As we said, in order to be able to use the prefabricated tiles while constructing the output image, we look at the individual tiles and check whether it is similar to any prefabricated tile. If so, we replace it.

We define similarity by comparing two tiles by their pixels.

Take 10x10 tile which we want to replace it with prefabricated tile.

======================== **Before Loosening Similarity** =======================

1. After flattening the 10x10 tile, we get list of 100 pixels, first 50 pixels correspond to upper part of tile, last 50 pixels correspond to lower part.

In order for tile to be similar to **half-up black prefabricated tile** (****) we have to have **at least** 40 black pixels on upper part, and 40 white pixels on lower part

1. In order for tile to be similar to **half-down black prefabricated tile** () we have to have **at least** 40 black pixels on lower part, and 40 white pixels on upper part
2. In order for tile to be similar to **half-left black prefabricated tile** () we have to have **at least** 40 black pixels on left part of tile, and 40 white pixels on right part.
3. In order for tile to be similar to **half-right black prefabricated tile** () we have to have **at least** 40 black pixels on left right of tile, and 40 white pixels on left part.
4. In order for tile to be similar to **line-middle prefabricated tile** () we have to have

**at least** 30 black pixels between interval of 30th and 70th pixels of tile

1. In order for tile to be similar to **line-straight prefabricated tile** () we have to have **at least** 30 black pixels between interval of

[3-7 ∩ 13-17 ∩ 23-27 ∩ 33-37 ∩ 43-47 ∩ 53-57 ∩ 63-67 ∩ 73-77 ∩ 83-87 ∩ 93-97]

1. In order for tile to be similar to **white prefabricated tile** () we have to have at **least 90** white pixels in whole tile.
2. In order for tile to be similar to **black prefabricated tile** () we have to have at **least 90** black pixels in whole tile.

Using similarity conditions of above, we achieved:

**3x** line-middle prefab usage

**2x** half-up black prefab usage

**1x** half-left black prefab usage

Text

Description automatically generated

========================== **After Loosening Similarity** =======================

1. loosen **half-up black prefabricated tile** (****) similarity condition

from 40 pixels ---> to 30 pixels

1. loosen **half-down black prefabricated tile** () similarity condition

from 40 pixels ---> to 30 pixels

1. loosen **half-left black prefabricated tile** () similarity condition

from 40 pixels ---> to 30 pixels

1. loosen **half-right black prefabricated tile** () similarity condition

from 40 pixels ---> to 30 pixels

1. loosening similarity conditions for line-middle prefabricated tile (), line-straight prefabricated tile (), white prefabricated tile (), black prefabricated tile () didn’t help to achieve better image reconstruction.

Using loosened similarity conditions of above, we achieved:

**3x** line-middle prefab usage

**5x** half-up black prefab usage

**4x** half-left black prefab usage

**2x** half-down black prefab usage

**3x** half-right black prefab usage

Text

Description automatically generated

================================== **Conclusion** =============================

As a result of loosening the similarity condition, we achieved to have $29,600 net profit compared to $18,600. Santa image reconstruction before and after loosening is as below:

A picture containing diagram

Description automatically generated before A picture containing diagram

Description automatically generated after

Comparing two images, we see that the right eye, bottom borders of beard, upper borders of hat and its tail, right and left border of face have been approximated by prefabricated tails.