Supplementary Material for "Efficient Robust Principal Component Analysis via Block Krylov Iteration and CUR Decomposition"

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In this supplementary material, we present more experimental results which are not included in the main paper due to page limitation.

In this section, we conduct more experiments on the following five videos: $Candela\_m1.10$, $HallAndMonitor$, $HighwayI$, $HumanBody2$, and $IBMtest2$ from Scene Background Initialization (SBI) dataset[1].The performance measurements are: AGE, pEP, pCEP, PSNR, MS-SSIM, CQM, and TIME.

1. Candela_m1.10

The size of each frame of $Candela\_m1.10$ is 352×288. The foreground "man" keeps a long seated state in the video, which leads a ghost in the background in Fig. 1. PETRELS obtains best performance and IRCUR is fastest in Table 1. The proposed eRPCA obtains the similar results. In Fig. 1, eRPCA of each frame is more stable than PETRELS.

2. HallAndMonitor

The size of each frame of $HallAndMonitor$ is 352×240. Similarly, the man in white maintains the same position in the background, which leads a ghost. In Table 2, eRPCA obtains the best objective evaluation results. For visual results, eRPCA only has a ghost in the background, but other methods include more foreground information in the background shown in Fig. 2.

3. HighwayI

The size of each frame of $HighwayI$ is 320×240. This scene is easy to separate because the foreground "cars" move fast. In Fig. 3, the visual results are similar. In Table 3, the objective evaluations of eRPCA are better than others apart from AGE.

4. HumanBody2

The size of each frame of $HumanBody2$ is 320×240. Each frame is well separated by different methods in Fig. 4. In addition, the flashing light effect can be displayed in the foreground for eRPCA. In Table 4, eRPCA obtains better results.

5. IBMtest2

The size of each frame of $IBMtest2$ is 320×240. The scene is simple and most algorithms perform well in Fig. 5. PETRELS is sensitive to excessive reflections and much noise. It can be seen from 5 that the proposed eRPCA outperfroms other methods except for pCEPS.

6. Videos

In this supplementary material, we also present videos to verify the efficiency and effectiveness of the proposed method.

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[1]https://sbmi2015.na.icar.cnr.it/SBIdataset.html

Table 1. Performance of one frame from Candela_m1.10 dataset among different algorithms

	AGE	pEPs%	pCEPS%	MSSSIM	PSNR	CQM	TIME(s)
ARE-RPCA	4.8392	3.6725	2.2925	0.9358	27.0294	26.2677	9.9506
IRCUR	4.5591	3.705	2.1997	0.9312	26.5602	25.8461	**0.01288**
PETRELS	**4.4883**	**3.4515**	**1.9679**	**0.9435**	**28.2685**	**27.5266**	0.665746
ADW-RPCA	4.5088	3.7149	2.2372	0.9337	26.923	26.2355	3.758677
eRPCA	4.6558	3.5669	2.1001	0.9383	27.0326	26.2908	0.05646

