IN5520 Mandatory 2

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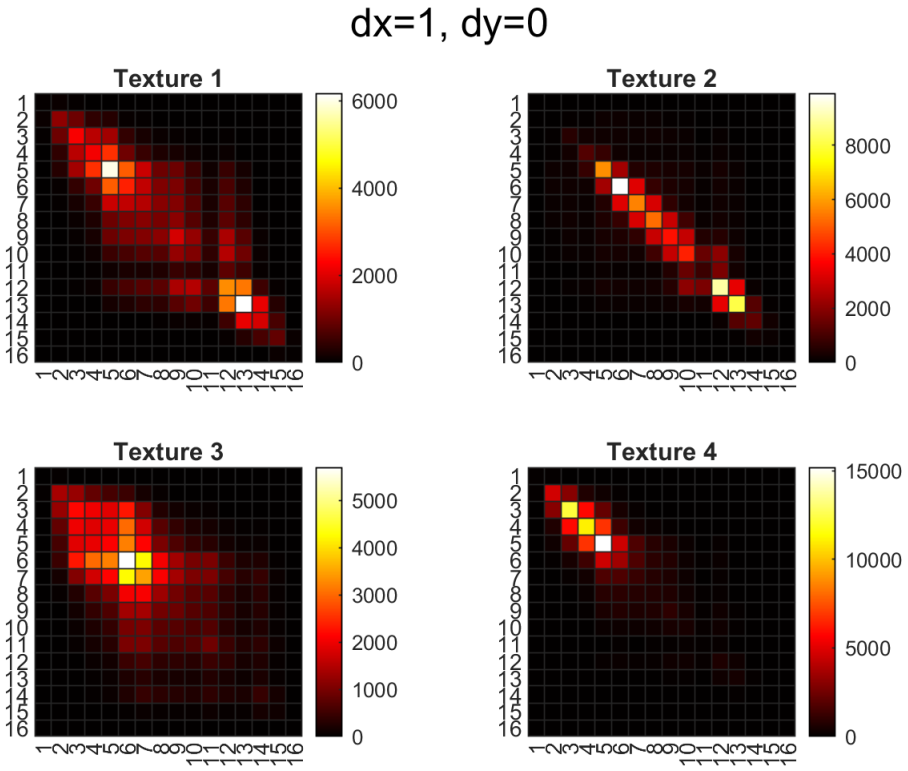
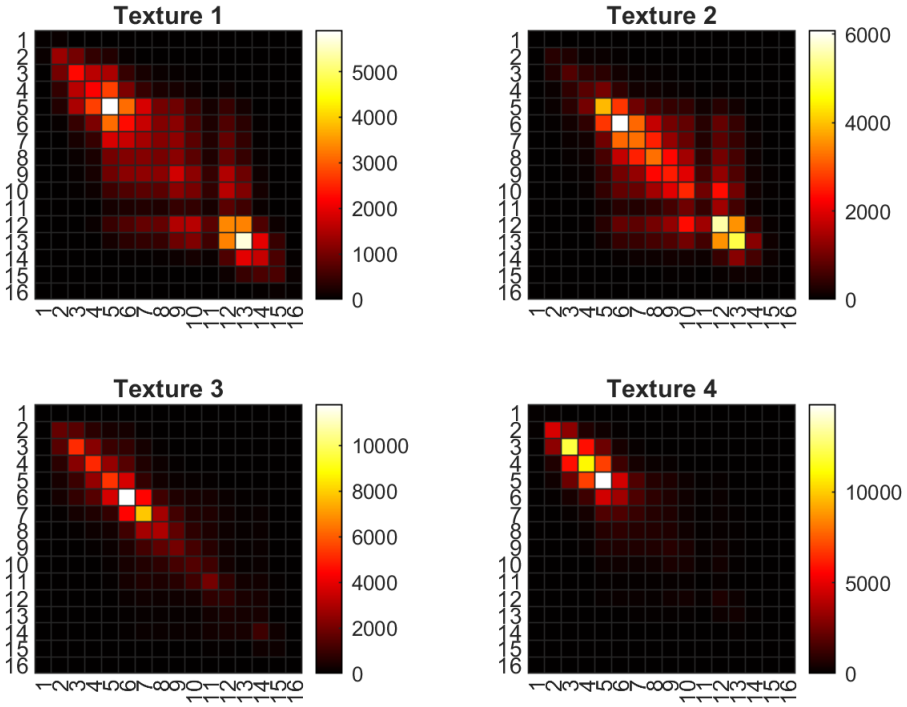
November 12, 2021

