Motion Processing

One way to process motion between two image frames in a video is to identify points in one frame and then in the next frame; then, for each point in frame One, find its best match in frame Two, smartly handling collisions and ambiguities.
Video

- A video is a sequence of frames captured over time.
- Now each frame/image is a function of space \((x, y)\) and time \((t)\).
Motion Processing

A second way is to have a definition of motion based on physics and mathematics. Until the past seven years or so, this approach was theoretically nice, but did not work in practice. Since this is an elegant theory, and now is growing in popularity, we present it to you. Here are two frames.
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This figure shows the output expected from the theoretical approach. Let us next understand how 2d motion is modeled.
Basic Setup

\((x, y)\) 

\(I_{t+1}\)
Basic Question

- Where did this point move to in the next image?
Basic Setup

$I^t(x, y)$
Basic Assumption

- Image Brightness Constancy Equation:

\[ I(x, y, t) = I(x + \Delta x, y + \Delta y, t + \Delta t) \]

- Assumes that the scene doesn’t change intensity
Hamburg Taxi seq
Optical Flow Field Examples
Optical Flow - Examples

Videos

Color Coded Optical Flows

Encoding Scheme
Optical Flow - Examples

Videos

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Encoding Scheme
Optical Flow