视频稳定/视频防抖论文分享

Reporter：曹逸飞

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  - OIS
  - AIS

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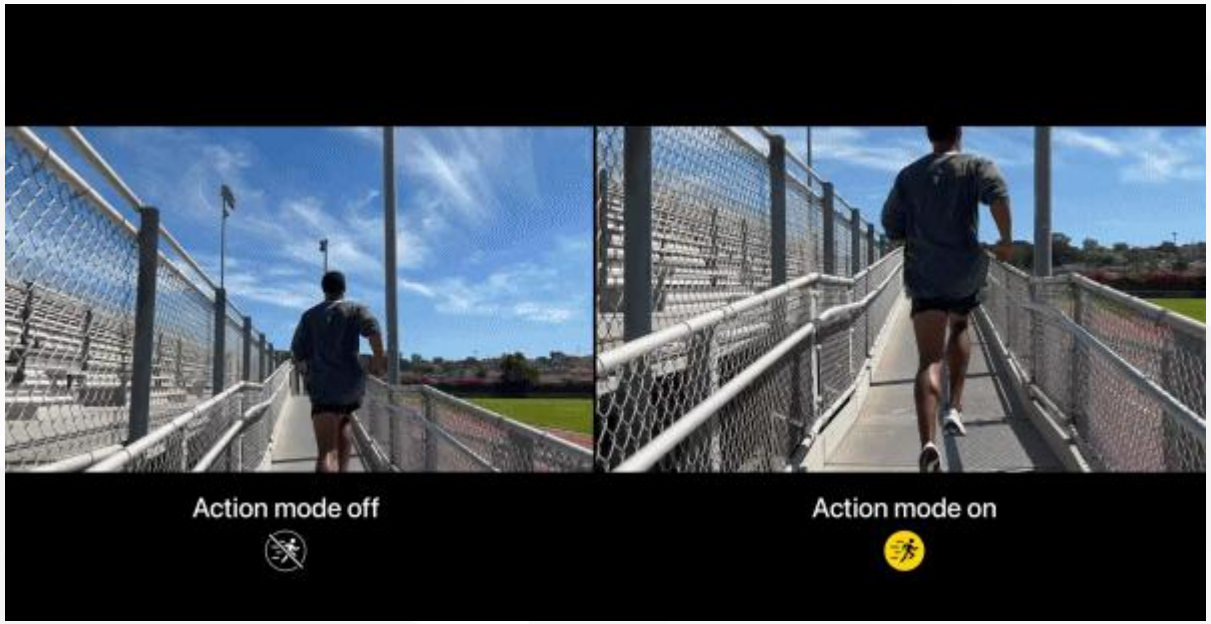
  - 平滑处理
  - 稳定生成

