DEMO: MOTION-CONSISTENT VIDEO INPAINTING

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Introduction

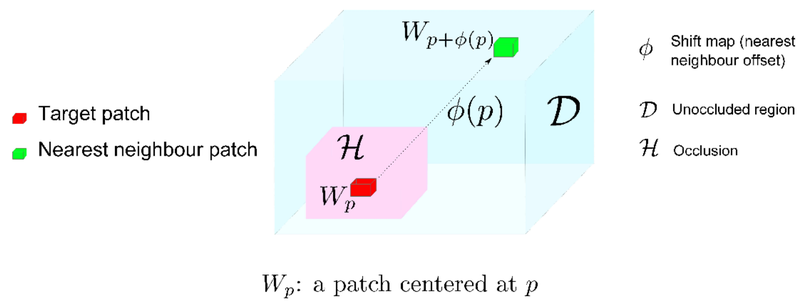
Video inpainting

- Replacing the content of a region in a video with some other content which is visually plausible.
- **Applications:** Video editing, object removal…
- **Challenges:**
  - Moving objects reconstruction
  - Artifact (spatial/temporal incoherence)
  - Long computation times

Proposed method

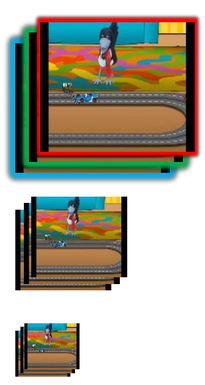
Optimize a global, patch-based function:

$$E(u,\phi) = \sum_{p \in \mathcal{H}} d^2\left(W_p^u, W_{p+\phi(p)}^u\right)$$



W_p: a patch centered at p

Multi-scale



Nearest neighbor search

Find the nearest neighbor field with the following distance:

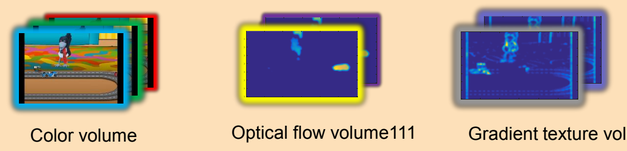
$$d^2\left(W_p^u, W_q^u\right) = \frac{1}{N}\sum_{r \in N_p} \alpha\left(\|u(r) - u(r-p+q)\|_2\right) + \beta\left(\|T(r) - T(r-p+q)\|_2\right) + \gamma\left(\|O(r) - O(r-p+q)\|_2\right)$$

$u = (R,G,B)$ color information

$T = (|T_x|, |T_y|)$ texture information

$O = (|O_x|, |O_y|)$ optical flow information

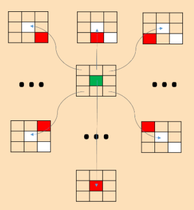
Pixel reconstruction



Weighted-mean based approach

$$u(p) = \frac{\sum_{q \in N_p} s_p^q u\left(p + \phi(q)\right)}{\sum_{q \in N_p} s_p^q}, \forall p \in \mathcal{H}$$

$$s_p^q = exp\left(\frac{d^2\left(W_q, W_{q+\phi(q)}\right)}{2\delta_p^2}\right)\psi_p^q\varphi_p^q$$



φ_p^q: *Separation map*

$$\varphi_p^q = \begin{cases} 1 \text{ if } p \text{ and } q \text{ are of the same type (background /foreground)} \\ 0 \text{ if } p \text{ and } q \text{ are different tyy} \end{cases}$$

ψ_p^q: *Confidence map*

$$\psi_p^q \begin{cases} (1 - Co)\exp\left(-\frac{d(q,\Omega)}{\sigma^2}\right) + C0 \text{ if } x \text{ is occluded} \\ 1 \qquad \text{if } x \text{ is not occluded} \end{cases}$$

$d(q,\Omega)$ *is distance from q to the border*

Intensive use of the optical flow

Coarse initialization

- **Nearest neighbor search** — Optical flow
- **Distance between patches** — Optical flow
- **Patch shape** — Optical flow

Results

+ Moving objects reconstruction
+ Objects removal.

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Site web https://purl.org/vid_inp_motion