Virtual Studio

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Problem

The aim of our project was to place the object/person in front of a green screen in a known 3-D environment in realtime.

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2. Apply a Light mask to prevent the color bleeding
3. Find a homography, to place the person in a known 3-D environment.
4. Apply this homography, to generate the final result.

Chroma Keying

Chroma keying, is a visual effects technique for compositing (layering) two images or video streams together based on color hues (chroma range).[1]

Algorithm 1 Pseudocode for Segmentation

Input: Green-Screen frame, high and low thresholds

Output: Mask

Apply Bilateral filter to remove noise, while keeping the edges.
Convert the image to YCrCb color scheme
for *each pixel p* **do**
    $\alpha \leftarrow \sqrt{(Cr_p - Cr_{key})^2 + (Cb_p - Cb_{key})^2}$
    if $\alpha < low$ **then**
        $mask(p) \leftarrow 0.0$ (background)
    else if $\alpha > high$ **then**
        $mask(p) \leftarrow 1.0$ (foreground)
    else
        $mask(p) \leftarrow \frac{\alpha - low}{high - low}$
    end if
end for

Erode away the boundaries of foreground object

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- This mask is multiplied element-wise with the environment video.

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- To solve this we obtain a edge light mask from the matte obtained by Chroma Keying.
- This mask is multiplied element-wise with the environment video.
- Finally we blend this with the keyed video and the environment to get the final result.

Homography and Projection

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- We calculate a homography between the segmented image and a plane on which we need to project.
- Apply the Homography to get the final result.

Demo

References

[1] Wikipedia. Chroma key — wikipedia, the free encyclopedia, 2017. [Online; accessed 10-November-2017].