

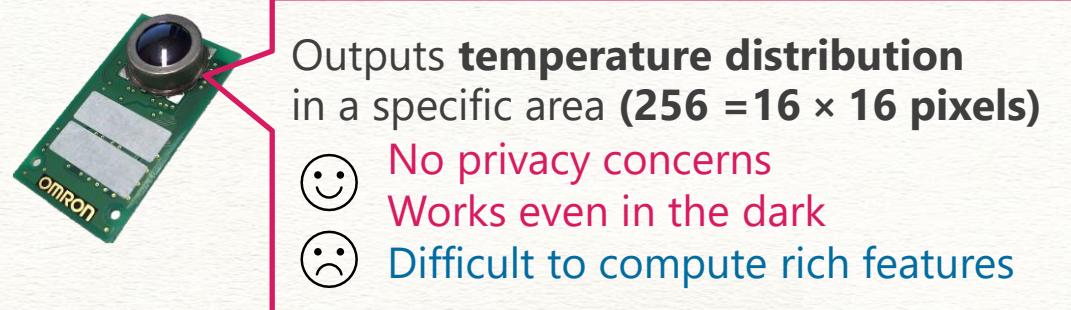
LFIR2Pose : Pose Estimation from an Extremely Low-Resolution FIR Image Sequence

Background and Purpose

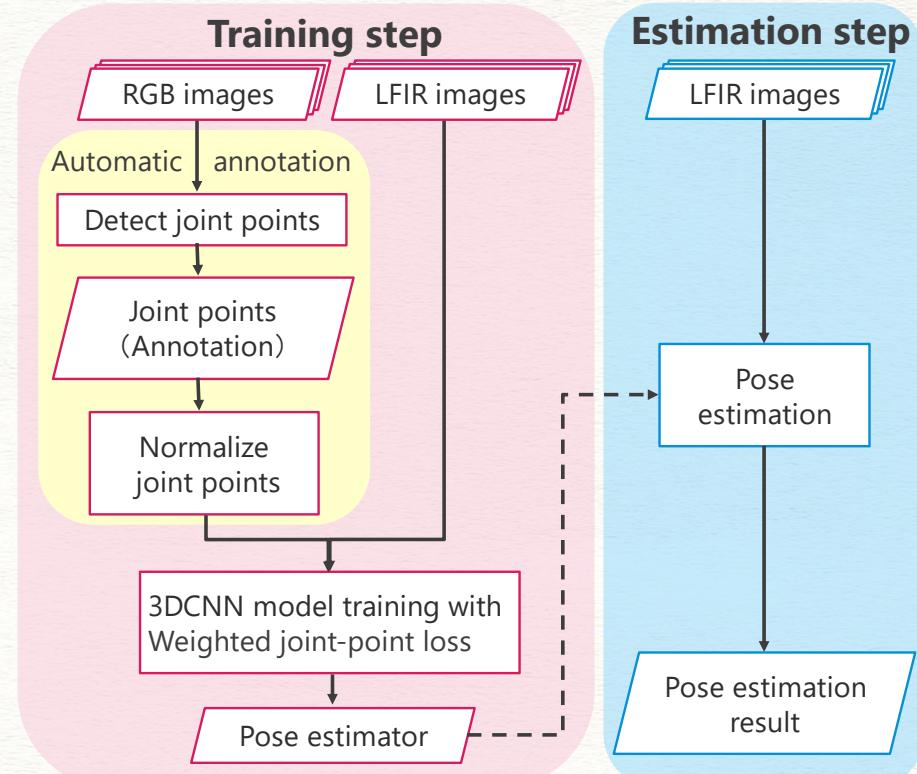
Monitoring system for elderly without privacy concerns



