ビデオから人目を惹く領域を検出する

時空間深層特徴による映像中の顕著物体検出

Video Salient Object Detection Using Spatiotemporal Deep Features

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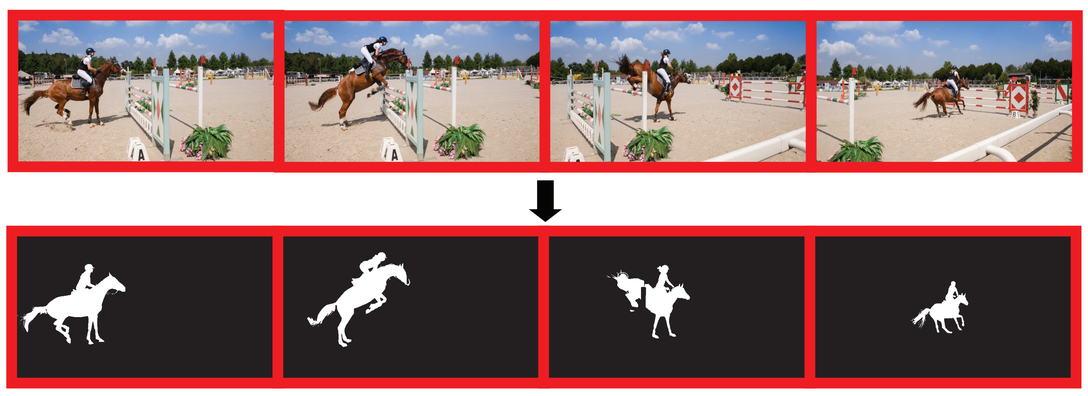
Introduction

Background



映像中の顕著物体検出はコンピュータービジョンおよび
マルチメディアにおいて重要
SOD from video is important for computer vision and multimedia

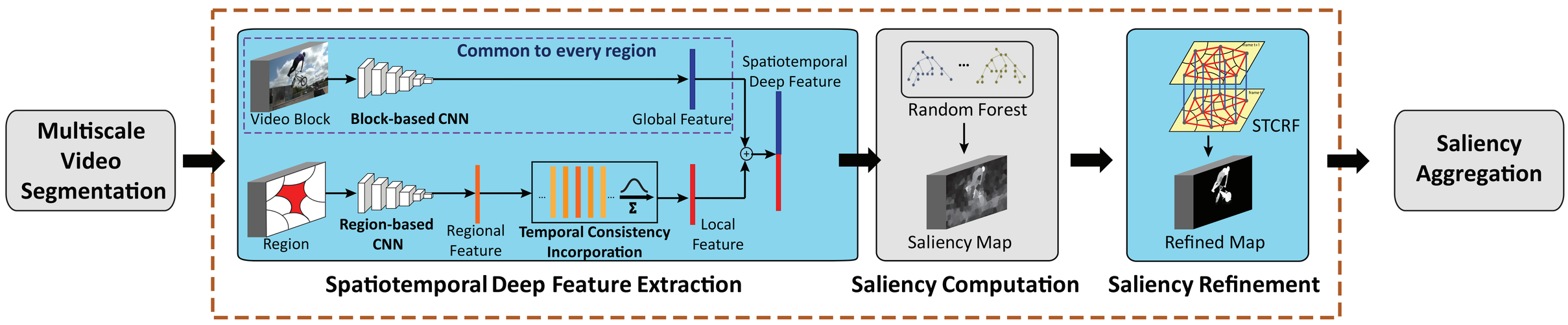
Contribution

深層特徴と視覚的顕著性モデルの両方に時間的情報を利用
Exploiting temporal information in both deep feature and saliency model

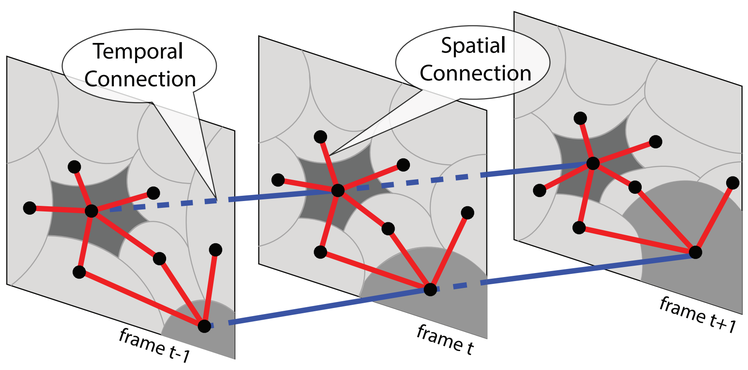
時空間深層特徴を提案
Proposing spatiotemporal deep feature

時空間深層特徴を用いた STCRF モデルを開発
Developing SpatioTemporal Conditional Random Field (STCRF) model using spatiotemporal deep features