- 视频稳定应用在哪些领域？

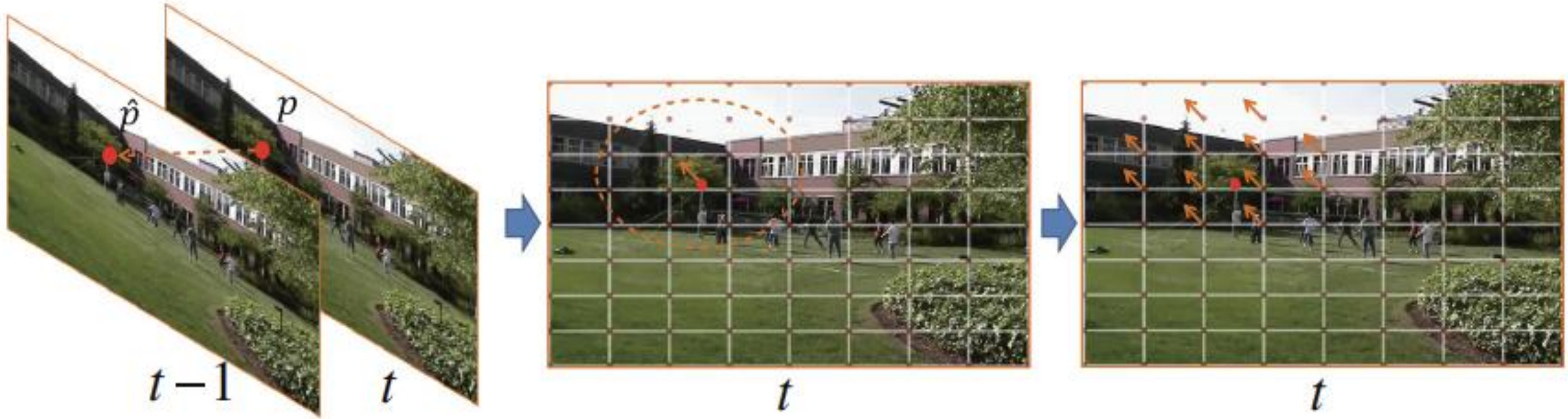


iphone 14 Pro OIS防抖处理

2、近几年的突出工作

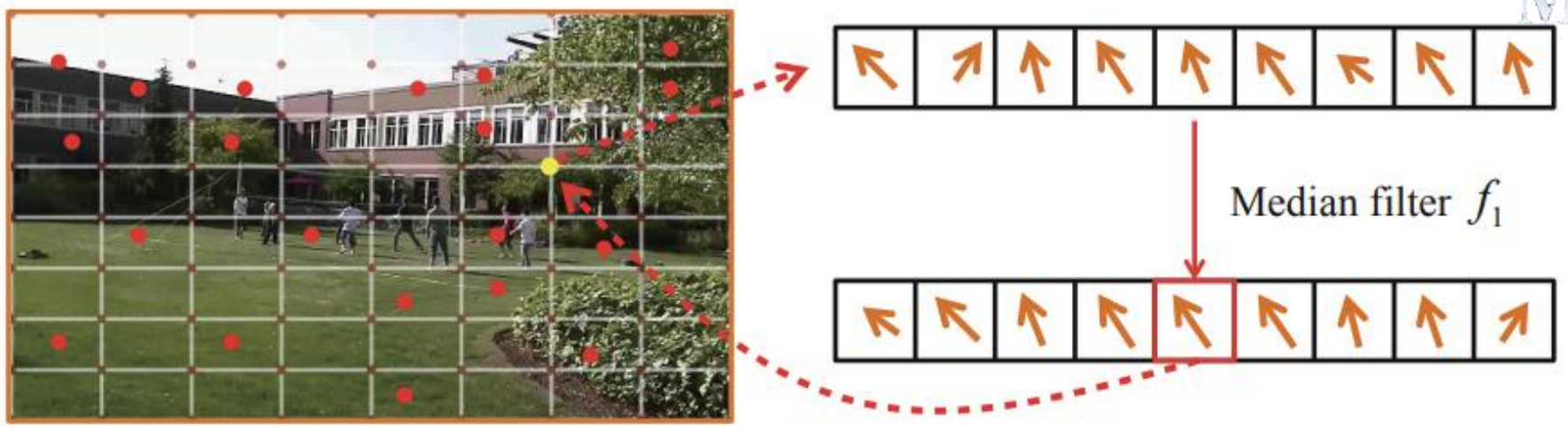
时间	来源	工作
2009	TOG	Content-Preserving Warps for 3D Video Stabilization
2011	CVPR	Auto-Directed Video Stabilization with Robust L1 Optimal Camera Paths
2012	TOG	Video Stabilization with a depth camera
2013	TOG	Bundled Camera Paths for Video Stabilization
...	...	...
2016	ECCV	MeshFlow: Minimum Latency Online Video Stabilization
2017	CVPR	Direct Photometric Alignment by Mesh Deformation
...	...	...
2020	CVPR	Learning Video Stabilization Using Optical Flow
2021	ICCV	Hybrid Neural Fusion for Full-frame Video Stabilization
2022	WACV	Deep Online Fused Video Stabilization

