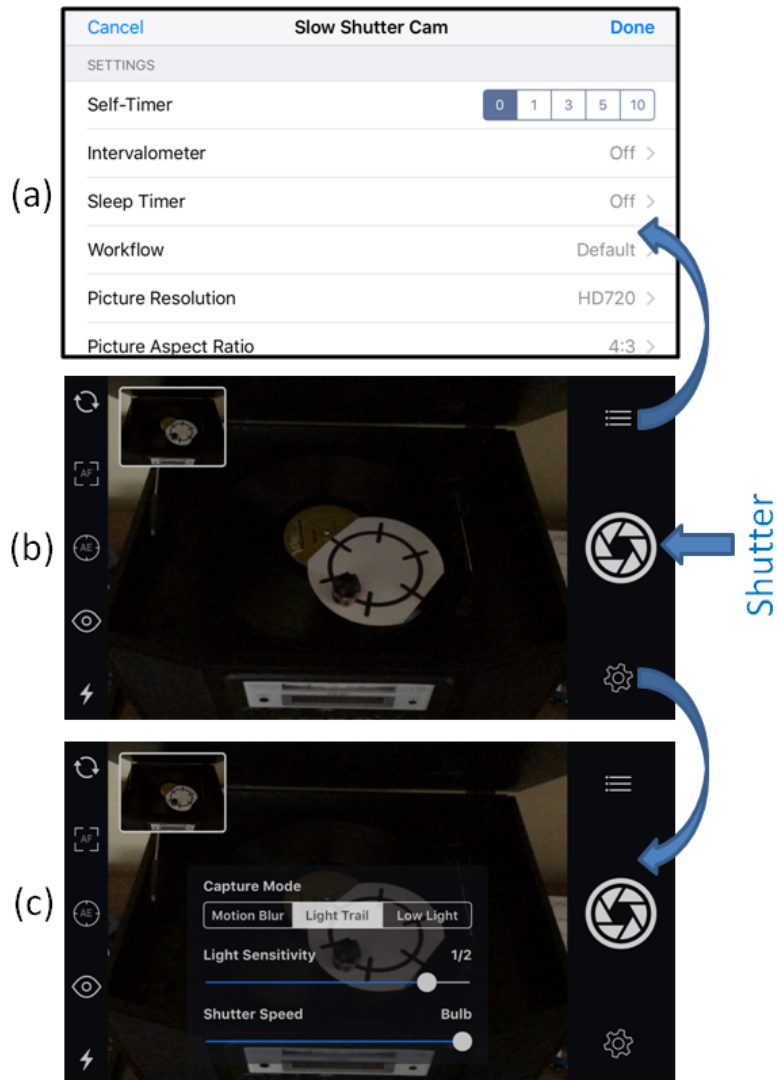

Figure 3

Figure 3(b) shows what the app looks like when opened and the iPhone is horizontal. Here it is showing that it is looking into a record player with a 33 1/3 rpm record on the spindle. The circular OzoMap is taped to the record with an Ozobot Bit moving clockwise, in the same direction as the record. It should be noted that the only record speed that kept Ozobot from flying off of the map was 33 1/3 rpm—45 rpm and 78 rpm were simply too fast. Figure 3(a) shows the details screen that opens when tapping the icon in the upper right of Figure 3(b). With the self-timer set at 0, the shutter does not open until it is tapped. With the picture resolution set to HD720, the frame rate is a fast 120 fps, and provided for smoother blurs. Figure 3(c) shows the settings screen that opens when tapping the icon in the lower right of Figure 3(b). The capture mode is set

to Light Trail. You can set the light sensitivity to anything from 1/128 to full—experiment with this for best results. The shutter speed can be set to anything from a minimum of about ¼ second to a maximum of 60 seconds. If the shutter is set to Bulb, which the author found most convenient, then the shutter remains open from when it is first tapped until it is tapped a second time.

Figure 4 shows the image that was obtained with this setup, with an exposure of about 15 seconds. As was the case with the use of a DSLR camera, a darkened room is necessary and the iPhone camera must remain steady during the entire exposure. This can be done by holding the camera against a steady object. It is best, however, to use an iPhone holder that can be attached to a tripod. A nice iPhone holder called a "smartMount" can be obtained from iStabilizer.com for $19.95 (as of 4/24/2016).
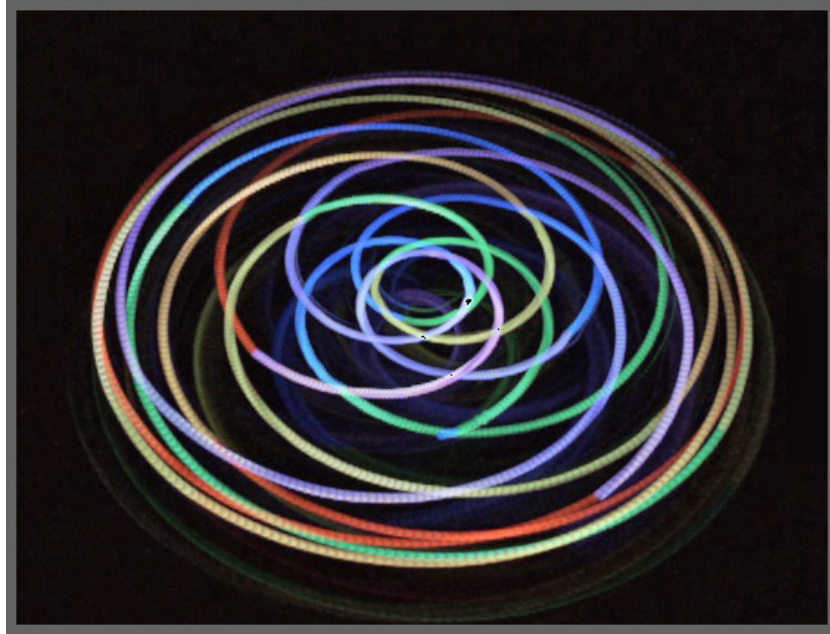

