Abstract:

The project aims to synchronize two or more videos that are taken on the same spatial location which may or may not be temporally synchronized. The non-linear behavior of video creation leads to the problem of inefficient synchronization of videos even using the existing, standard algorithms. We devise a cost matrix between two videos and generate the lowest-cost path which gives maximum synchronization. The videos are then padded to generate the synchronized videos for output.

Project:

The project is divided into 5 divisions:

1. Generating Frames from the videos and computing the keypoints for each of them.
2. Mapping features from one video to another using nearest neighbor algorithm implemented over KD-Tree.
3. Generating the cost matrix which gives the cost of synchronizing any two frames of the two videos.
4. Finding the shortest path in the cost matrix using modified Dijkstra’s algorithm.
5. Padding the videos appropriately to generate the two synchronized videos.

Observation:

1. The algorithm works accurately when the videos are in high quality or have sharp features.
2. The algorithm has been tested for robustness by applying on mobile camera feeds.
3. The algorithm interpolates when the shortest path is not clearly visible in the cost matrix because of its modified dijkstra’s algorithm.

Conclusion and future work:

1. Obtained a great insight in the field of Computer Graphics and Video Processing from a beginners of view.
2. Keypoints computation and KD-Tree clustering gave a good hand-on experience on OpenCV library.
3. The algorithm takes a considerable amount of in processing videos. We plan on making use of GPU to minimize this time cost.
4. The algorithm pads the frames into the videos which increases the size. We intend to create an intelligent algorithm that adds / removes frames, appropriately.
5. The algorithm faces some glitches for noisy videos which can be further be explored and improved.

References:

1. Wang, Oliver, et al. "Videosnapping: Interactive synchronization of multiple videos." *ACM Transactions on Graphics (TOG)* 33.4 (2014): 77.
2. Agarwala, Aseem, et al. "Panoramic video textures." *ACM Transactions on Graphics (TOG)*. Vol. 24. No. 3. ACM, 2005.
3. Caspi, Yaron, and Michal Irani. "Spatio-temporal alignment of sequences."*Pattern Analysis and Machine Intelligence, IEEE Transactions on* 24.11 (2002): 1409-1424.

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