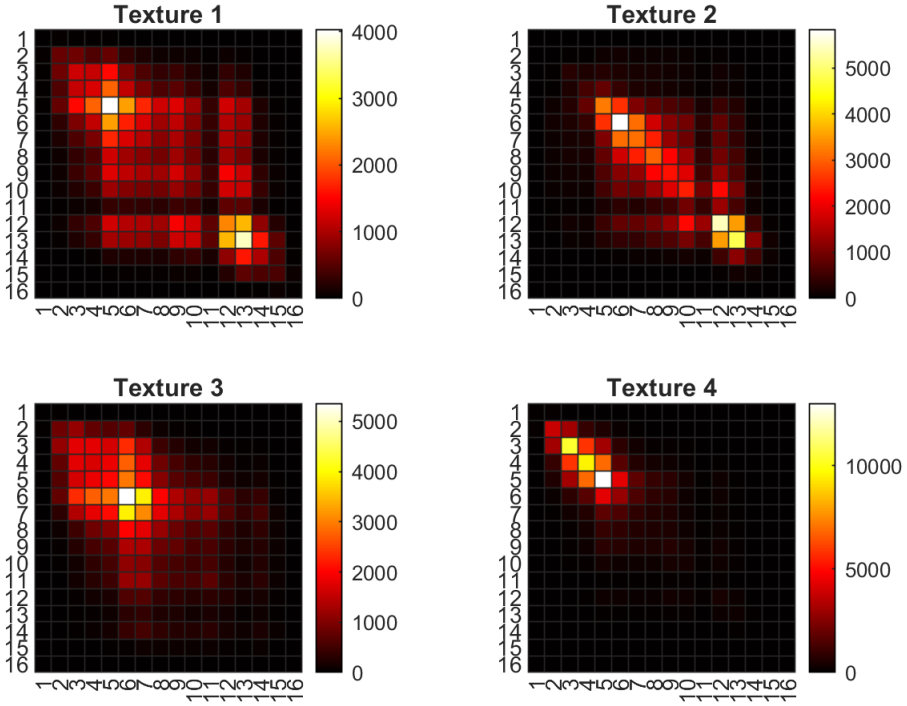
Task 1)
Plots of the glcms of the 4 textures for each direction:

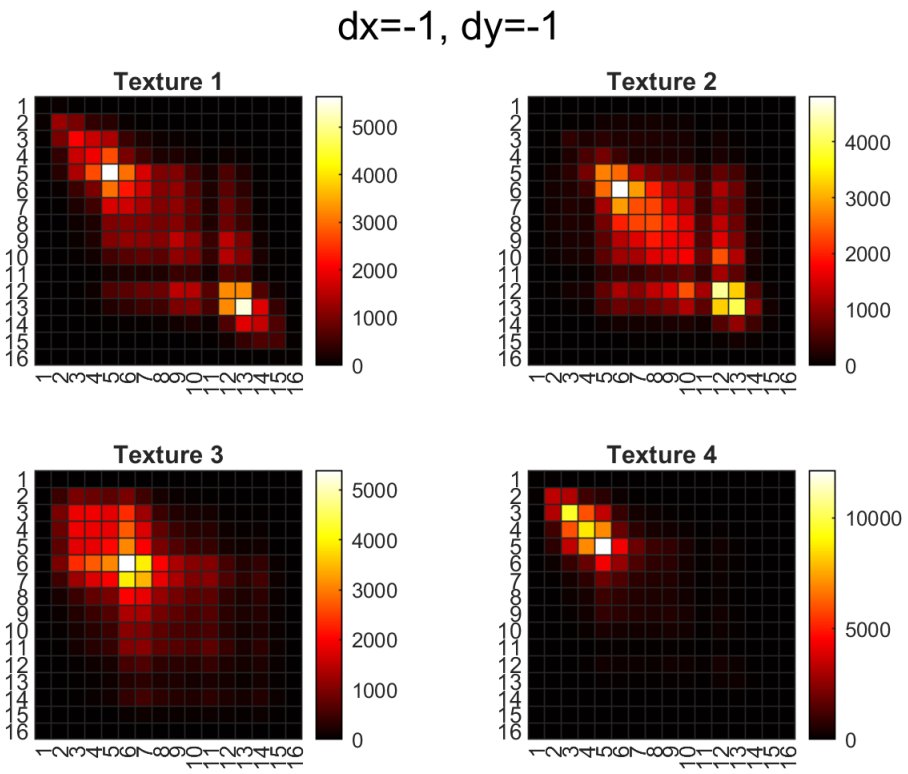


dx=0, dy=-1



dx=1, dy=-1





I don't think one direction will be enough to discriminate between all the textures. Because for all the directions at least two of the textures have very similar glcms.
Therefore i will chose two directions. As for which directions, i think dx=1,dy=0 and dx=0,dy=-1 will give a good chance for differentiating the textures.
Because each pair of textures are different in at least one direction.
(for convenience i will from now on call dx=1,dy=0 for d1. And dx=0,dy=-1 for d2)
e.g. texture 1 and 4 are different in both d1 and d2. But texture 1 and 2 are different in d1 but quite similar in d2.
Also texture 2 and 3 are quite different from themselves when comparing d1 and d2.
These differences between d1 and d2 should give us a lot of good information to give the classifier.

