Date: 02-11-18

PROJECT REPORT

Team: cut-copy-paste

Project Title: Artifact-free High Dynamic Range Imaging for Dynamic Scenes using Robust Patch-Based HDR Reconstruction

Overview:

Given - Input LDR Images, along with exposure times -> $\{L_1, L_2, \ldots L_N\}$

Assumptions - Select a reference image $\{L_{ref}\}$ out of the stack of the input images (usually, the middle one in the stack is selected).

Algorithm -

Algorithm 1 Patch-based HDR image reconstruction algorithm

Input: unregistered LDR sources $L_1, \ldots, L_N$ and reference L_{ref}
Output: HDR image H, and "aligned" LDR images $I_1, \ldots, I_N$

Initialize: $\{I_1, \ldots, I_N\} \leftarrow \{g^1(L_{\text{ref}}), \ldots, g^N(L_{\text{ref}})\}$
for all scales s **do**
  for all optimization iterations **do**
    / Stage 1 – optimize for $I_1, \ldots, I_N$ in Eq. 4 */*
    for exposure $k = 1$ to $N, k \neq$ ref **do**
      $I_k \leftarrow \text{SearchVote}(I_k \mid g^k(L_1), \ldots, g^k(L_N))$
      $I_k \leftarrow \text{Blend}(I_k, l^k(H))$
    end for
    / Stage 2 – optimize for H in Eq. 4 */*
    $\tilde{H} \leftarrow \text{HDRmerge}(I_1, \ldots, I_N)$ [Eq. 5]
    $H \leftarrow \text{AlphaBlend}(h(L_{\text{ref}}), \tilde{H})$ [Eq. 6]
    / extract the new image targets for the next iteration */*
    $\{I_1, \ldots, I_N\} \leftarrow \{l^1(H), \ldots, l^N(H)\}$
  end for
end for
return H and $I_1, \ldots, I_N$

Current Status:

→ Pre-processed the images, with gamma correction (given:2.2(paper))

→ Initialised the first set of aligned images of input LDRs by the LDR to HDR and HDR to LDR mappings.

→ Implemented the Stage-1 of the Optimiser algorithm given above.

  → Implemented Search and Vote on the targets.

  → Update the aligned images to the output of the above voting process done after the completeness and coherency search.

→ This process is continued for all the input LDR exposures.

Output: We end up with Aligned LDR images which are yet to be merged and this has to be computed on a multi-scale level (assumed 1 scale for now)

Results:

Reference LDR image:

Aligned less exposure LDR image

Aligned high exposure LDR image

Milestones:

> Implementation of HDR Merge
> Extension to multi-scale
> Testing on our own dataset

Challenges:

> Cannot eliminate unwanted artifacts (i.e, noise) if the reference image is noisy, it gets propagated to the final HDR image.
> MBDS (Modified Bi-Directional Search) has limitations with respect to completeness and coherency, we have to tune the parameters properly else there can be additions of implausible artifacts.