Proposed method



Spatiotemporal Conditional Random Field

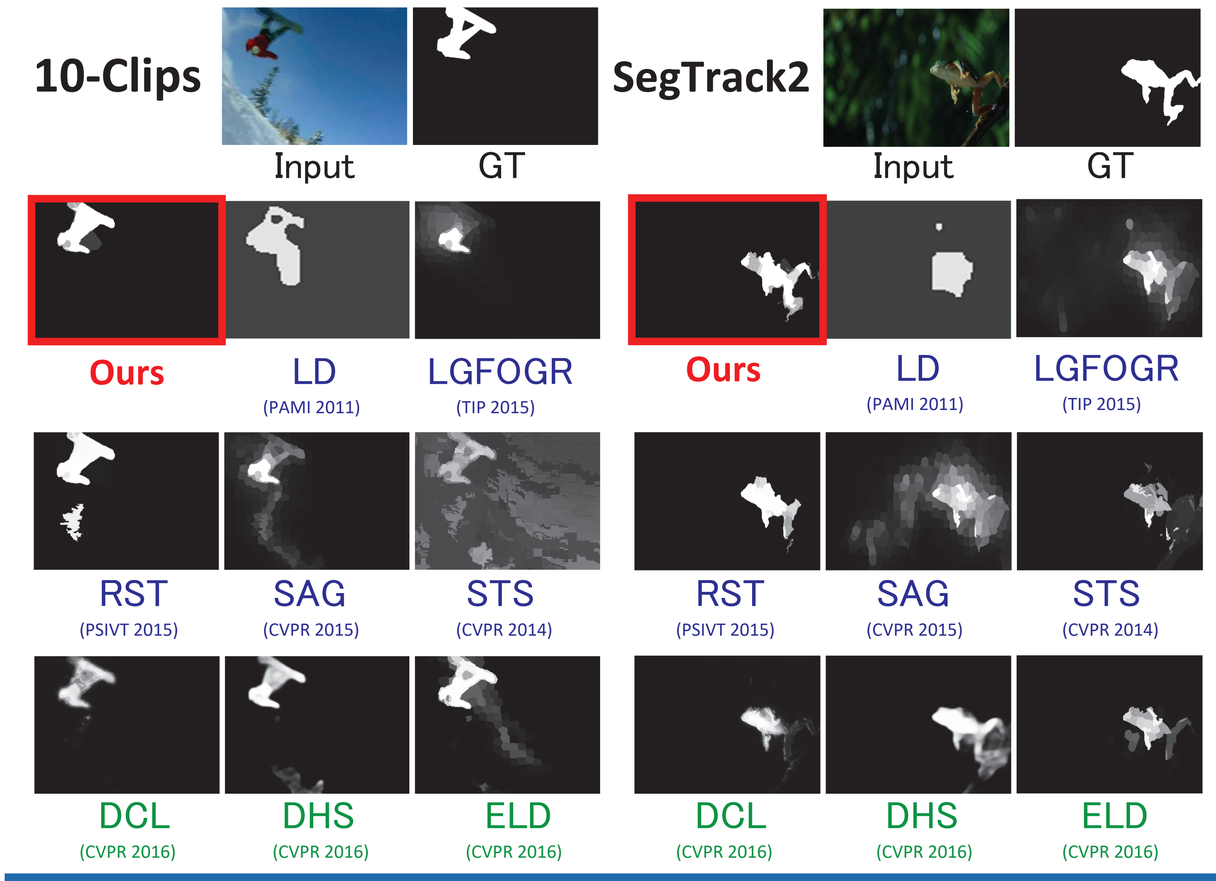


Energy Optimization: $\hat{\ell} = \underset{\ell}{\operatorname{argmin}}\, E(\ell, x; \theta) = \underset{\ell}{\operatorname{argmin}} \left[\sum_{i \in V} \psi_u(\ell_i, x; \theta_u) + \sum_{(i,j) \in E} \psi_b(\ell_i, \ell_j, x; \theta_b) \right]$

Unary Potential: $\psi_u(\ell_i, x; \theta_u) = \theta_u \ell_i(x)$

Binary Potential: $\psi_b(\ell_i, \ell_j, x; \theta_b) = \begin{cases} \theta_{bs}[\ell_i \neq \ell_j] \exp\left(-\frac{\|F_i(x) - F_j(x)\|^2}{2\sigma^2}\right) & (i,j) \in \text{Edge}_s \\ \theta_{bt}[\ell_i \neq \ell_j] & (i,j) \in \text{Edge}_t \end{cases}$

Experiments



Comparision with State-of-the-art Methods

Dataset / Metric	10-Clips F-Adap	SegTrack2 F-Adap	DAVIS F-Adap
STCRF (Our method)	**0.927**	**0.817**	**0.794**
LD [T.Liu, PAMI 2011]	0.637	0.286	0.252
LGFOGR [W.Wang, TIP 2015]	0.629	0.500	0.537
RST [T.N.Le, PSIVT 2015]	0.827	0.510	0.627
SAG [W.Wang, CVPR 2015]	0.755	0.504	0.494
STS [F.Zhou, CVPR 2014]	0.591	0.471	0.379
DCL [G.Li, CVPR 2016]	**0.935**	**0.734**	0.664
DHS [N.Liu, CVPR 2016]	0.923	0.733	**0.715**
ELD [G.Lee, CVPR 2016]	0.893	0.611	0.572

Detail Analysis

Setting Description		10-Clips	SegTrack2	DAVIS
Feature	Refinement	F-Adap	F-Adap	F-Adap
Local	-	0.868	0.590	0.600
STF	-	0.887	0.658	0.650
STF	CRF	0.916	0.789	0.763
STF	STCRF	**0.927**	**0.817**	**0.794**

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