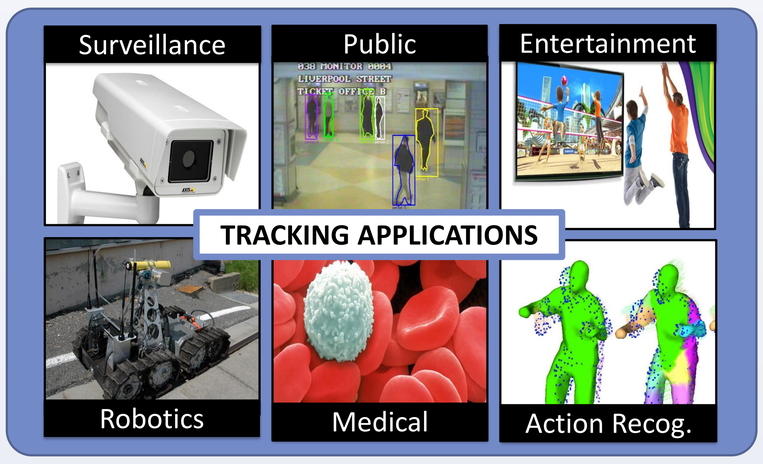
OCCLUSION AWARE MULTIPLE TARGET PARTICLE FILTER TRACKER

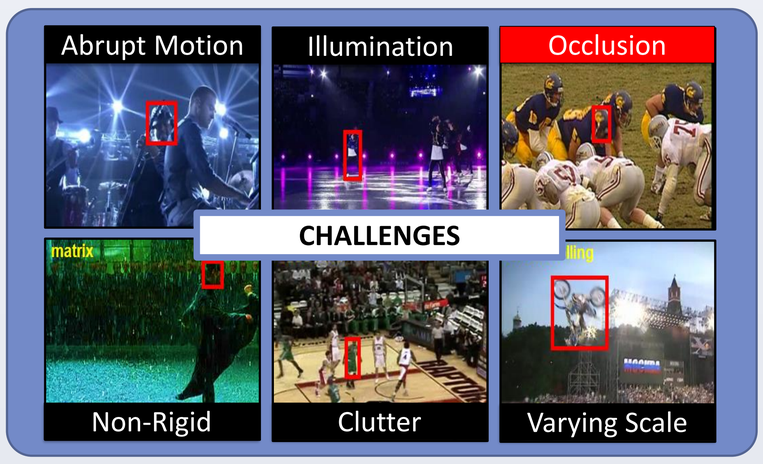
Kourosh MESHGI*, Shin-ichi MAEDA, Shigeyuki OBA, Shin ISHII

Ishii Lab, Dept. of Systems Science, Graduate School of Informatics, Kyoto University, Japan