Far-InfraRed (FIR) sensor array



Process flow of the proposed method

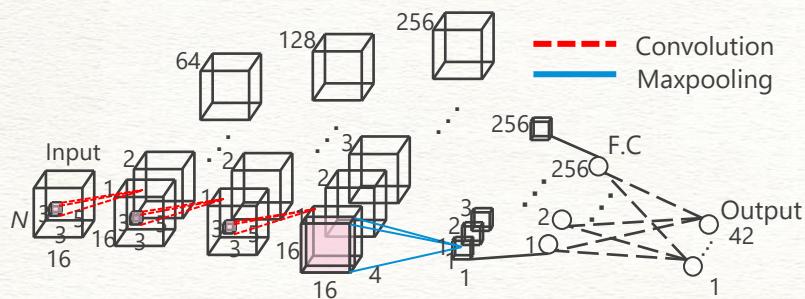


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Proposed method : LFIR2Pose

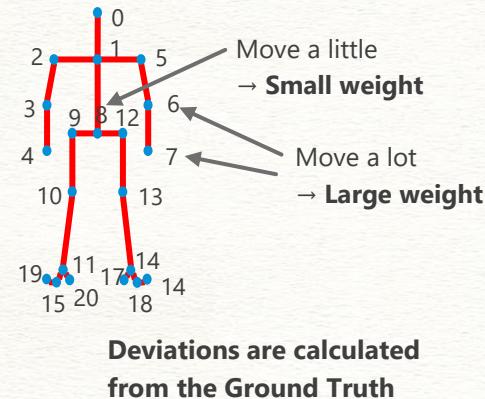
Contribution 1 : LFIR2Pose model

- ① 3DCNN - Utilize temporal information



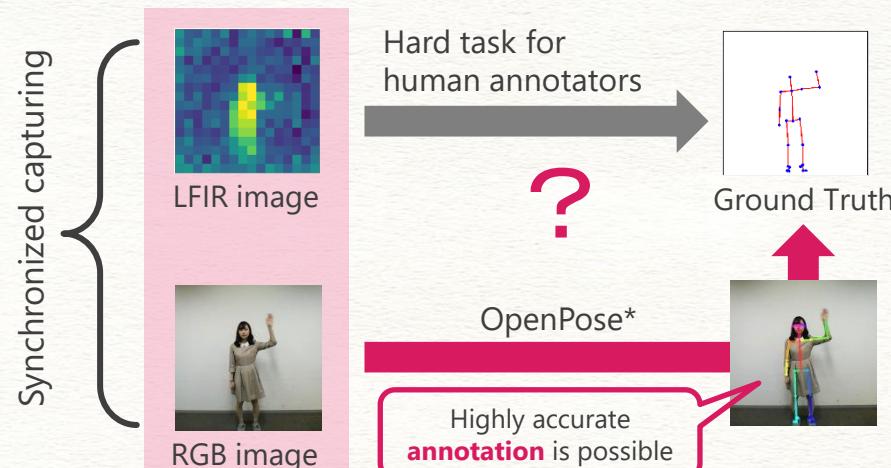
- ② Weighted joint point loss

- Weighting each joint point depending on the standard deviations of their movements



Contribution 2 : Automatic annotation

Capturing both **RGB** and **LFIR images**, and annotating the ground truth for each LFIR image by applying OpenPose* to the corresponding RGB image



* Z. Cao et al., "Realtime multi-person 2D pose estimation using part affinity fields", CVPR 2017.

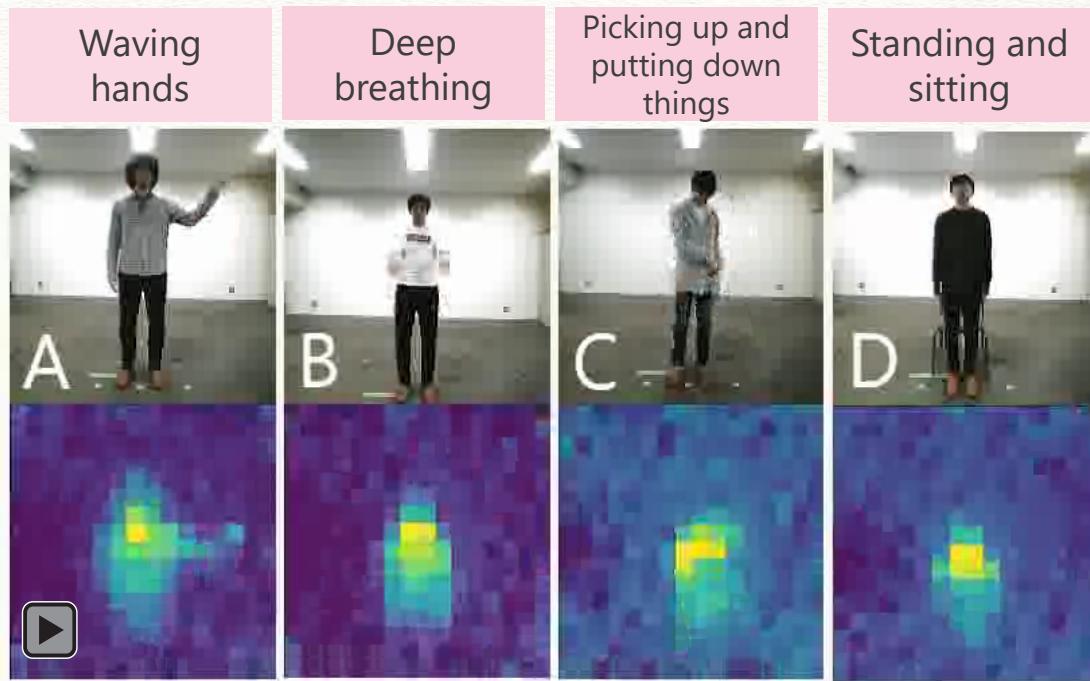
LFIR2Pose : Pose Estimation from an Extremely Low-Resolution FIR Image Sequence