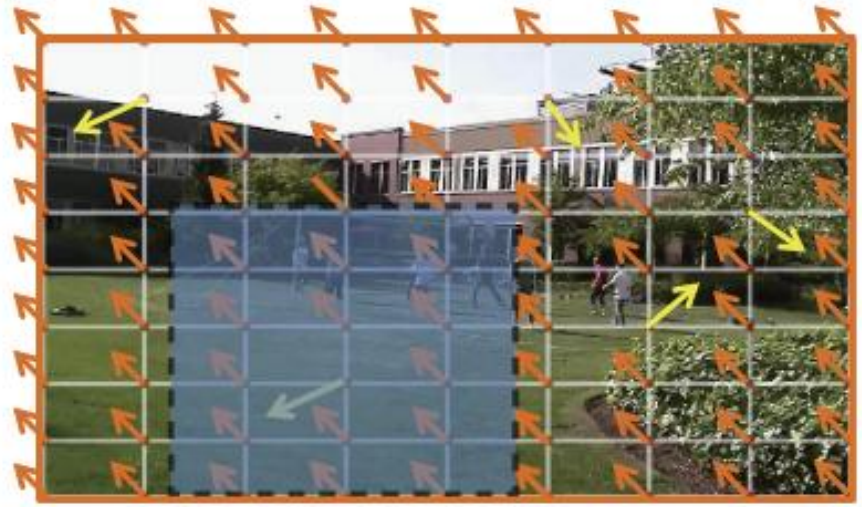
3、MeshFlow的核心思路

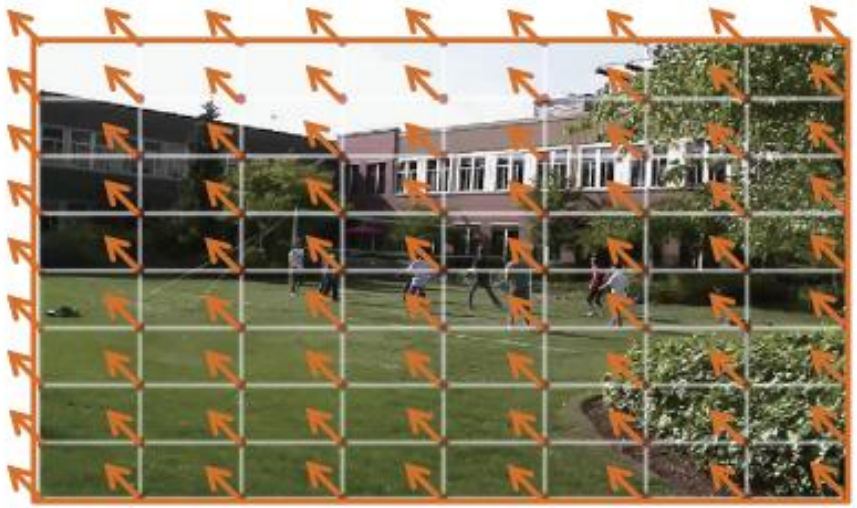


注：t:当前帧 p&$\hat{p}$:一对儿匹配的特征点

3、MeshFlow的核心思路




Median filter f_2


spatial smooth sparse motion field

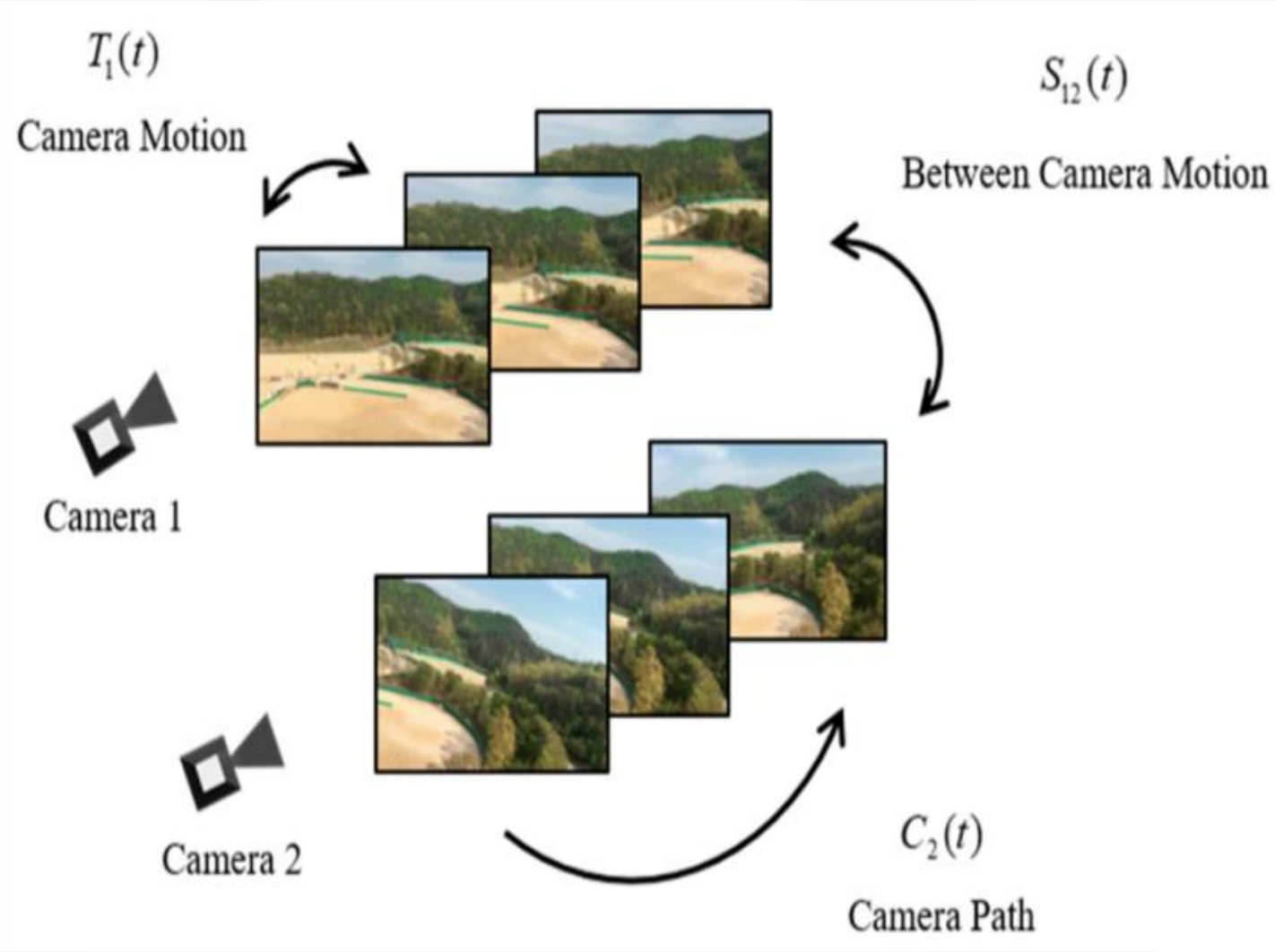
4、Real-time Video-Stitching的核心思路

摄像机1拍摄画面