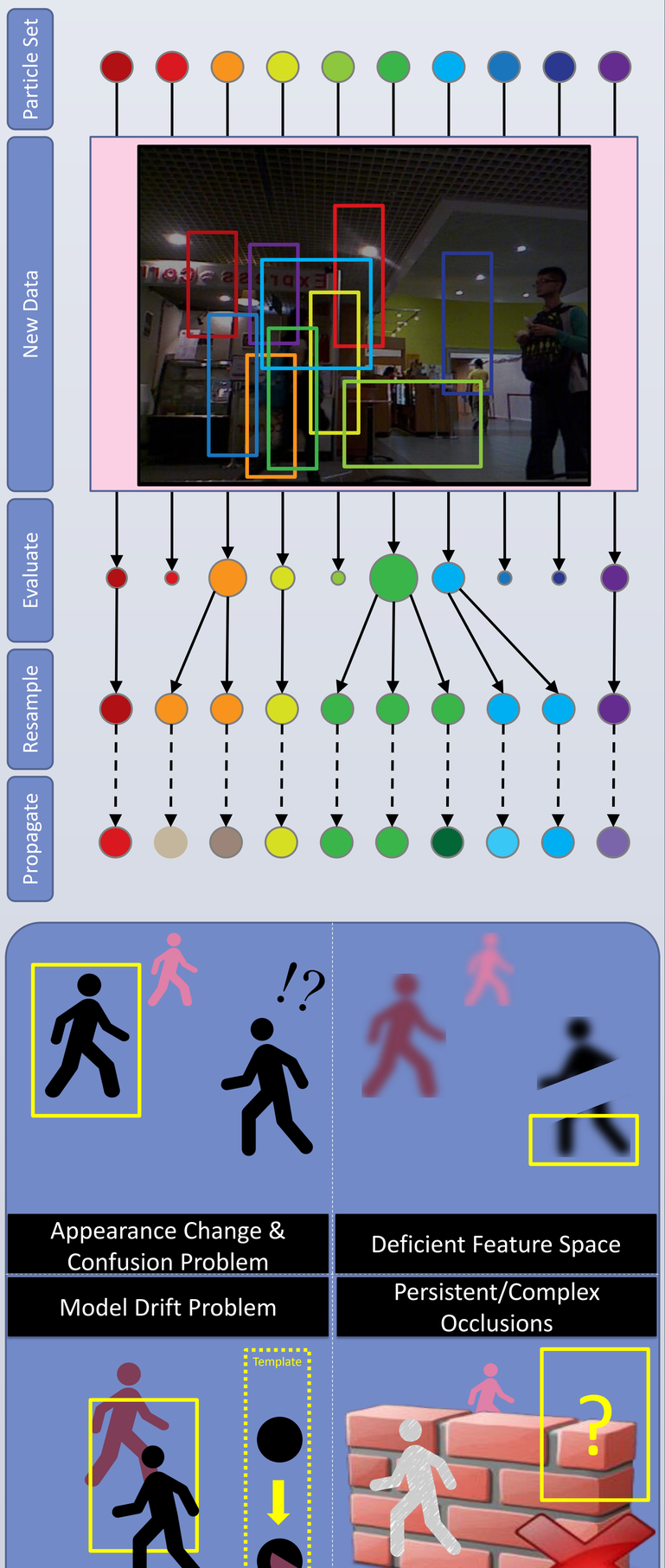
* http://ishiilab.jp/member/meshgi-k/r-tracking.html, meshgi-k@sys.i.kyoto-u.ac.jp