Saki Iwata†, Yasutomo Kawanishit, Daisuke Deguchit, Ichiro Idet, Hiroshi Muraset, Tomoyoshi Aizawa†
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Experiment

Dataset

The number of actions	4
The positions of a subject	9
The number of frames	About 170 / Video
The number of subject	11
The number of videos	99 / Action
Training data	Positions 1,3,5,7,9
Test data	Positions 2,4,6,8



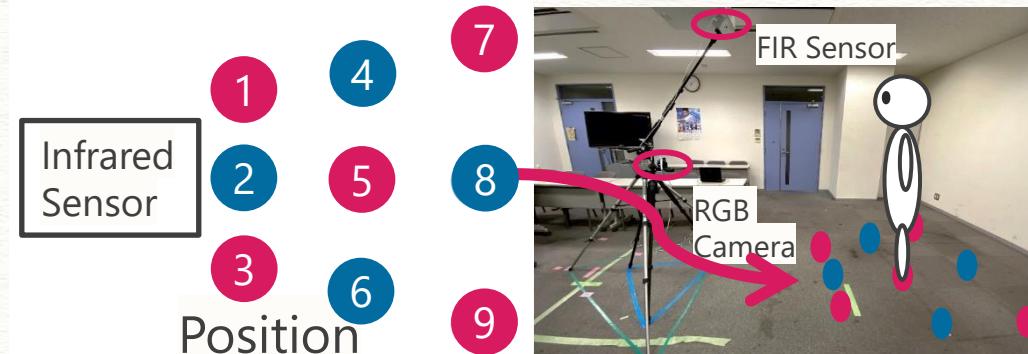
Method

Comparative method 1 : 2DCNN

Comparative method 2 : 2DCNN (global max pooling)

Proposed method 1 : 3DCNN

Proposed method 2 : 3DCNN + Weighted joint point loss



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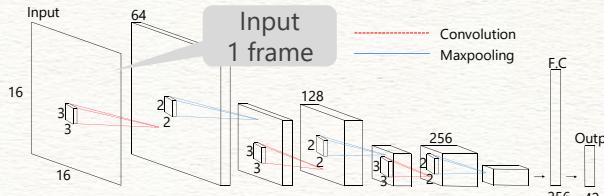
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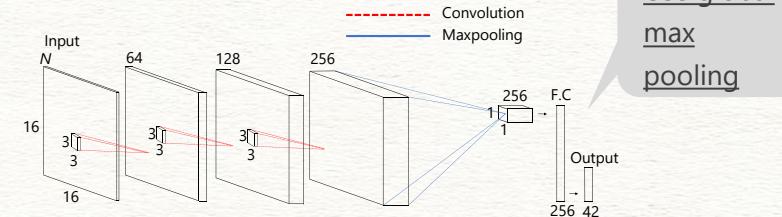
RMSE of the Ground Truth and the estimation results ($\times 10^{-2}$)

Position	2	4	6	8	Average
Action A 	Comp1	4.33	4.85	5.35	5.11
	Comp2	4.63	4.70	5.04	5.22
	Prop1	2.88	3.46	3.45	3.63
	Prop2	2.65	3.12	3.32	3.68
Action B 	Comp1	9.65	10.4	8.28	12.6
	Comp2	7.10	5.62	5.52	7.19
	Prop1	4.97	4.35	4.32	4.85
	Prop2	4.53	4.29	4.10	4.59
Action C 	Comp1	11.2	10.0	16.8	10.9
	Comp2	7.35	7.32	7.24	7.31
	Prop1	5.13	5.12	5.07	4.99
	Prop2	4.91	4.96	5.04	4.96
Action D 	Comp1	8.32	7.25	6.57	7.19
	Comp2	5.53	5.67	5.01	6.34
	Prop1	3.82	4.34	4.08	5.29
	Prop2	3.73	4.15	4.06	5.40