Figure 4

Figure 5(a) shows the setup for the image of Figure 4. It shows how the iPhone sits in the mount and how the mount is screwed to the tripod. You will also note that the camera is facing the record player at an angle rather than straight down on the center of the spindle. This explains why the image is oval in shape. If you want circular shape, then you would need the camera directly above the spindle. The author could not do this because the door on the record player top could not be raised all the way up and out of the way.

Figure 5(b) shows a close-up of the Ozobot Bit. It has been covered with black electrical tape in which a small hole has been punched for the LED light to escape. This is necessary to keep the light trace as narrow as possible. If this is not done, the image will be quite blurry as the entire Ozobot will be reflecting light from the LED.

Finally, the ozocode file used to produce the image of Figure 4 is found in the accompanying file *iPhoneOzoArtNumber4.ozocode*. Students should be encouraged to make adjustments to this ozocode or come up with their own ozocode file that produces an OzoArt piece that they like.

(a)　　　　　　　　　　　　　　(b)

Figure 5

The images discussed so far have all made use of Ozobot Bit running with an OzoBlockly program involving the line-following mode. Your students can also create some fantastic images using the movement mode rather than using line following. This also gives them another opportunity to learn and apply additional OzoBlockly commands. Figure 6 shows three examples of the movement category of OzoArt.
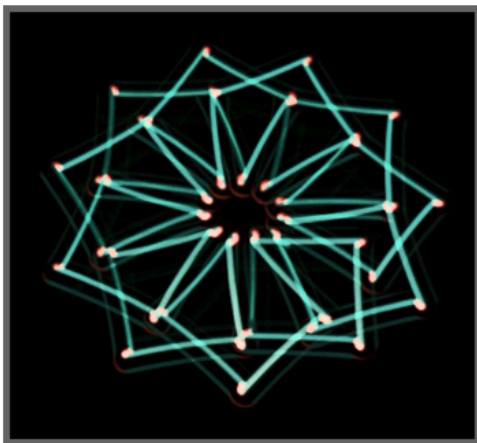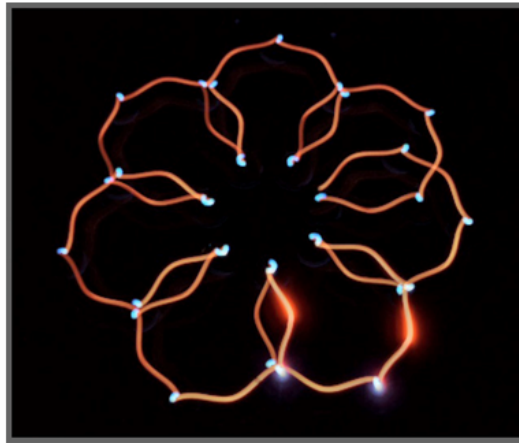
(a)　　　　　　　　　　　(b)　　　　　　　　　　　(c)

Figure 6

The OzoBlockly files used to create these three images are included in the attached files *iPhoneOzoArtNumber1.ozocode, iPhoneOzoArtNumber2.ozocode,* and *iPhoneOzoArtNumber3.ozocode,* respectively. All three OzoBlockly programs begin by turning the LED off and then waiting three seconds. This allows time after setting the Ozobot Bit down and turning it on, to tap the shutter on the Slow Shutter Cam app before the OzoBlockly program starts doing the desired motion and blinking.

Figure 7 shows the setup that was used to create the three movement category OzoArt images. A piece of black foam board on the floor is where Ozobot Bit is placed to do his movement category motion and blinking. The room as usual is darkened, and OzoBot bit is taped with black electrical friction tape except for a small opening on the top for the LED to shine through. The first tap of the shutter starts recording the LED trail. The shutter can then be tapped a second time to stop trailing Ozobot when the screen has a trail that you like. If you don't like the image you can clear it and try again, or modify your OzoBlockly program to produce exactly the effect that you desire. Experimentation is the key—and have fun creating your own OzoArt!

Figure 7