INTRODUCTION





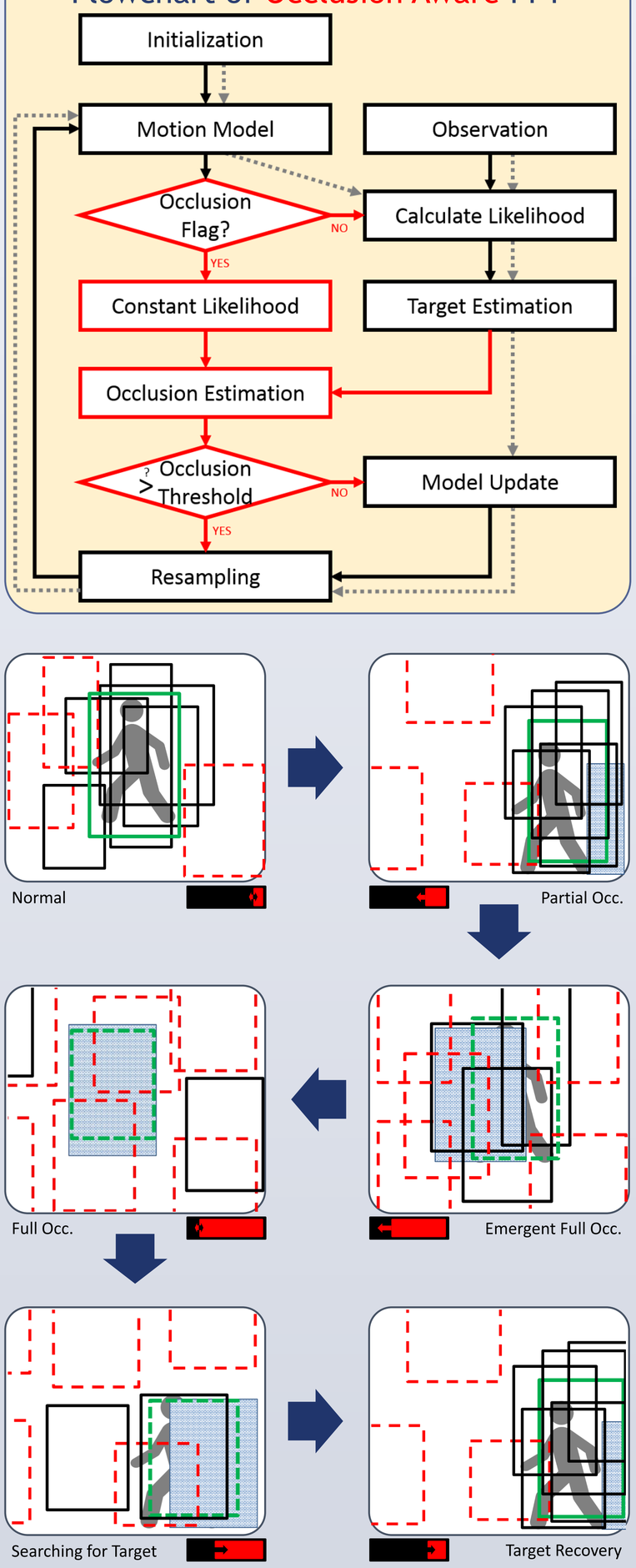
PARTICLE FILTER TRACKERS



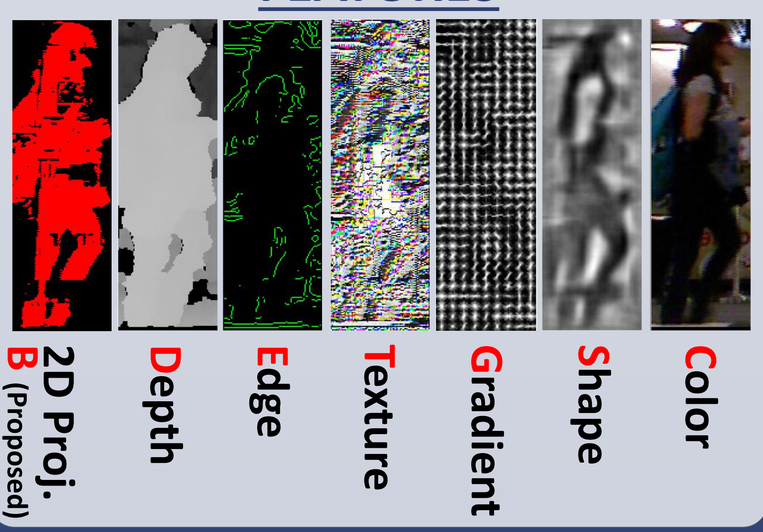
PROPOSED METHOD

- Occlusion Flag: Switching Sampling and Motion Model based on Occlusion State
  - Introducing Occlusion Flag (Z) to Representation
  - *Occlusion Case* ➡ *Uniform Distribution*
  - *No Occlusion Case* ➡ *Feature Level Template Match*
  - Resampling uses a state transition model to probabilistically detect occlusions.
  - Occlusion Estimation
  - Target Localization using Non-occluded Particles

