

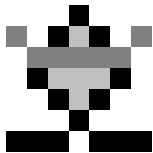
Homework #2

Learning Objectives:

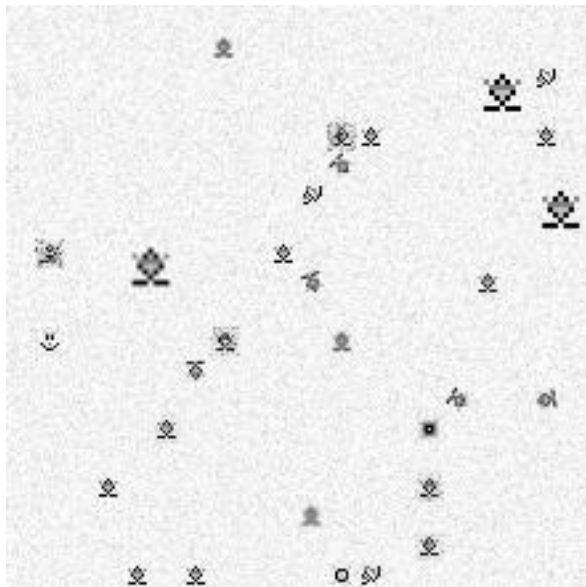
- Reinforce basic programming principles
- Manipulating and interpreting images using computer vision principles

Problem 1: Computer Vision - Where's Waldo? (45 points) - Individual

Meet Waldo.



Waldo, as you may be aware, frequently hides, and we need to find him. Your job is to create a program which will automatically locate Waldo (and his doppelgangers) in images such as this:



Each image contains the following kinds of Waldos:

- 5 exact copies
- 4 blurred copies
- 7 copies with noise added
- 5 rotated copies
- 1 double size copy
- 2 double size blurred copies

In addition every image will contain 6 non-Waldos, such as the smiley face above. Note that the white pixels in the Waldo image are not considered part of Waldo. That is, they will not generally be white for the exact match Waldos.

Your program must read the input image and write the results to a file called "waldo.txt". This file must contain one line for each Waldo identified. Each line must contain the first index of the image, a space, and then the second index, followed by a newline. For example:

```
13 47
78 13
107 33
```

Your numbers need to be within 3 pixels of the center of the waldo for the normal size Waldos and 5 pixels for the 2x size Waldos. You can output decimal numbers if you'd like. Note that In our convention, images are indexed (x,y) starting from the upper-left corner, with x increasing to the right, and y increasing downward. Be careful, as this is different from matrices, which are indexed (y,x)!

Grading:

Your assignment will be graded as follows:

- 22.5 points: Find at least one Waldo
- 35 points: Find all 5 exact copies
- 37.5 points: Find all 5 exact copies, plus any one other
- 40 points: Find all 5 exact copies, plus one from any two other types
- 45 points: Find all Waldos of 3 types
- -2 points per inaccurate position reported (min score 0)

Your code will be run on three different maps and your grade will be the average score of the three runs. There are several sample pictures on Moodle as well as Waldo himself.

Deliverables:

- Your commented source code in the Moodle dropbox as well as any supplementary files your program needs

Lab 1 - Rube Goldberg Machine (55 points) - Group

Complete Lab 1, your Rube Goldberg machine, per the lab sheet on Moodle.