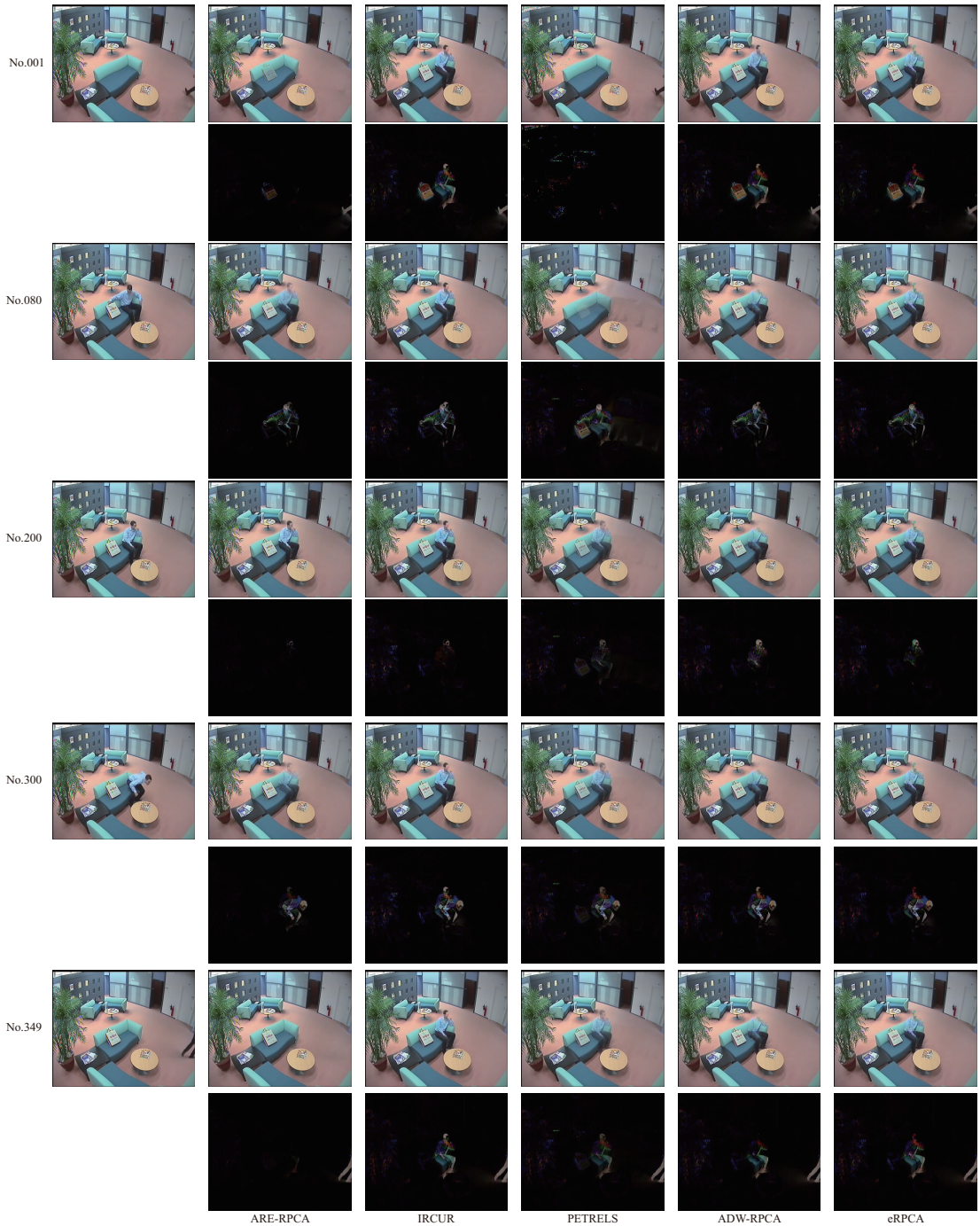

Figure 1. The comparison of visual results on Candela_m1.10 among different algorithms.

Table 2. Performance of one frame from HallAndMonitor dataset among different algorithms

	AGE	pEPs%	pCEPS%	MSSSIM	PSNR	CQM	TIME(s)
ARE-RPCA	3.922	2.4633	1.2464	0.953	29.7385	29.6704	7.99907
IRCUR	3.38	1.4228	0.651	0.9564	29.2765	29.0621	**0.01268**
PETRELS	12.2361	9.6165	4.014	0.8606	17.7815	17.351	0.94426
ADW-RPCA	3.3671	1.2559	0.5919	0.958	29.4232	29.3636	3.229358
eRPCA	**3.1321**	**1.0535**	**0.4273**	**0.9747**	**31.6776**	**30.9741**	0.051737

Figure 2. The comparison of visual results on HallAndMonitor among different algorithms.

Table 3. Performance of one frame from HighwayI dataset among different algorithms

	AGE	pEPs%	pCEPS%	MSSSIM	PSNR	CQM	TIME(s)
ARE-RPCA	2.387	0.151	0.013	0.9817	37.0762	36.7377	5.267023
IRCUR	**1.5779**	0.1901	0.0247	0.9899	39.436	38.9574	**0.00845**
PETRELS	4.3669	0.2917	0.0482	0.9622	33.6238	32.6101	0.506284
ADW-RPCA	1.8532	0.168	0.0182	0.9899	38.9903	38.711	1.589877
eRPCA	1.5939	**0.1458**	**0.0117**	**0.9901**	**39.6658**	**39.1678**	0.033886

Figure 3. The comparison of visual results on HighwayI among different algorithms.