Task 2)

Based on the glcms produced by d1 and d2. We see that texture 1 and 2 has most of their energy split between Q1 and Q4, for d1 and d2.
While texture 3 and 4 has most of theirs in just Q1, again for d1 and d2.
Furthermore, texture 1 has some energy in Q2 and Q3 for both d1 and d2.
As for texture 2, is also has some energy in Q2 and Q3 for d2. But for d1 it has almost no energy in Q2 and Q3.
A similar relation is also true for textures 3 and 4.
Texture 3 has some energy in Q2, Q3 and Q4 (still most in Q1) for d1. And also a tiny amount for d2 as well. Texture 4 on the other hand appears to have no energy at all for Q2, Q3 and Q4 for both d1 and q2.

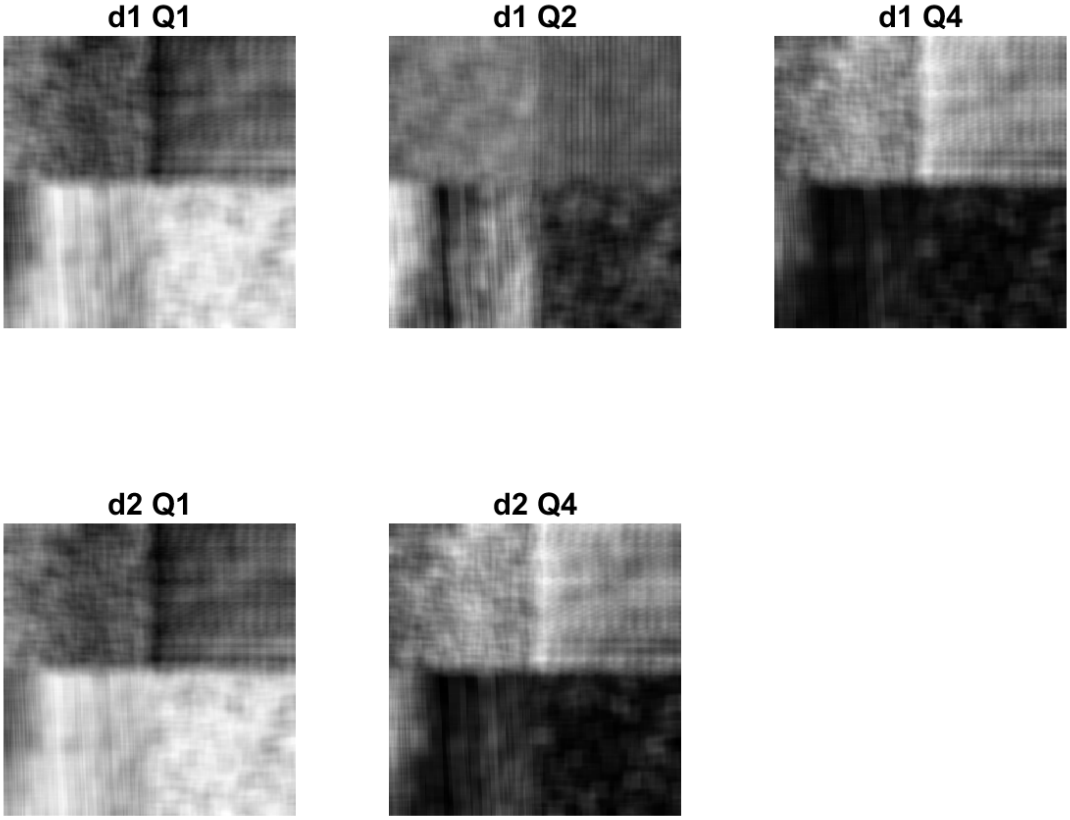
Therefore, we can use Q1 and Q4 for d1 and d2 (+4 quadrants total), to separate texture 1 and 2 from texture 3 and 4.
Then we may use Q2 and Q3 for d1 (+2 quadrant total) to separate texture 1 from 2.
We may then use Q2, Q3 and Q4 for d1, and possibly Q4 for d2
(+0 quadrants total as all are already used) to separate texture 3 from 4.
We can also make the observation that since the glcms are by inherently symmetric, Q2 and Q3 for the same angle will always be equal. We can therfore choose to ignore all Q3 values an use just Q2.

We should therefore look closer at, Q1, Q2, Q4 for d1, and Q1, Q4 for d2. As features for discriminating between all 4 textures.

Task 3)

Se 'task3.m' and 'computequadrants.m' for how glcms and quadrants are computed, as well as plotting of the feature images. If you wish to run this code you can skip the computation of the glcms by running the load glcms part instead.

The following feature images was produced:



We see Q1 for d1 and d2 are strongly correlated. The same seems to hold for Q4.
It also seems that Q1 and Q4 are negatively correlated.
Q2 for d1 seems to have good separation between classes.
Seeing this i choose feature vector $[d1Q1, d1Q2]$

Taks 4)