Flowchart of Occlusion Aware PFT



FEATURES

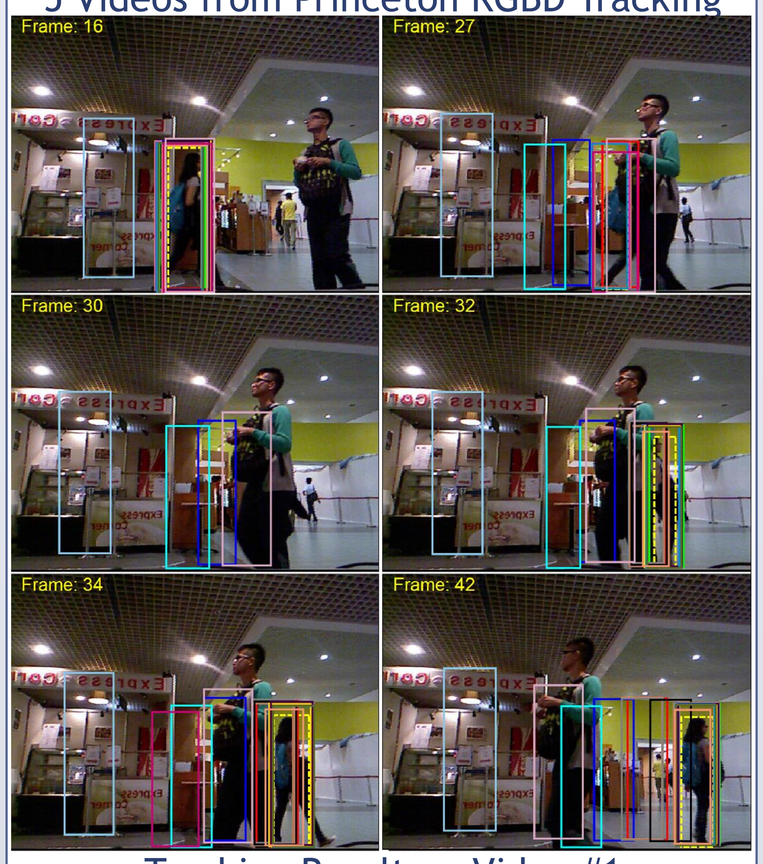


RESULTS (SINGLE TARGET)

Tracker	cc#	*AUC*	*CPE*	*SAE*	*MI*	*FT*	*MT*	*FPS*
C		53.99	34.44	14.04	**0.0**	0.8	11.4	8.2
D		61.02	31.53	17.57	**0.0**	1.6	20.6	**14.4**
E		21.09	90.95	23.63	12.6	**0.0**	81.6	8.2
S		26.41	124.07	21.05	3.4	0.6	121.2	1.2
CD		68.52	16.26	15.83	**0.0**	0.8	2.4	8.3
CE		37.81	56.66	20.37	12.0	0.6	39.4	5.6
CG		54.76	34.61	12.72	**0.0**	1.6	26.4	6.1
CDE		58.20	24.63	17.93	2.8	0.8	**0.0**	5.7
CGS		37.69	47.56	16.71	**0.0**	83.6	32.2	1.1
CGT		55.14	28.06	13.66	**0.0**	1.6	3.8	3.8
CDET		63.48	19.49	14.81	**0.0**	1.4	**0.0**	3.7
CDGT		74.14	12.30	11.81	**0.0**	1.2	**0.0**	3.8
CDEST		54.94	34.20	16.25	2.8	0.8	29.6	1.0
CDEGST		72.94	12.03	11.25	**0.0**	1.6	**0.0**	0.9
BCDEGST		**76.50**	**9.59**	**7.32**	**0.0**	2.4	**0.0**	0.9
OI+SVM		69.15	9.68	12.04	0.4	20.0	0.8	0.4
STRUCK		46.67	68.74	26.61	12.6	**0.0**	64.4	13.4
ACPF		27.55	90.38	35.27	12.6	**0.0**	31.0	1.4

cc – Color Code for the Tracker

5 Videos from Princeton RGBD Tracking



Tracking Result on Video #1

MULTI TARGET EXPANSION

- Multi modal presentation of particle filter **(TBD)**

CONCLUSIONS

Occlusion Flag
- Detect Occlusion
- Recover after Occlusion Quickly
- Handles Abrupt Motion Changes
- Expands Search Area if Occlusion Persists

Channel Fusion
- Performance of the Fusion is Better than Each Channel Alone
- Handle Illumination Changes

REFERENCES

OI+SVM: Song, S., Xiao, J., 2013. Tracking revisited using rgbd camera: Unified benchmark and baselines, in: ICCV 2013.

ACPF: Nummiaro, K., Koller-Meier, E., Van Gool, L., 2003. An adaptive color-based particle filter. JIVC.

STRUCK: Hare, S., Saari, A., Torr, P.H., 2011. Struck: Structured output tracking with kernels, in: ICCV, 2011

OAPF (proposed): Meshgi, K., Maeda, S.i., Oba, S., Ishii, S., 2014. Fusion of multiple cues from color and depth domains using occlusion aware bayesian tracker. Tech.Rep of NC'2014.