
Two-Dimensional Arrays and Nested Loops – part 4

Barb Ericson
Georgia Institute of Technology
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Learning Goals

- Understand at a conceptual and practical level
 - How to copy part of one picture to another?
 - What makes a good method?
 - How to write more general methods?
 - By adding parameters to the method
 - How to rewrite methods?
 - To reduce copied code

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Cropping

- We can copy just part of a picture to a new picture
 - Just change the start and end source x and y values to the desired values
 - Use `pictureObj.explore()` to find the x and y values
 - What are the x and y values to get the face of the girl in `KatieFancy.jpg`?

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Copy Face Method

```
public void copyKatiesFace()
{
    String sourceFile =
        FileChooser.getMediaPath("KatieFancy.jpg");
    Picture sourcePicture = new Picture(sourceFile);
    Pixel sourcePixel = null;
    Pixel targetPixel = null;

    // loop through the columns
    for (int sourceX = 70, targetX = 100;
         sourceX < 135; sourceX++, targetX++)
    {
        // loop through the rows
        for (int sourceY = 3, targetY = 100;
             sourceY < 80; sourceY++, targetY++)
        {
```

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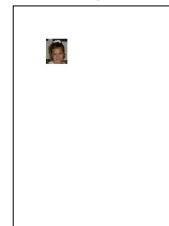
Copy Face Method - Continued

```
        // set the target pixel color to the source pixel color
        sourcePixel =
            sourcePicture.getPixel(sourceX,sourceY);
        targetPixel = this.getPixel(targetX,targetY);
        targetPixel.setColor(sourcePixel.getColor());
    }
}
}
```

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Testing Copy Katie's Face

- Create a picture object
 - `Picture p1 = new Picture(FileChooser.getMediaPath("7inX95in.jpg"));`
- Show the picture
 - `p1.show();`
- Invoke the method
 - `p1.copyKatiesFace();`
- Repaint the picture
 - `p1.repaint();`



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What makes a Good Method?

- A method should do one and only one thing
 - Accomplish some task
 - The name should tell you what it does
- A method can call other methods to do some of the work
 - Procedural decomposition
- We shouldn't copy code between methods
 - We should make general methods that are reusable
- A method should be in the class that has the data the method is working on

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Where the last two methods general?

- We specified the file to copy from in the method
 - Meaning we would need to change the method
 - or make another method
 - to copy a different picture

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General Copy Algorithm

- Create a method that copies pixels from a passed source picture
 - Giving a start x and y and end x and y for the source picture
 - If the start x and y and end x and y cover the entire picture then the whole picture will be copied
 - If the start x and y and end x and y are part of the picture then cropping will occur
 - To the current picture object with a target start x and target start y
 - If the start x and y are 0 then it copies to the upper left corner

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General Copy Algorithm

- Loop through the x values between xStart and xEnd
- Loop through the y values between yStart and yEnd
- Get the pixel from the source picture for the current x and y values
 - Get the pixel from the target picture for the targetStartX + x and targetStartY + y values
 - Set the color in the target pixel to the color in the source pixel

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General Copy Method

```
public void copy(Picture sourcePicture, int startX, int startY,
                int endX, int endY, int targetStartX, int targetStartY)
{
    Pixel sourcePixel = null;
    Pixel targetPixel = null;

    // loop through the x values
    for (int x = startX, tx = targetStartX;
         x < endX;
         x++, tx++)
    {
        // loop through the y values
        for (int y = startY, ty = targetStartY;
             y < endY;
             y++, ty++)
        {
```

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General Copy Method - Continued

```
        // copy the source color to the target color
        sourcePixel = sourcePicture.getPixel(x,y);
        targetPixel = this.getPixel(tx,ty);
        targetPixel.setColor(sourcePixel.getColor());
    }
}
```

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Rewrite Methods Exercise

- Type the copy method in Picture.java
- Rewrite copyKatie() and copyKatiesFace() methods to use the new copy method
- Run the methods to make sure they still work



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Summary

- To copy part of one picture to another
 - Change the start and end conditions in the for loop
- A good method should do one and only one thing
- Use parameters to make methods more reusable
- Don't copy code from one method to another
 - Create a general method instead
 - And call the general method from other methods

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