# TP-2

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Work done individually

**Note**: Used RBG histogram to model the region of interest and Bhattacharyya distance for similarity index

1. **Présentez votre implémentation en discutant des forces et des faiblesses de cette approche** (Introduce your implementation by discussing the strengths and weaknesses of this approach)

The algorithm implemented in this assignment is a simple version of Condensation (conditional density propagation) Algorithm. Kalman Filter wasn't sufficient in tracking objects when there is clutter. This algorithm works even in multimodal environment and it is also computationally less expensive. In my I took RGB histogram to model the region and Bhattacharrya distance to calculate the similarity index.

The first part of code contains initializations, and some parameter which can be changed depending on the video. Then each frame is taken and then each sample is considered and the corresponding similarity index is calculated. The maximum similarity index is taken as the new bounding box for region. Then from of present sample set we need select few particles from which we can propagate in the next step. They are chosen using 'randsample()' function in statistics toolbox. Then these selected particles are drifted or modified to a new position. This goes on iteratively.

The strength of this implementation is that it is not computationally intensive. Weakness of this implementation is that it the updating function could be more modified where we could have be tter spread of particles. As described in paper ,we could implement an updating mechanism where the previous steps behaviour is considered. Also better similarity index could be used. Also this implementation doesn't consider rotation of object.

2. **Discutez l'effet de la quantification de l'histogramme de la partie suivie, le nombre d'échantillons utilisé ainsi que l'effet de la modification des dimensions de la région d'intérêt sur la qualité du suivi.** (Discuss the effect of the quantization of the histogram of the part followed by the number of samples used and the effect of changing the region of interest on dimensions quality monitoring)

The number of bins in the Histogram affects the similarity index. We should have it an average value. By having all the 256 bins not only makes it computationally intensive but also overfits the data. Too low value also is bad as it doesn't have sufficient information. So I

used 16 bins, we could increase it for better performance, but we have to be careful not to over fit the data.

The dimensions of the bounding box play a major role on the accuracy of the algorithm. In this algorithm we had taken a rectangle, but the performance can be increased if the shape of bounding figure is similar to the object to be tracked. Also we should see that the bounding box doesn't have too much information about thing that are not of interest. Also it shouldn't be to small s that the information is less.

By increasing the number of samples mostly increases accuracy , but it makes the algorithm computationallyintensive. By increasing the sample set we are increasing more possibilities and hence there is better chance of matching.

3. **Finalement, proposez une amélioration possible à cet algorithme de base qui pourrait, selon vous, améliorer la précision du suivi.**(Finally, suggest a possible improvement in this basic algorithm which could, in you improve tracking accuracy.)

In general extension of Condensation Algorithm would be multiple object tracking . In our scenario there are many possibilities of improving. The first thing would be the updating strategy. It can be made more efficient by learning from its previous iterations. In present we just taking randomly some values which are nearby, but we can improve this by detecting the direction of change and the speed of change. This will greatly reduce the no of samples to taken and considerably decrease computation.

In our algorithm we had taken initial region of interest and always used the similarity index to find with respect to that one. But there will be cases in which the face can be turned, in which we could lose the object, so we can tackle these by having a set of region of interest or by taking the previous best tracked portion as the region of interest for next iteration.

**References and Sources**: Lecture Notes, Wikipedia, Matlab Documentation