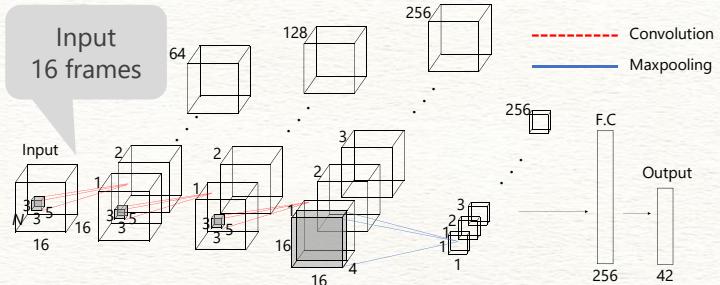
Comparative method 1 network



Comparative method 2 network



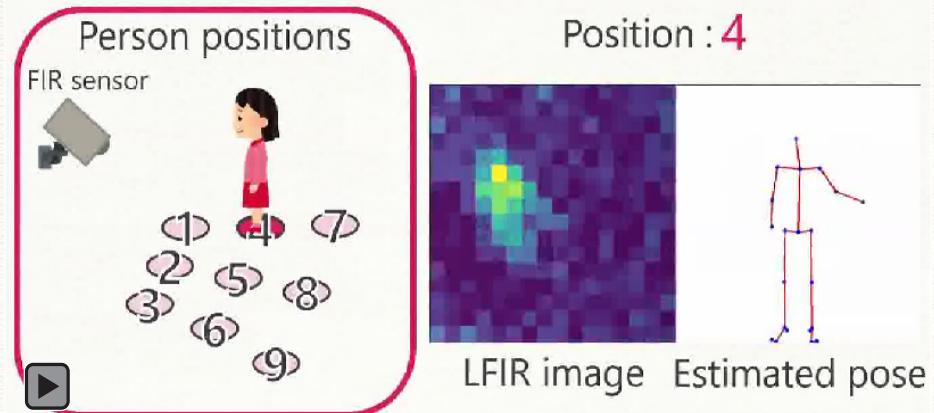
Proposed method network



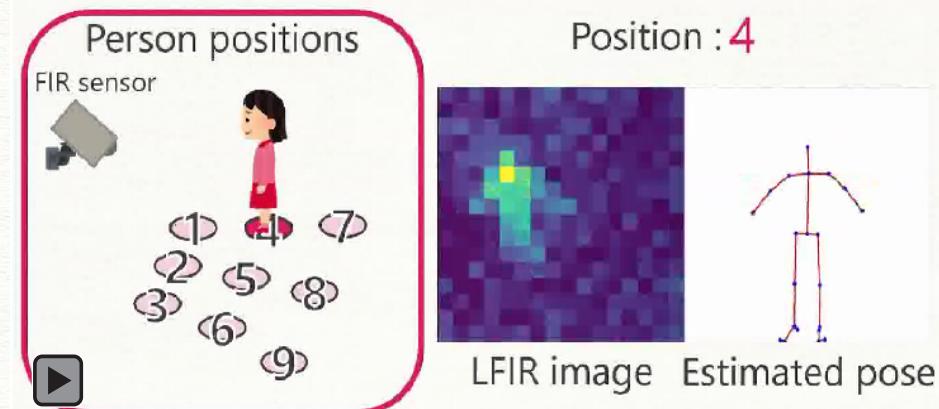
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Estimation results at various person positions

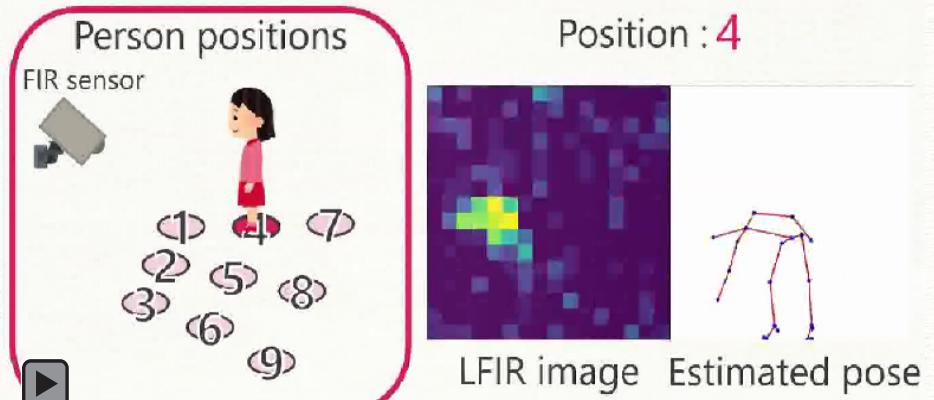
Action A Waving hands



Action B Deep breathing



Action C Picking up and putting down things



Action D Standing and sitting

