Auxiliary Task-Guided CycleGAN for Black-Box Model Domain Adaptation

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Sensors / Semi- and Unsupervised Learning

Summary

- We analyzed the performance of CycleGAN [1] for unsupervised cross-sensor adaptation of a keypoint detection model, i.e., human pose estimation, across four different settings with varying domain shift.
- We show that unsupervised cross-sensor adaptation can be greatly improved by two simple modifications to CycleGAN, namely switching to a cyclical learning rate and adding a task-related auxiliary loss inspired by multi-task learning and self-supervision, even under the assumption that we have access to a black-box model only.
- We compare our method to the recent approach RegDA [2] for unsupervised domain adaptation for keypoint detection.

Method

- Inspired by multi-task learning, we define an auxiliary task and extend CycleGAN with additional auxiliary losses to support the transfer of task-related information.
- The auxiliary task is based on the predictions of the black-box source model on source domain data.
- The discriminators for source and target domain are forced to predict the auxiliary task besides performing domain discrimination.
- We introduce an additional discriminator D_{aux} to further support the transfer of the auxiliary task between domains.

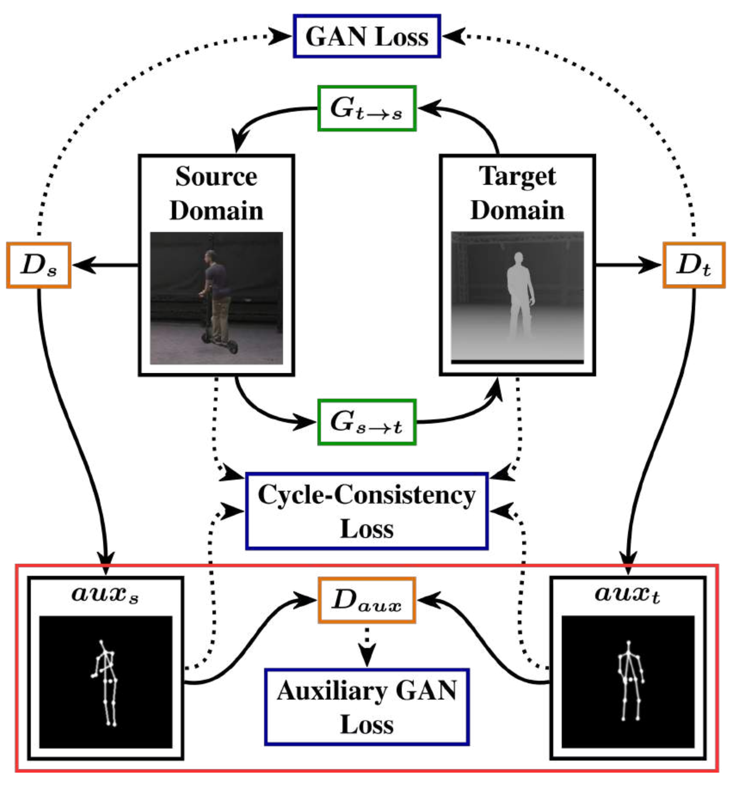


Figure 1: Overview of our proposed method. [3]

Experiments and Results

- We consider four different settings with varying domain shift for our domain adaptation experiments.
- We used our motion capture system to create a paired dataset especially targeted at sim-to-real domain adaptation. Paired data is only used for validation.
- Settings 1-3 are based on our dataset and
- setting 4 on SURREAL [4] and LSP [5].

