Thinking about it (6)

Now, **answer the following question:**

- **Compare the invariance of each feature in the feature vector** and **comment why it is invariant or not to rotation and scale.**

  The feature vector has this shape: [`max_prob`, `energy`, `entropy`, `moments` (optional)]. Apart from central moment 1 (which always takes the value 1), no feature is equal to no other. Nevertheless, the max_prob, energy and entropy of the rotated image are quite similar to the original one, as those features do not depend on orientation. When scaling, they are quite different because of the creation of new pixels to scale the original image (those values depend on how many pixels there are). And, regarding central moments, they just change as we have discussed previously.

Conclusion

Awesome! This was a laborious and dense notebook, but you carried it through to the end!

In this notebook you have learned:

- how to compute non-central, central, scale-invariant and Hu moments for describing a region, and apply them to the plate number recognition problem.

- how to describe textures using 1D moments of the histogram and co-ocurrence matrices, using them in the context of the state identification problem.

Extra

Usually, the co-ocurrence matrices **of the image rotated** 45, 90, and 135 degrees are also calculated. **What do you think this is due to?**

*The reason for calculating the co-occurrence matrices at different angles (45°, 90°, and 135°) is to **capture the directional texture information in the image**. Textures often have orientation patterns, and analyzing them at multiple angles allows for a more comprehensive description of these patterns.*

Implement this new procedure for co-ocurrence matrices and then, check again the invariances. **What happened?**