摄像机2拍摄画面

视频拼接画面

4、Real-time Video-Stitching的核心思路



Note：

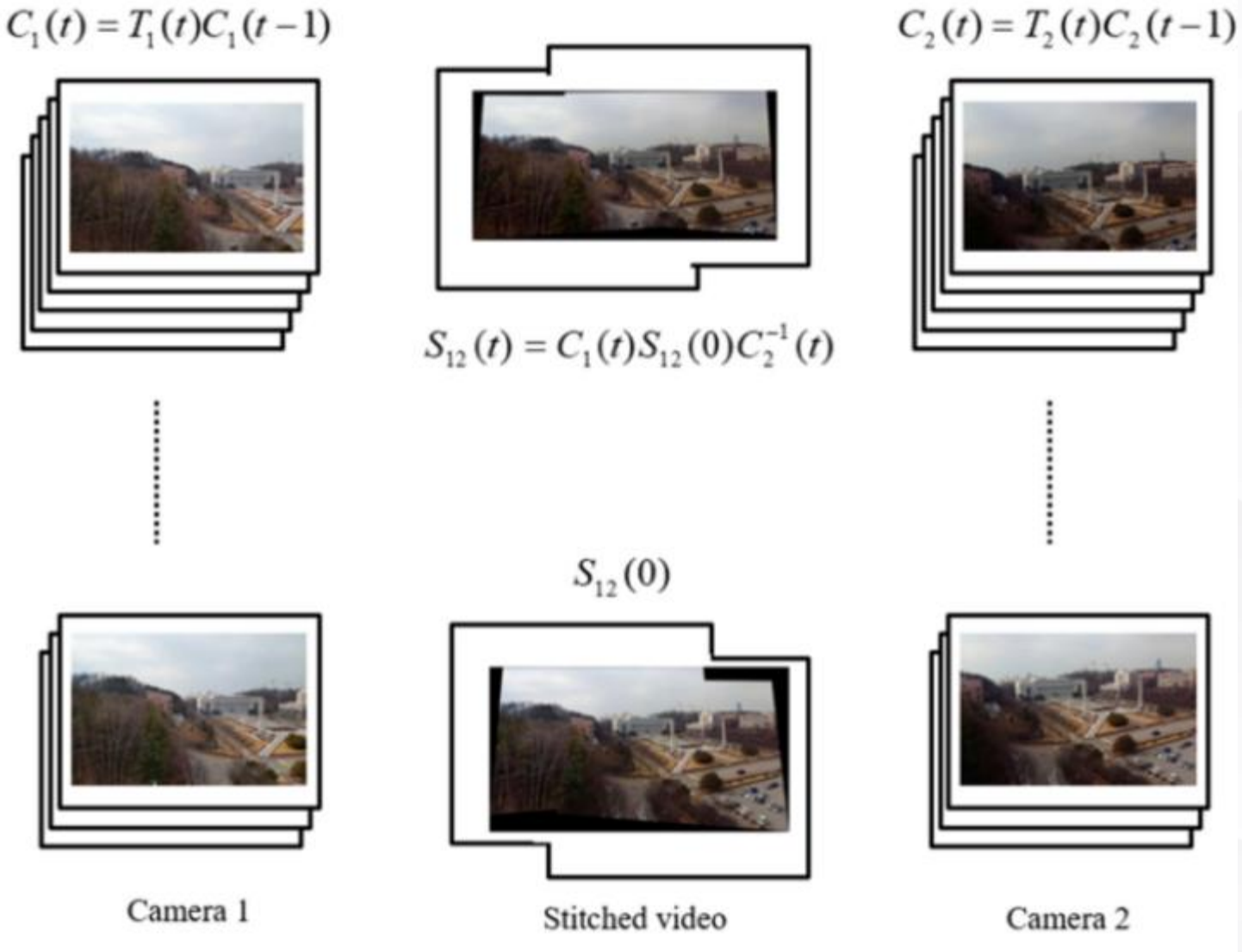
$BC = S_{nm}(t)$：在第t帧的相机n和相机m之间的仿射变换

$CM = T_n(t)$：第n个相机中，从t-1帧到t帧的仿射变换

$CP = C_n(t)$：第n个相机下针对前t帧的仿射变换的累积

$$CP = C_n(t) = T_n(t)\ C_n(t-1) = T_n(t) \dots T_n(2)T_n(1) = CM_t \dots CM_2CM_1$$

