Moving-camera Video Surveillance in Cluttered Environments using Deep Features

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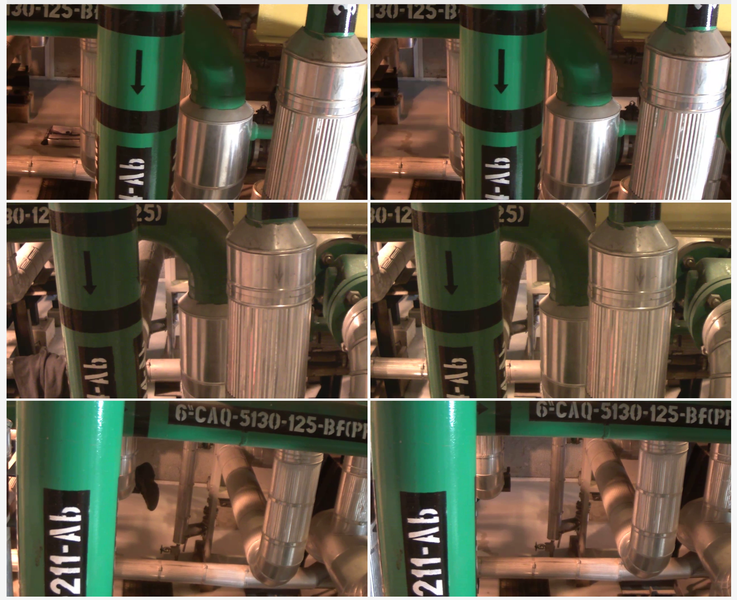
PROPOSED PIPELINE

- Anomaly detection in cluttered environments using videos acquired with a moving camera is a major unsolved issue
- New simple method of comparing a reference and a target video that uses ConvNets to leverage the robustness of the extracted features
- We investigate detection performance across layers as well as the influence of different classifiers

DATASET

- The Video Database of Abandoned Objects (VDAO) [1,2] consists of multiple videos recorded in a **cluttered industrial** environment with **camera moving** back and forth along a rail.
  - High resolution 1280x720 pixels
  - Different lighting conditions
  - Bounding-box annotation



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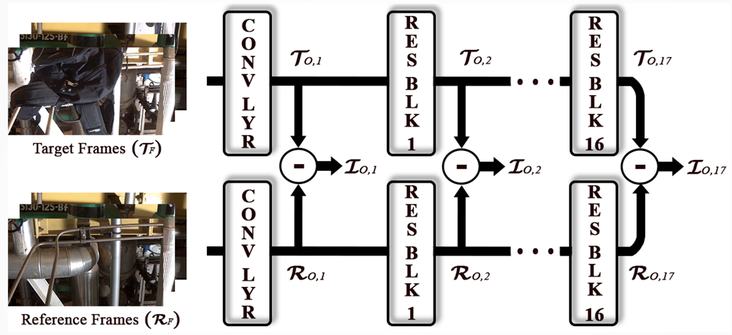
PROPOSED PIPELINE

Feature extraction

- Pre-trained ResNet50 [3]
- Siamese setup
- Feature map subtraction

Two different classifiers

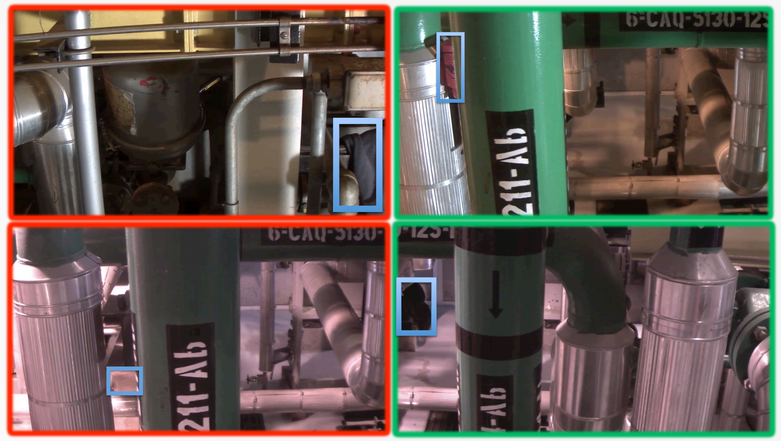
- MLP with 2 hidden layers
- Random forest with a maximum of 100 trees



RESULTS

	CNN+RF			CNN+MLP		
Layer	FP	TP	DIS	FP	TP	DIS
1	0.32	0.68	0.45	0.39	0.70	0.49
2	0.30	0.73	0.40	0.36	0.70	0.47
3	0.24	0.69	0.39	0.34	0.71	0.44
4	0.25	0.74	0.36	0.28	0.66	0.44
5	0.27	0.68	0.42	0.40	0.76	0.47
6	0.27	0.68	0.42	0.39	0.73	0.47

METHOD	FP	TP	DIS
STC-mc [4]	0.48	0.41	0.66
DAOMC [5]	0.89	0.46	0.47
MCBS [6]	0.99	0.98	0.98
mcRoSuRe-A [7]	0.95	0.37	0.37
CNN + MLP	0.66	0.28	0.44
CNN + RF	0.74	0.25	0.36



CONCLUSIONS

- State-of-the-art results
- Simple temporal consistency median filter reduces **DIS** by 4.4%
- The closest result to the ideal scenario on average for all test videos
- Shallower layers with considerably better results
- RF classifier gives better performance than MLP even though the latter is far more popular

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