Project Title:
FriendBlend

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Description:

The goal of the project is to allow two users to take a photo of themselves as if a third party were present to take a photo for them. This can be done by taking two separate photos and merging them. Suppose there are two people involved, Person A and Person B. Person A first takes a photo of person B, and then they swap positions and Person B takes a photo of Person A (with the same background as used in the previous photo). Next, the two photos are merged together so that both Person A and Person B are present in the same picture, as if someone else had taken a picture of both of them together.

The algorithm involves feature detection, facial detection, image registration, image segmentation, and color correction. The first image with only Person A, which we call image A, serves as the reference image for color and registration. In order to perform image registration, we will extract keypoints (such as SIFT features) from each image and then match the keypoints of each image with each other. In this process, we will also discard keypoints if matching keypoints cannot be found. Once we have found pairs of corresponding keypoints, we can compute a transformation matrix using least squares. We can select a few keypoints to construct the transformation matrix and then evaluate the quality of the transformation using RANSAC. This process will align the two images.

The first algorithm to run on image B is face detection. If a face is detected, we segment the person's body using a Poisson equation with Dirichlet boundary conditions as described in [1]. Otherwise, we will use a difference image and perform erosion-based techniques to determine a confident estimation to segment Person B and then perhaps use region-growing techniques to fully segment Person B. We then color correct segmented Person B and place Person B in Image A.

As an extension of our project, if we are successful with two images, is to extend the concept to an arbitrary number of images. Applications of this include creating panoramas that are arbitrary shape and for multiple poses of the same person within an image.

We plan to develop and test the algorithm in MATLAB with OpenCV. Then, we will port our algorithm so Android with OpenCV and test our software on the following devices: the HTC One, NVIDIA Shield, and Motorola Droid Turbo.

References (at least 3):

[1] FARBMAN, Z., HOFFER, G., LIPMAN, Y., COHEN-OR, D., AND LISCHINSKI, D. 2009. Coordinates for instant image cloning. ACM Transactions on Graphics 28, 3 (Aug.), 67.

[2] PÉREZ P., GANGNET M., BLAKE A.: Poisson image editing. TOG (SIGGRAPH '03) 22 (2003), 313–318.

[3] SCHWARTZ W., KEMBHAVI A., HARWOOD D., DAVID L.: Human Detection Using Partial Least Squares Analysis. Proc. IEEE Int'l Conf. Computer Vision, 2009.