4、Real-time Video-Stitching的核心思路



$S_{12}(0)$：初始帧的BC 仿射变换

$C_1(t)$和$C_2(t)$分别是相机1和相机2的CP

Note：

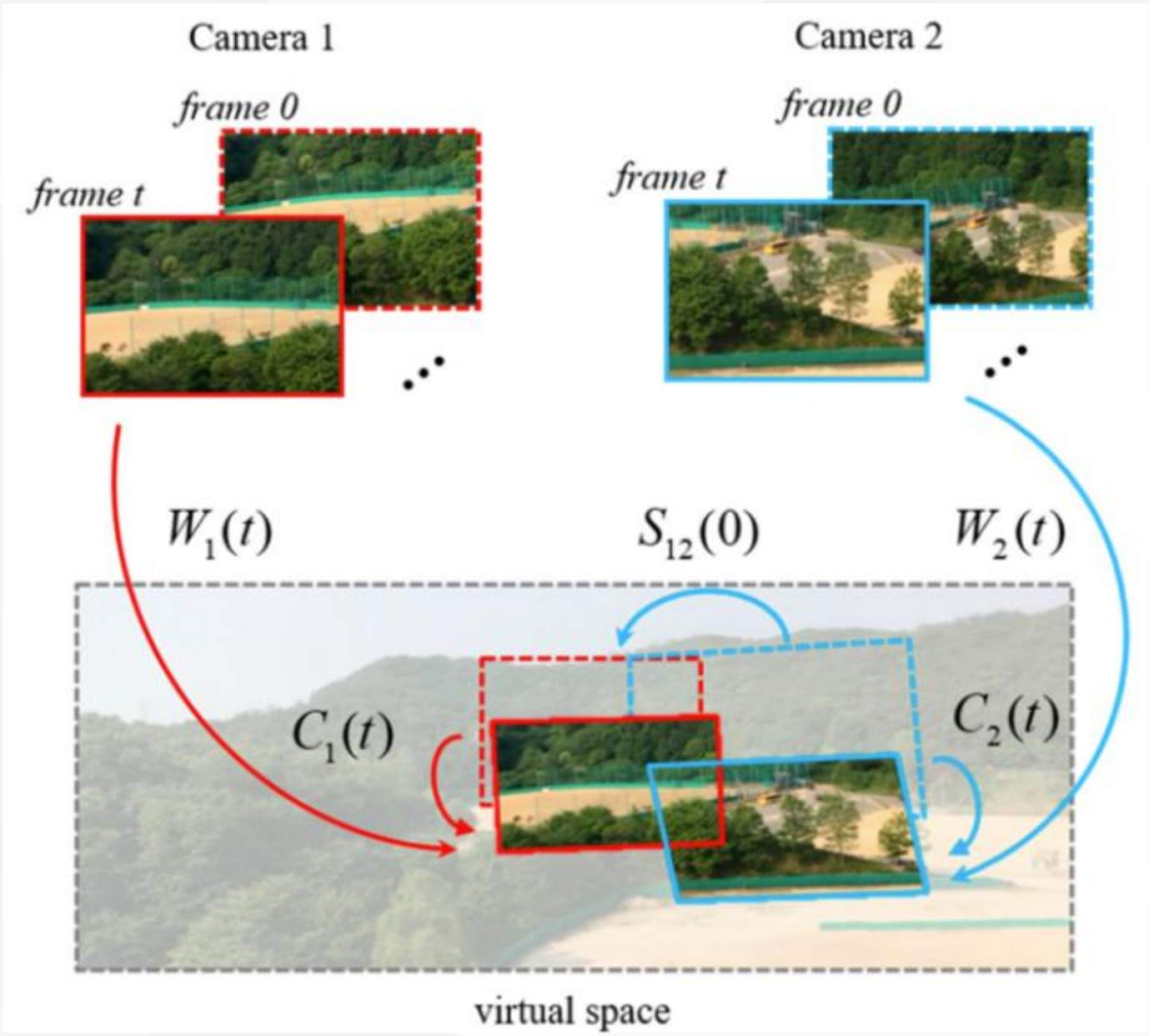
$BC = S_{nm}(t)$：在第t帧的相机n和相机m之间的仿射变换

$CM = T_n(t)$：第n个相机中，从t-1帧到t帧的仿射变换

$CP = C_n(t)$：第n个相机下针对前t帧的仿射变换的累积

$$S_{12}(t) = C_1(t)S_{12}(0)C_2^{-1}(t)$$

4、Real-time Video-Stitching的核心思路

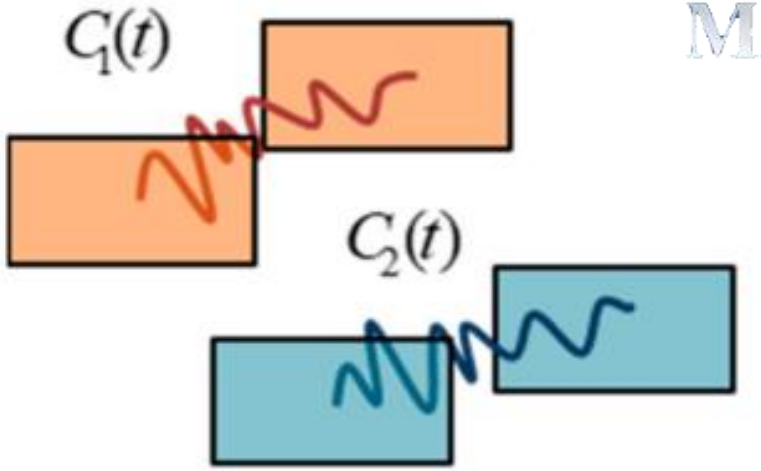


$$W_1(t) = C_1^{-1}(t),$$

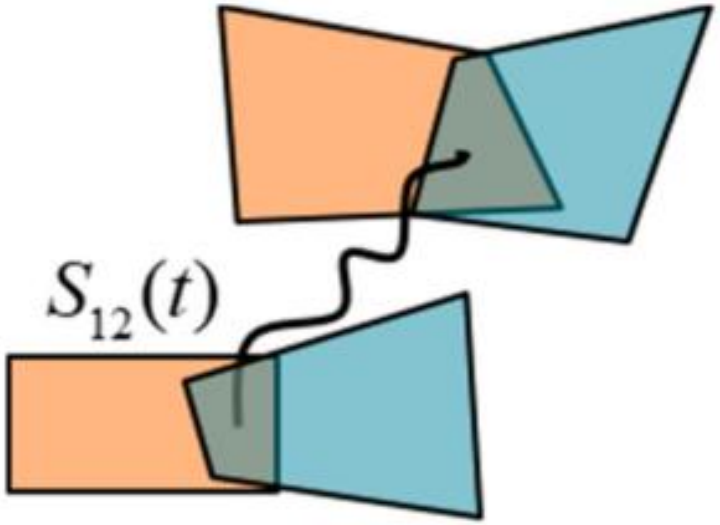
$$W_2(t) = S_{12}(0)C_2^{-1}(t),$$

4、Real-time Video-Stitching的核心思路

(a)



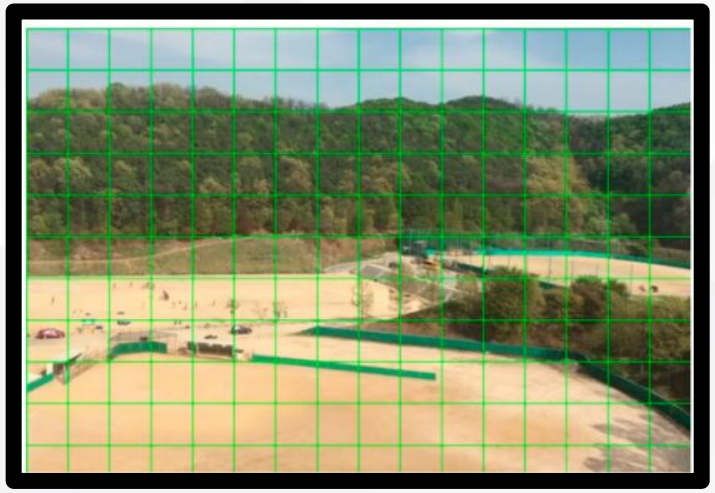
(b)