Table 4. Performance of one frame from HumanBody2 dataset among different algorithms

	AGE	pEPs%	pCEPS%	MSSSIM	PSNR	CQM	TIME(s)
ARE-RPCA	8.6089	10.8971	7.0417	0.9335	22.8818	22.3712	9.725046
IRCUR	3.1827	0.6875	0.0378	0.9947	33.8956	32.8492	**0.00469**
PETRELS	14.467	15.776	9.9284	0.8428	17.8471	17.2904	0.448968
ADW-RPCA	3.1547	0.6016	0.0599	0.9943	33.7795	32.5693	2.769496
eRPCA	**3.1225**	**0.5352**	**0.0169**	**0.9954**	**34.3688**	**33.0228**	0.020845

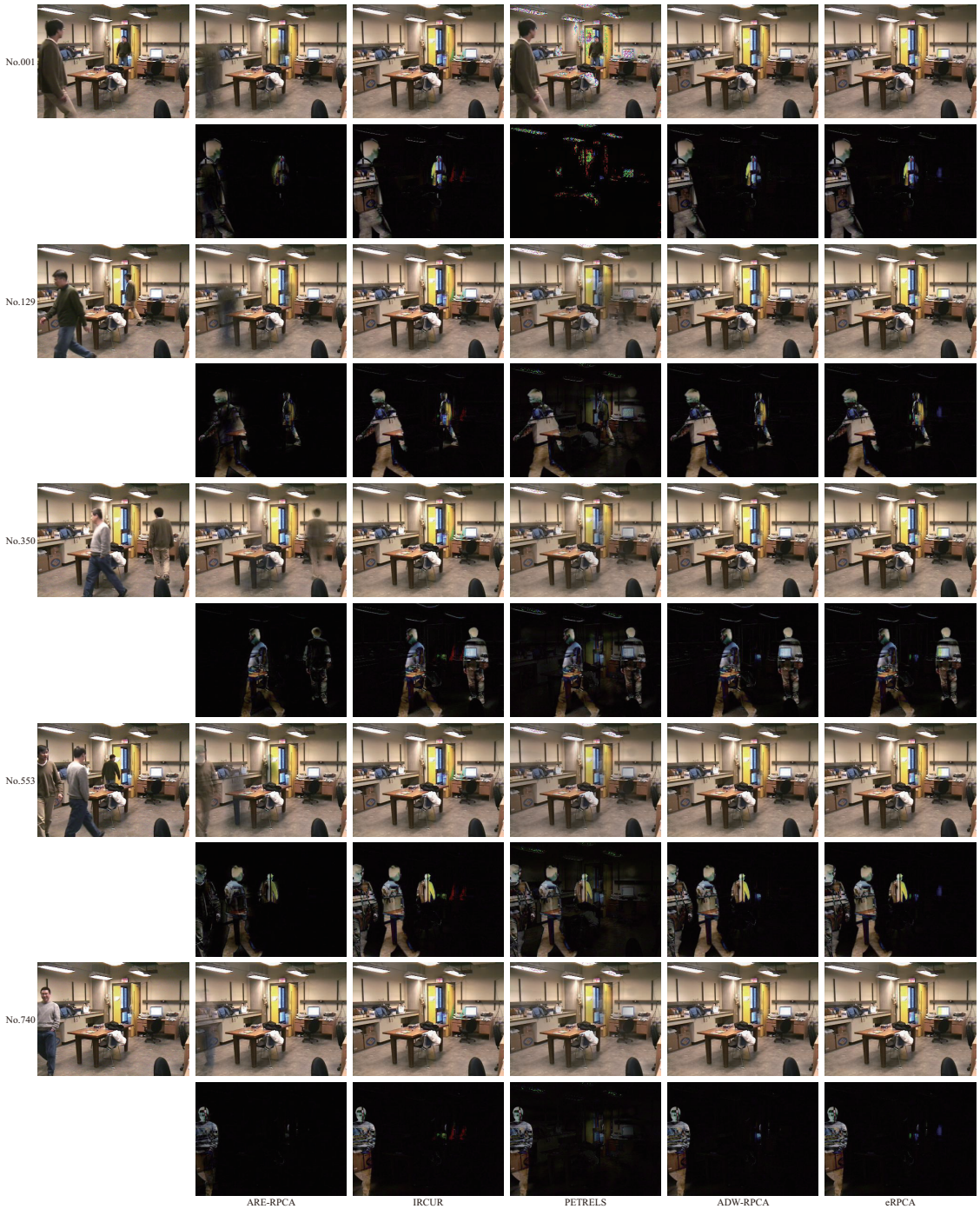

Figure 4. The comparison of visual results on HumanBody2 among different algorithms.

