Assignment–5

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Purpose:

To perform Pattern recognition using K-means and Nearest Neighbors algorithm on a given input image. To perform Motion Compensation and Tracking of given playframes.

Method and Outputs:

1. Dividing the upper part of input image in 4x4 blocks and the average of each block is calculated, and the average is used to give class labels like 0, 128,255.

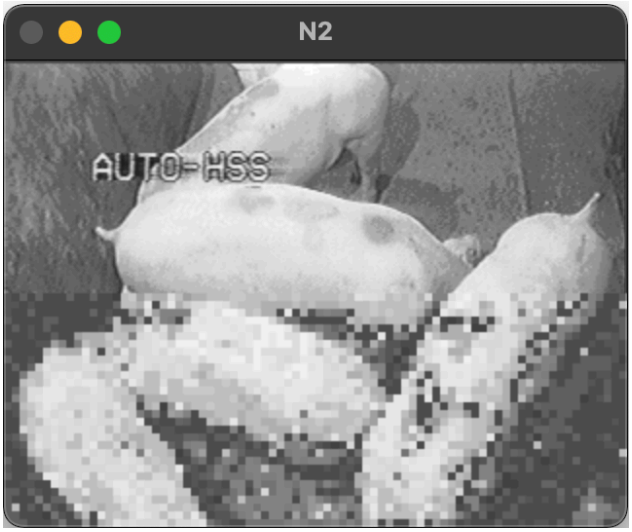
2. N1 is generated by applying the similar algorithm for in calculating M1 but for the lower part of the image. The class label is applied differently by taking squared distance between two pixels and divide it by sum of all the pixels in each block and taking square root of it will be compared with the labels to assign a label to each block. N2 is generated by applying the similar algorithm in but instead of considering the class label, training vector is used. N3 is generated using testing vector. N4 is generated by considering block by block average along with class label.

3. T1 is generated similarly like M1 but for the bottom half of the image.

4. K1 is generated by applying k-means algorithm where randomly we will select centroids for the cluster from the image and find the pixel distances from the centroids and then assign the points to the cluster with the minimum distance to its centroid. We will then again calculate new centroids by taking average of all the points in each cluster. Repeating the above steps until the cluster's centroids are constant, we can get K1 image.

The error rate considering T1 and K-means image is 64.25%


N1
AUTO-HSS


N2
AUTO-HSS

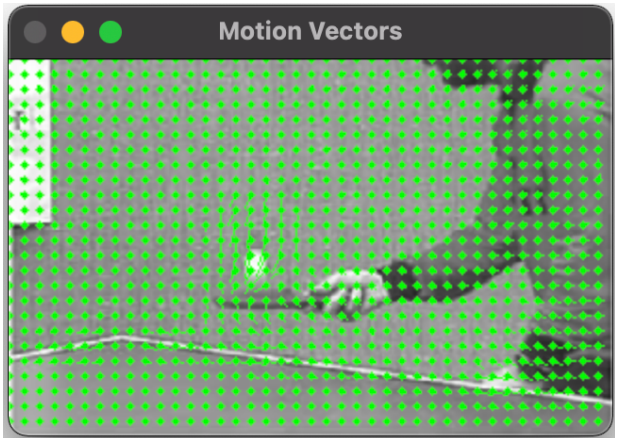

N3
AUTO-HSS


N4
AUTO-HSS


T1
AUTO-HSS


K-means
AUTO-HSS

5. Motion vectors are being generated by drawing optical flow between two images by connecting the lines of each circle drawn for every group of pixels and the motion vectors can be generated from the frames as following. For generating previous and next frames calcOpticalFlowFarneback method is used from Opencv.



6. Absolute Difference between two frames are shown Below:

7. compensated difference of the two frames:

Steps to compile and run:
1. Go to the ***Assignment-4*** directory and then go to the ***programs*** subdirectory:
2. **g++ $(pkg-config --cflags --libs opencv4) -std=c++11 main.cpp -o main**
3 **./main**

References:
For Motion Estimation and optical flow:
1. https://funvision.blogspot.com/2016/02/opencv-31-tutorial-optical-flow.html