Model-based Outdoor Performance Capture

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Overview

Stage-I – Coarse Tracking
The coarse skeleton motion is tracked based on the approach from Stoll et al. [ICCV 2011]

\[ E_{m,3} = \left( \int \hat{g}_m(x) \hat{1}_n(x) dx \right)^2 = \frac{2(\sigma_{m}^2 + \sigma_{c}^2)}{\sigma_{m}^2 + \sigma_{c}^2} \ln \frac{\sigma_{m}^2 + \sigma_{c}^2}{\sigma_{m}^2} \]

Stage-II – Surface Refinement
Non-rigid cloth and soft tissue deformation is refined by maximizing the agreement between a fine-scale implicit surface representation and the image (without segmentation).

\[ E(v, \theta) = E_{surf}(v) + E_{cont}(v) - w_{skin} E_{skin}(v) - w_{smooth} E_{smooth}(v) \]

\[ E_{surf}(v) = \sum_{i} C(\delta_{n}) E_{n,i} \]

\[ E_{cont}(v) = \sum_{k} \sum_{i} C(\delta_{k}) E_{k,i} + (1 - C(\delta_{n})) E_{n,i} \]

Eskin is a regularization term that maintains the surface attachment to the skeleton and is used to refine the skeletal pose obtained at Stage I.

Es smoother regularizes unnatural surface deformations with a smoothness Laplacian prior term.

Results and Evaluation
We succeed in outdoor settings with high reconstruction quality, and show that we are on par with state-of-the-art methods on indoor scenes. We quantitatively assess the performance of our method using a silhouette overlap metric.