Virtual Graffiti (*name subject to change)*
(using Android device)

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Project Description:
The goal of this project is produce an augmented reality system where a user may select some distinguishable, flat, rectangular, mostly uniform-colored object (e.g. a piece of paper) in a live video feed and overlay a desired image onto that selected surface.

Motivation:
This project has uses in previewing images as they might appear on a surface such as a piece of paper, a poster, a billboard, etc. It can also used as an aid for aspiring artists to learn the basics of drawing, as they can overlay a selected image on a piece of paper and trace its outline--especially if the image has been passed through an edge detector.

Methods:
To initially identify the flat surface, we will use the Android device's touch screen capability to allow the user to make a selection on the live feed. The flat object will be segmented using color thresholding and then isolated using a connected components algorithm.

The user selects an image from their personal library to transform and overlay onto the surface.

The next step is to determine the homography transform from the original (rectangular) image to the rectangular surface of interest. This will be calculated by first locating the corners of the surface with a Harris corner detector [3] and then calculating the homography from the image to the found corners using OpenCV.

Once this is complete, we perform the transformation and overlay the user-selected image onto the live feed.

To handle the camera/phone movement, we will use object tracking (KLT feature tracker [1,2]) to keep track of the region containing the surface so as to maintain correct region thresholding and keep the image overlaid in the correct location.

Possible Extensions:
Possible extensions to this project include: expanding the transformation to other types of surfaces, utilizing different image segments and overlaying textures to more general surfaces (not necessarily rectangular), or simply overlaying colors on different image segments to preview paint colors.

References:

[1] Bruce D. Lucas and Takeo Kanade. An Iterative Image Registration Technique with an Application to Stereo Vision. International Joint Conference on Artificial Intelligence, pages 674-679, 1981.

[2] Carlo Tomasi and Takeo Kanade. Detection and Tracking of Point Features. Carnegie Mellon University Technical Report CMU-CS-91-132, April 1991.

[3] Harris, Chris, and Mike Stephens. "A combined corner and edge detector." Alvey vision conference. Vol. 15. 1988.

[4] Jianbo Shi and Carlo Tomasi. Good Features to Track. IEEE Conference on Computer Vision and Pattern Recognition, pages 593-600, 1994.