



LEARNING MODULES

GK-12 DISSECT at New Mexico State University

Title: Image Reconstruction

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Discipline or Area: Image Processing

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School: Centennial High School

Subject of class: Forensic Science

Grade: 11/12

COVERAGE OF COMPUTATIONAL TOPICS

Algorithm

Iteration

Branching

OBJECTIVES

The objective of this module is to show students how a computer puts together an image.

EQUIPMENT AND MATERIALS

Different images pasted on cardboard or cardstock

Scissors to cut pictures into pieces

BACKGROUND AND REFERENCES

The current lesson plan was to teach students how forensic science is done in the real world. A common theme with what I was talking about was pictures/images being processed by a computer. I wanted to show students how the algorithm for reconstructing images works.

PROCEDURE

Before performing this module I spent about 25 minutes talking to students about computers and forensic science and they were still learning about fingerprints. I explained to them how fingerprints get put into a database and briefly talked about the math that goes into a computer reading a fingerprint. I used this game to show them how a picture is broken up and then put back together by a computer (similar to how a computer stores images of fingerprints).

Procedure:

1. Have a few different images printed on cardboard or cardstock
 - a. The images I used were chosen from USC's image database because they are commonly used in image processing.
<http://sipi.usc.edu/database/database.php?volume=misc>
2. Cut the whole images into even sized pieces, I chose to do 6 pieces per image.
3. Mix the different pieces and pass out to the students.
 - a. You can choose to have an even number of pieces to students OR
 - b. To have some of the pictures missing pieces (This simulates fragmented or incomplete images)
4. Have the students talk to each other and ask questions to see if they may have pieces to the same pictures.
 - a. Questions can include color, shape, edges (Similar to putting together a puzzle)
5. As students find matches they group and look together for another matching piece.
6. By the end students should have formed groups. All the groups may have complete pictures or fragmented ones depending on how the distribution of pieces went.

After playing the game I talked to the students about patterns they saw while playing the game (iteration of repeating questions to different students). I also asked how easy or difficult it was to "reconstruct" the image. Some were easy, some hard. Usually groups with missing pieces found it more difficult because they didn't know when their group was complete.

Learning Goals:

Students should have an idea of how the algorithm for putting together images on a computer works. They should be able to see iteration because they repeat questions to different students. They should also be able to see branching based on changing questions or moving to different students.

Assessment of CT Learning:

After completing this module we had a class discussion on CT concepts used during the activity and the students were able to say what concepts they thought were used and why.

NOTES AND OBSERVATIONS

What were challenges you encountered in the overall development of the module?

Students seemed to understand what they needed to do to get a complete picture. The only challenge for me was time. I left about 15 minutes to do this module and it probably would have been better if done in 20-25 minutes.

What was successful?

Students liked moving around the classroom for the activity and I think they were able to clearly see how iteration and branching were working in the activity.

How was the students' reception to the content of the module?

Students appeared to enjoy the module. During the discussion they were quite vocal.