

Real-time Virtual Lighting

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Abstract -

During a time of increase in video conferencing, getting a correct lighting condition at any time of the day is a very common problem faced by all of us. We propose a virtual lighting system that can segment 3D details from a scene(esp. face) and relight a face/video with virtual systems like Skyboxes/virtual point or directional lights. The benefit of such a system would be pivotal in increasing the quality and realism of video conferencing both professionally(laptops) and personally(through phones).

Goals -

1. Face Tracking and 3D segmentation in real-time (with possible pre-processing)
2. Re-lighting Face with Virtual Lights/Skyboxes and overlaying into original image space

Development Environments - OpenCV(with maybe libraries like Vuforia for face tracking) and OpenGL(for virtual lighting) built on Python on Windows/Mac

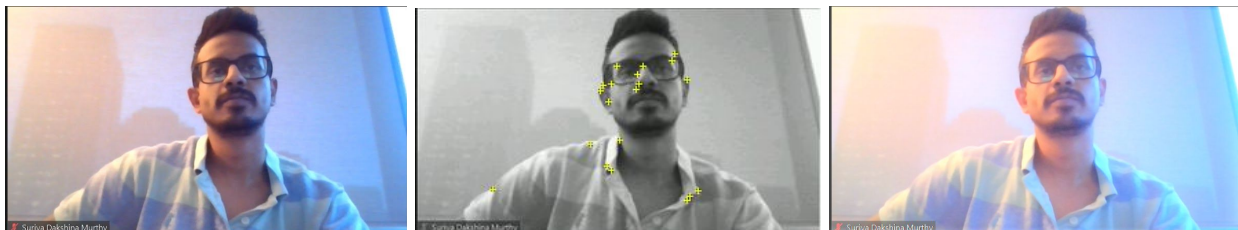
Literature Survey -

1. State-of-the-art in Face Tracking and segmentation and possible use of existing libraries(Vuforia).
2. Real-time Lighting techniques and approximations(using Spherical Harmonics or more recent techniques).
3. Visual Coherence - to blend both of the above seamlessly and possible use of Machine Learning.

Mixed Reality Techniques(To build on Assignment 1&2) -

1. Get the camera calibration matrix from the input video(pre-processing).
2. Get the face tracking features from the input video(pre-processing).
3. Downloading or building skybox examples.
4. Define the lighting for each skybox
5. Project virtual lighting effects on the face or other objects.

Examples (visualized final output) -



Input Frame + Feature Tracking = Image Re-lighting