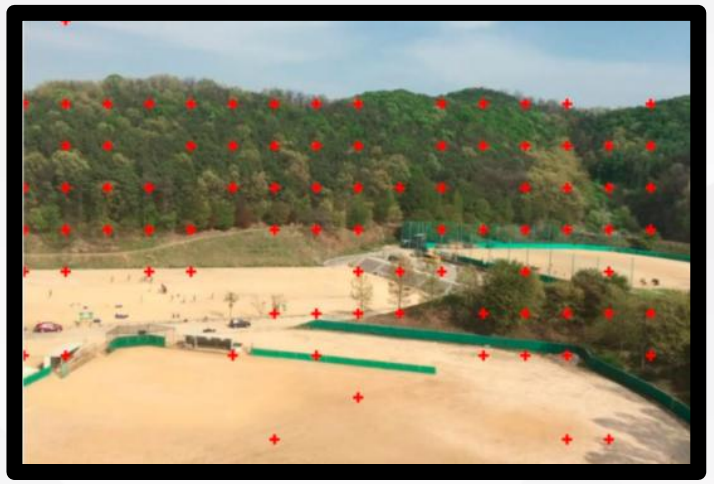


(c)

(d)

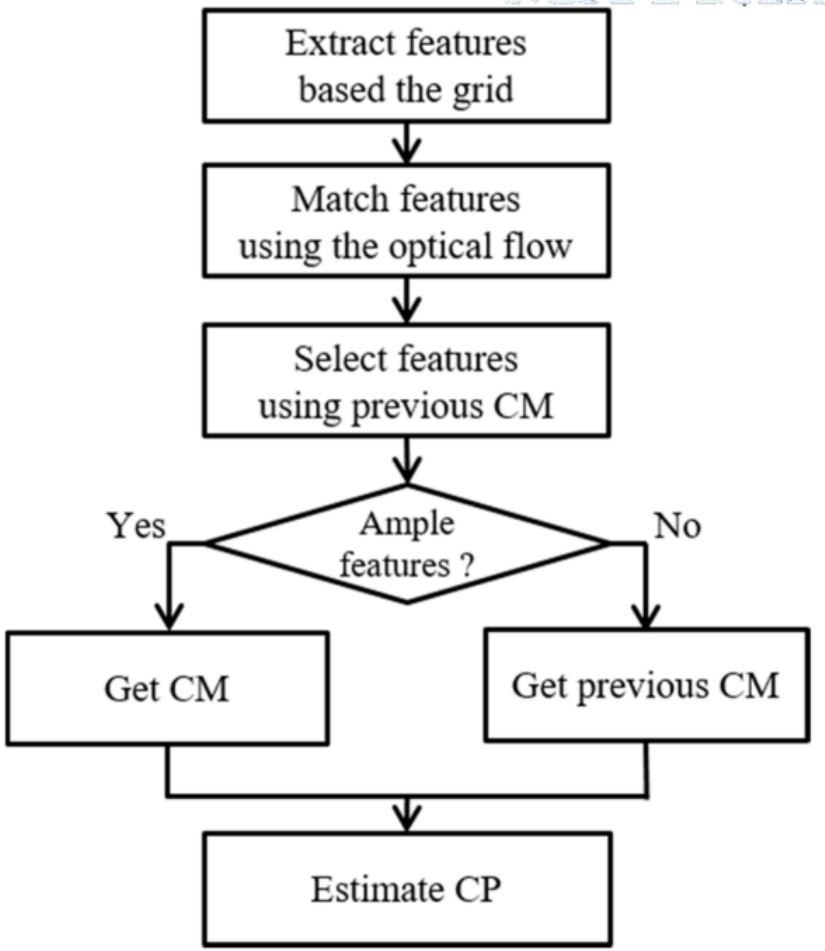
4、Real-time Video-Stitching的核心思路





$$|I_t(x,y) - I_{t-1}(x,y)| > \tau_i$$

$$d_1(p, p_{track})/N(w) < \tau_e$$

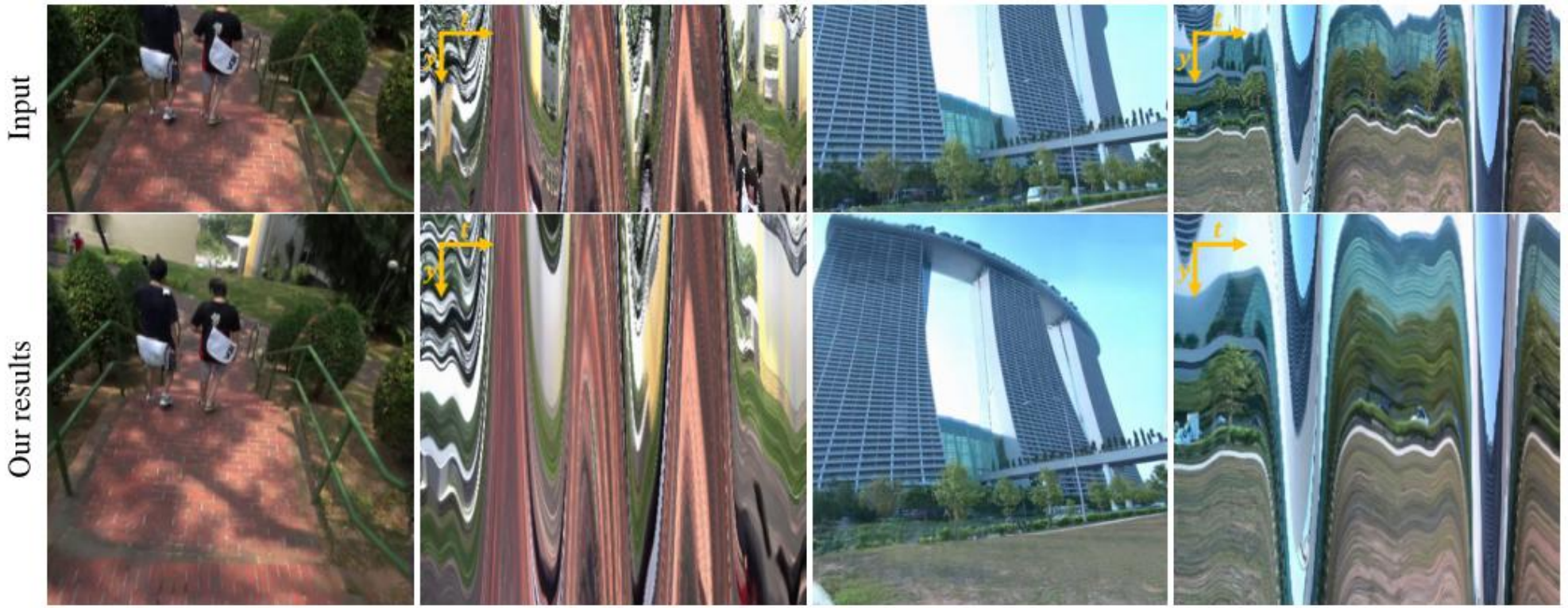


5、FuSta的核心思路

Hybrid Neural Fusion for Full-frame Video Stabilization

