AP® Computer Science A Picture Lab Student Guide

The AP Program wishes to acknowledge and thank Barbara Ericson of the Georgia Institute of Technology, who developed this lab and the accompanying documentation.

Extensions

E1: Steganography

Steganography is the science of hiding information in a picture. You can hide a black and white message inside a color picture by first changing all the red values in the original color picture to be an even value (by subtracting one if odd). Make a picture of the same size out of the message that will be hidden. Then loop through both the original picture and the message picture, setting the red value of a pixel in the original picture to odd (by adding one to it) if the corresponding pixel in the message picture is close to the color black. Write an `encode` method that takes the black and white picture message and changes the current picture to hide the message picture inside of it. Then also write a `decode` method that returns the picture hidden in the current picture.

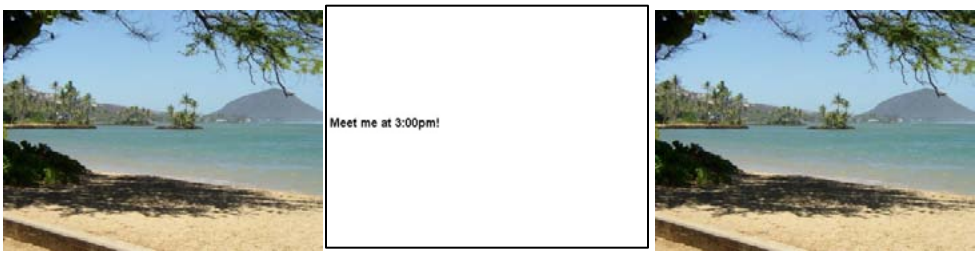

Figure 1: original (left), message (middle), beach with message hidden (right)

E2: Chromakey

Write a `chromakey` method that replaces the current pixel color with the color from another picture at the same row and column when the current pixel color is close to a specified color. In many movies, the actors are filmed in front of a green screen and then the green is replaced with a different background using a similar technique.

The picture in Figure 2 is of Dr. Mark Guzdial of Georgia Tech. Dr. Guzdial is the creator of the Media Computation approach to teaching computing concepts, which has students write programs that manipulate media: pictures, sounds, text, and movies. These labs are based on his work.

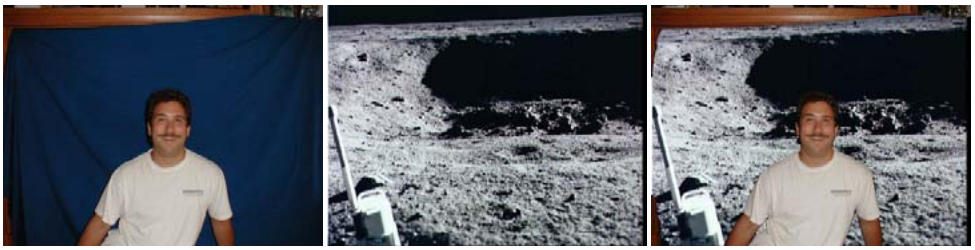

Figure 2: Dr. Guzdial (left), moon (middle), Dr. Guzdial on the moon (right)

References

Dann, W., Cooper, S., & Ericson, B. (2009) *Exploring Wonderland: Java Programming Using Alice and Media Computation*. Englewood, NJ: Prentice-Hall.

Guzdial, M., & Ericson B. (2006) *Introduction to Computing and Programming in Java: A Multimedia Approach*. Englewood, NJ: Prentice-Hall.

Guzdial, M., & Ericson, B. (2009) *Introduction to Computing and Programming in Python: A Multimedia Approach*. (2nd ed.). Englewood, NJ: Prentice-Hall.

Guzdial, M., & Ericson, B. (2010) *Problem Solving with Data Structures using Java: A Multimedia Approach*. Englewood, NJ: Prentice-Hall.