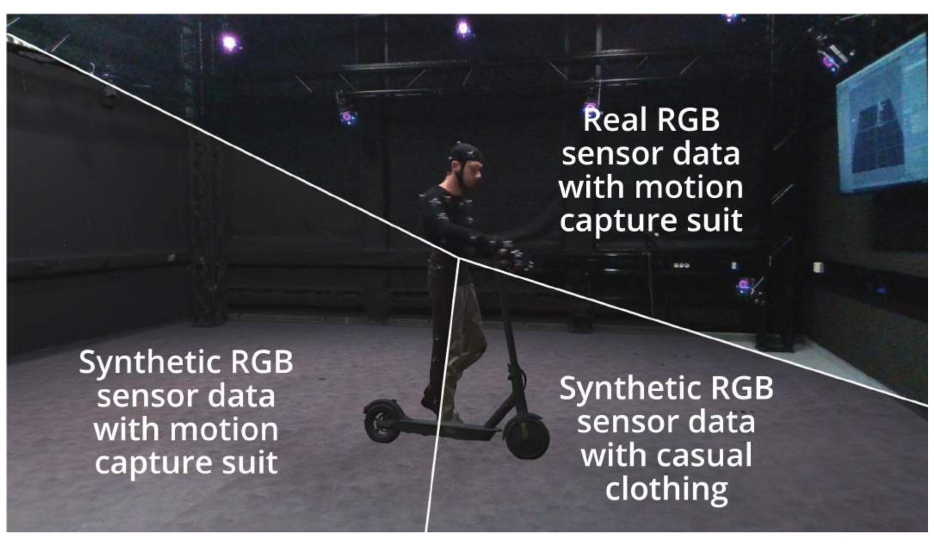
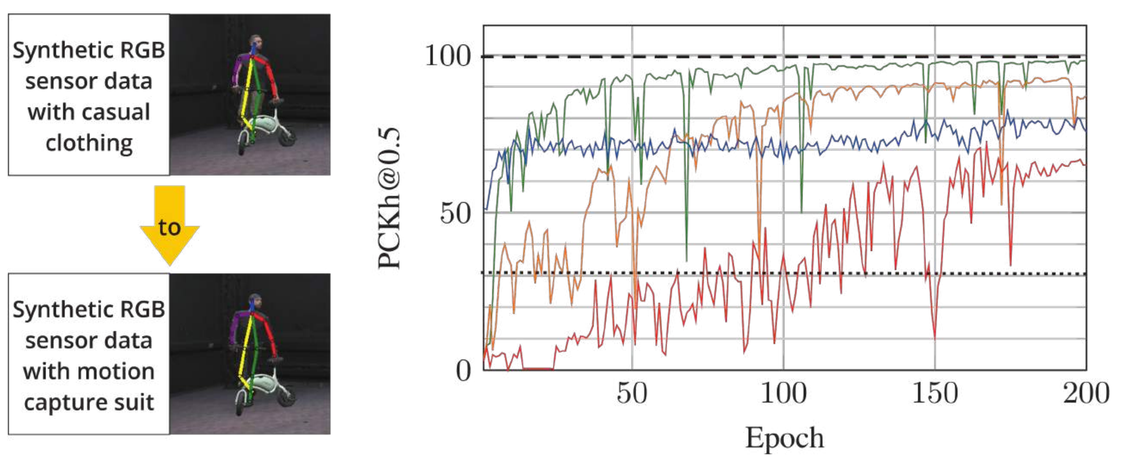
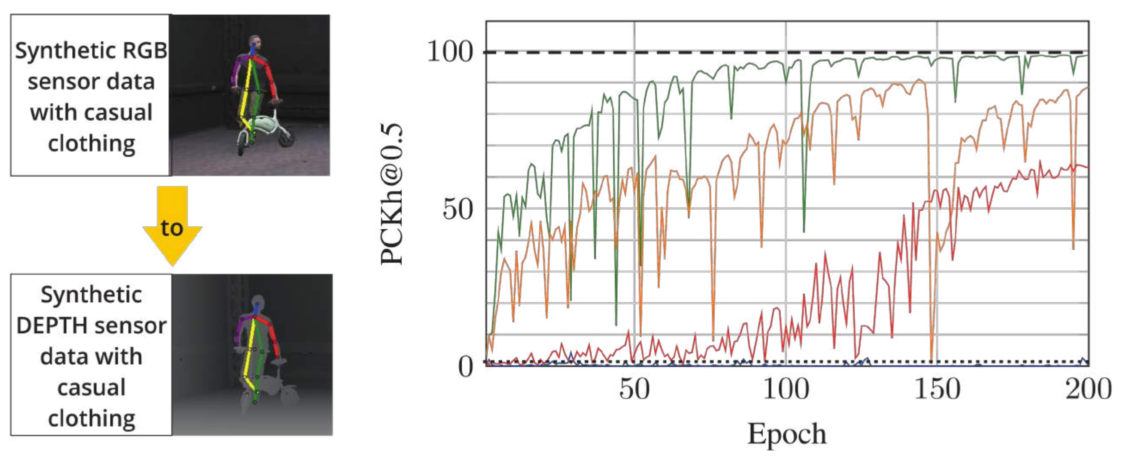