Yu-Lun Liu[1] Wei-Sheng Lai[2] Ming-Hsuan Yang[2,4,5] Yung-Yu Chuang[1] Jia-Bin Huang[3]
[1]National Taiwan University [2]Google [3]Virginia Tech [4]UC Merced [5]Yonsei University

https://alex04072000.github.io/FuSta/



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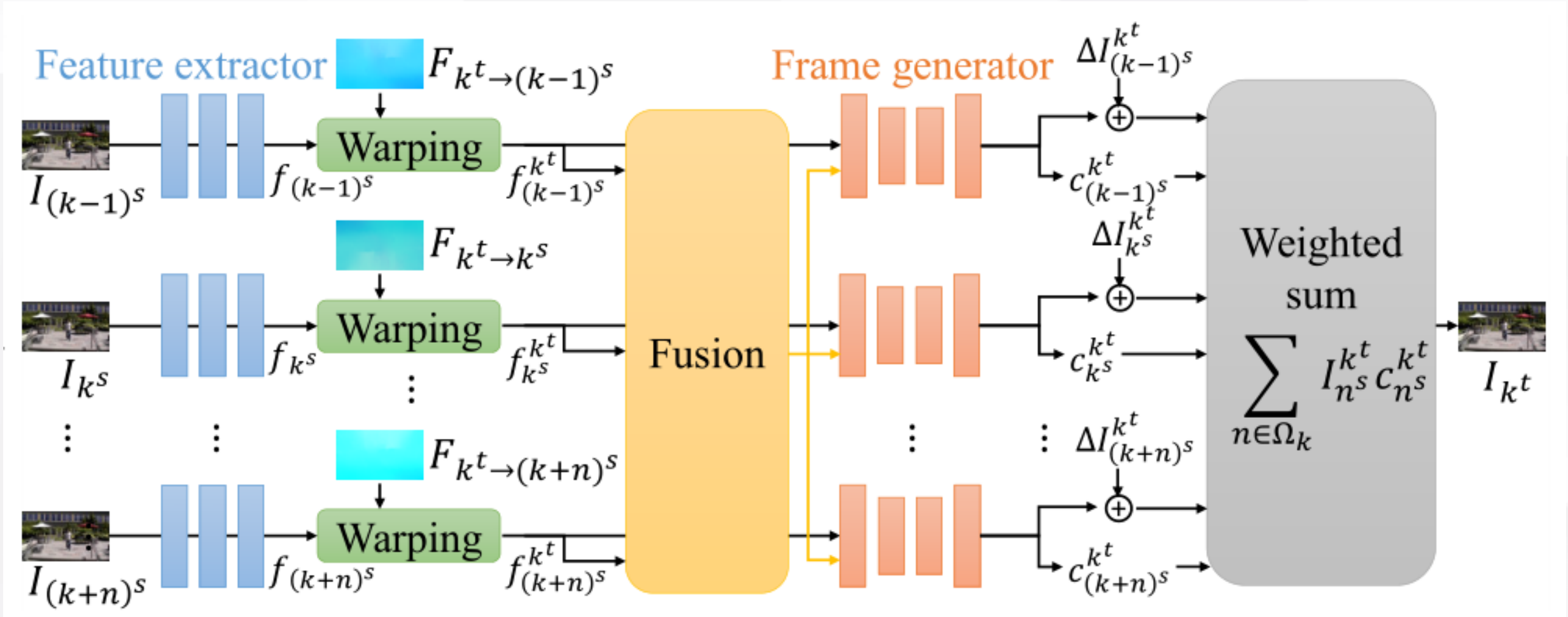
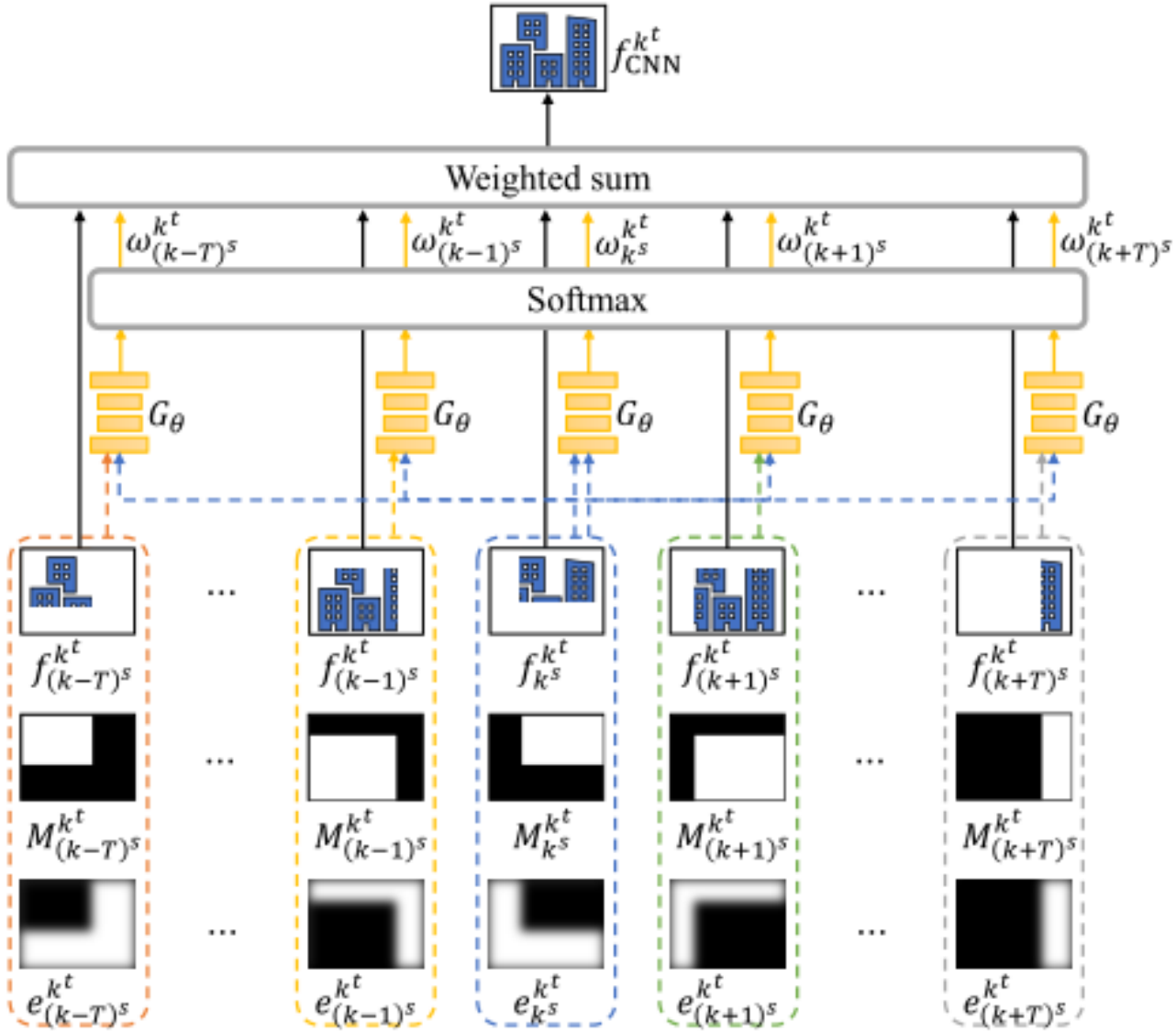


