College of Engineering Chengannur
Department of Computer Engineering
03CS6902 Mini Project
Abstract of Project Proposed
Single Image HDR Imaging Method based on Retinex Filtering

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Abstract

Image degradation is said to occur when a certain image undergoes loss of stored information either due to digitization or conversion (i.e algortithmic operations) or due to decreasing visiual quality. One of the major cause of image degradation is due to undesirable lighting conditions, like low light or over exposure conditions. Images obtained under the low light conditions such as night-time, underwater and medical images and overly exposed conditions undergoes information loss and results in degradation. To improve the quality of such images captured in undesirable illumination conditions, a variety of image enhancement methods have been proposed. But those methods were unable to deal both under and over exposure conditions.

Recently, single image high dynamic range (HDR) imaging method was developed which mimic the process of original HDR imaging technique. It first generates multiple images with different exposure from a single input image and then produce larger bit depth images by combining them or produce tone-mapped-like images by adding them with appropriate weights. But this method only deal with the illumination components of the image and not with reflectance components. Since luminance(L) (light that reaches the eye) is a function of both illumination(I) (light source) and the percentage of that illumination that is reflected off the surface (reflectance(R))(L= I*R), both I and R components are needed to be enhanced inorder to enhance the image. This concept is explained in Retinex Theory.

So as a modification this work proposes a new single image HDR imaging method based on the Retinex filtering scheme, mainly for the purpose of image enhancement under the undesirable illumination conditions. This proposed algorithm is consisted of three steps. The first step is to extract the luminance information(L) from an input RGB image by the RGB to Lab transform, and then to decompose L into illumination (I) and reflectance component (R). Inorder to decompose the I and R components, weighted least square filter (WLSF) is used. The second step is to adjust the reflectance and illumination components seperately. Reflectance component is scaled to improve the details in relatively bright areas. This is performed using selective reflectance scaling (SRS) method. Also for illumination components, this work proposes an algorithm that appropriately scales up and down the components, in order to generate several illumination images that correspond to certain camera exposure values different from the original. This work is performed using a virtual illumination generation (VIG) method. In final third step, a set of new luminance images (L_k) is reconstructed by combining the detail-improved reflectance (R‘) and the set of illumination components (I_k). This work also design appropriate weights (w_k) that contribute to preserve the image details and to enhance brightness in every image area. Finally, the luminance images (L_k) are fused to generate an enhanced one. By adopting tone reproduction process for the final luminance image, result obtained will be a brightness and detail-enhanced image.

References

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Decision: