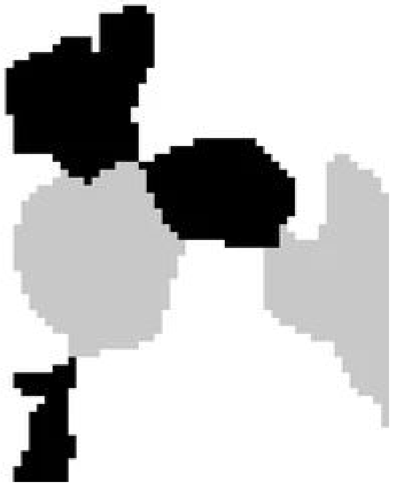
Python: Offline Coding Exercise

Write API (a function or a collection of classes - design decisions are up to you as long as the code is clean, readable, maintainable, and reasonably memory- and CPU-efficient) to count number of coloured areas in an image. Then write an application that would use your API.

Input: a grey-scale image represented as a 2-dimensional array of unsigned bytes.

Output: array of 256 unsigned int numbers, each of them being a count of areas coloured with the corresponding shade of grey.

For example, the image below has 2 white areas, 3 black areas, and 2 grey areas (with value 200), i.e. the output array A will have all its elements set to 0, except A[0] that will be set to 3, A[255] will be 2, and A[200] will be 2.



The implementation should be in Python. However, if you're not familiar with Python, but can provide a solution in C++ that will also be acceptable. If submitting in C++, please send us compilation scripts or build instructions. All submissions should be able to be built/run on a linux system.

You can use common libraries (e.g. numpy or STL) for input, output, and generic operations on containers for common operations, but you need to implement the algorithm itself on your own.

We should be able to run your code as following, with text output on stdout:

```
count-areas <input-filename> --shape <height>,<width>
```

Where input file is a binary representation of 2D unsigned char array and the output to stdout is 256 numbers corresponding to the area counts for pixel values 0, 1, ..., 255

For example, for the sample image **sample.bin** (follow hyperlink):

```
> count-areas sample.bin --shape 256,256
3
0
...
2
...
0
2
```

Your submission will be assessed on code cleanliness, it’s readability, maintainability, and whether it’s reasonably memory- and CPU-efficient. It will also be assessed on how well it adheres to the submission requirements specified above.