5、FuSta的核心思路



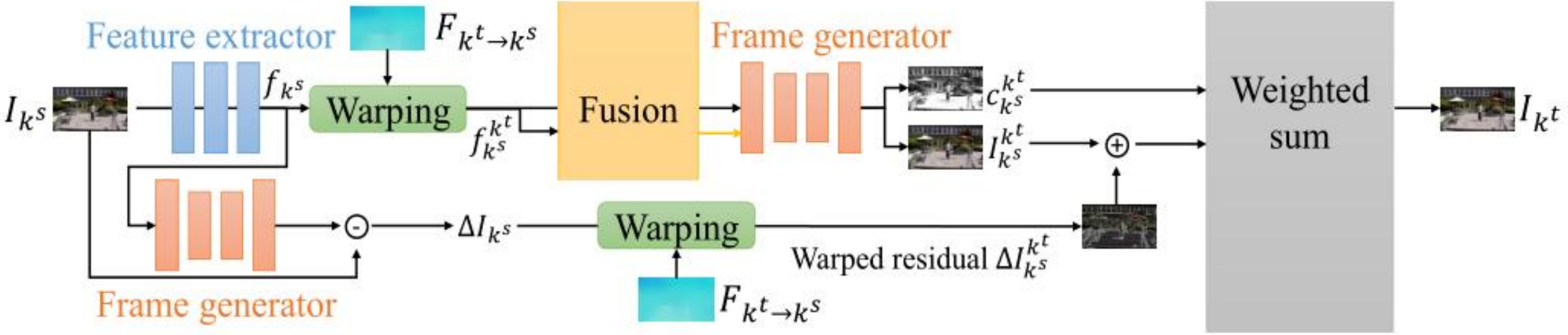
$$f_{\text{CNN}}^{k^t} = \sum_{n \in \Omega_k} f_{n^s}^{k^t} \underbrace{\sigma\left(G_\theta\left(f_{n^s}^{k^t}, M_{n^s}^{k^t}, f_{k^s}^{k^t}, M_{k^s}^{k^t}, e_{n^s}^{k^t}\right)\right)}_{\omega_{n^s}^{k^t}},$$

$$e_{n^s}(\mathbf{p}) = \left\| F_{k^s \to n^s}(\mathbf{p}) + F_{n^s \to k^s}(\mathbf{p} + F_{k^s \to n^s}) \right\|_2$$

$$\left\{ I_{n^s}^{k^t}, C_{n^s}^{k^t} \right\} = G_\phi\left(f_{n^s}^{k^t}, M_{n^s}^{k^t}, f_{\text{CNN}}^{k^t}\right)$$

$$I_{k^t} = \sum_{n \in \Omega_k} I_{n^s}^{k^t} C_{n^s}^{k^t}$$

5、FuSta的核心思路



Thanks