Figure 2: A sample of our dataset showing three different domains. [3]

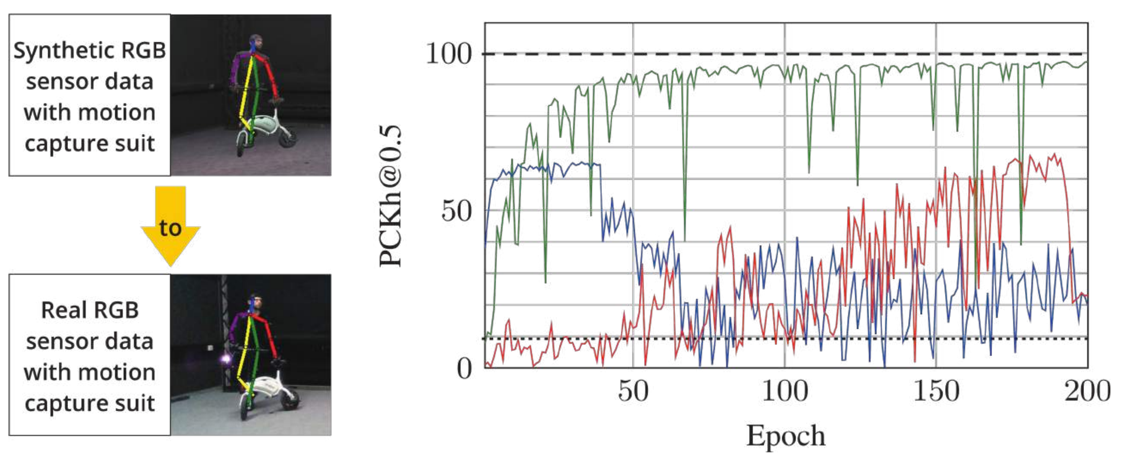
Setting 1



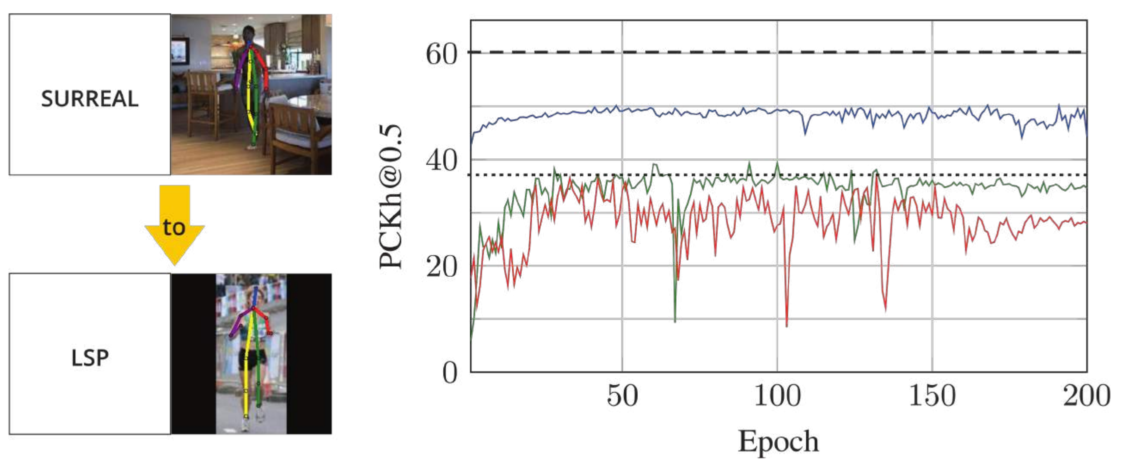
Setting 2



Setting 3



Setting 4



References:

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Partners

External partners

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