Opening Exercise

Write a method that turns pixels with an average intensity less than 85 to **GREEN**, pixels with an average intensity less than 170 to **RED**, and all other pixels to **BLUE**.
public void exercise01()
{
    for ( Pixel p : this.getPixels() )
    {
        double averageIntensity = p.getAverage();
        if ( averageIntensity < 85 )
            p.setColor( Color.green );
        if ( averageIntensity < 170 )
            p.setColor( Color.red );
        if ( averageIntensity < 256 )
            p.setColor( Color.blue );
    }
}
Guarded Action

manipulate a pixel
only if
it satisfies a particular condition

the if statement

if ( condition is true )
take the action
Alternative Action

Idea

manipulate a pixel

in one way
if it satisfies a particular condition
or in another way
if it satisfies a particular condition
Alternative Action

Implementation

the if-else statement

if ( condition is true )
    take one action
else
    take the other action
Range Selection

Using nested if-else statements to find ranges:

```python
if ( value is in the first range )
    take the first action
else if ( value is in the second range )
    take the second action
...
else
    take the final action
```
One Hallmark of Good Design

"When making a design choice, always have at least two alternatives. That way, you can at least know that you are not doing the worst possible thing."

— paraphrased from Kent Beck
Finding Objects in Images

Boundaries appear when neighboring pixels have very different colors.

This is the task of edge detection.
An Application of Edge Detection

computer vision
Boolean Conditions

\[
\text{if ( condition is true ) ...}
\]

simple boolean expression
\[
\begin{align*}
x &< y \\
p.\text{colorDistance}(\text{epsilon})
\end{align*}
\]

conjunction (and)
\[
\begin{align*}
x &< y \\
&\& \\
p.\text{colorDistance}(\text{epsilon})
\end{align*}
\]

disjunction (or)
\[
\begin{align*}
x &< y \\
| | \\
p.\text{colorDistance}(\text{epsilon})
\end{align*}
\]
Homework 2

What are the high-level operations?
• insert the image
• draw a box (several times)
  • draw a horizontal line
  • draw a vertical line

Design your solution in this way:
• create an empty method for each operation
• design, implement, and test each method one at a time