Table 5. Performance of one frame from IBMtest2 dataset among different algorithms

	AGE	pEPs%	pCEPS%	MSSSIM	PSNR	CQM	TIME(s)
ARE-RPCA	3.0977	**0.1016**	**0**	0.9932	35.3008	34.1	3.784217
IRCUR	2.8578	0.1250	**0**	0.9940	36.1595	34.9419	**0.03032**
PETRELS	9.3906	6.7891	1.5586	0.8637	19.7138	19.0021	0.44805
ADW-RPCA	3.089	0.1432	**0**	0.9936	35.5056	34.2255	3.137686
eRPCA	**2.7805**	**0.1016**	**0**	**0.9943**	**36.3659**	**35.1562**	0.10676

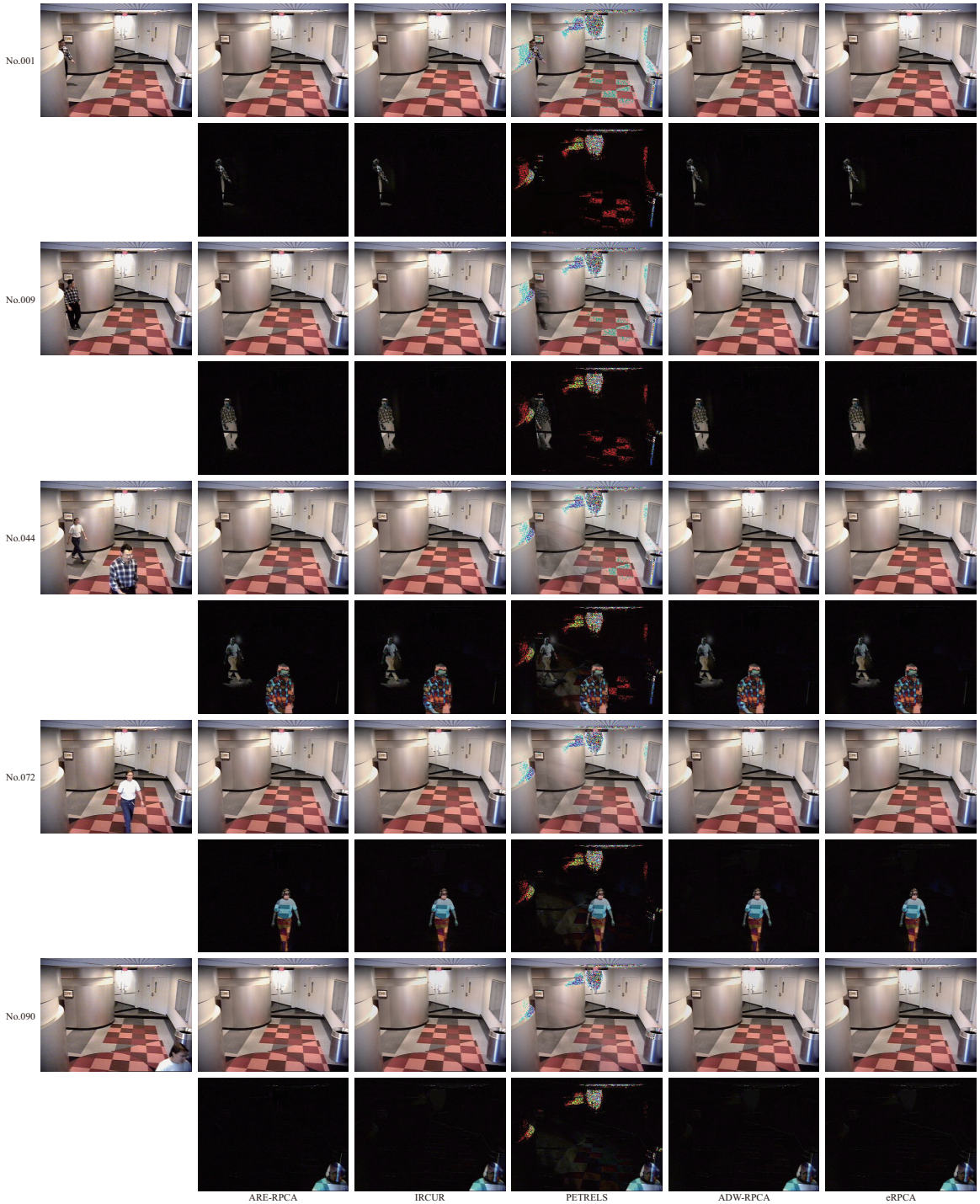

Figure 5. The comparison of visual results on IBMtest2 among different algorithms.