Manual for Human Tracking Software

Alexandru Balan
Department of Computer Science
Brown University
Providence, Rhode Island 02912
alb@cs.brown.edu

Version 2.b0.2 – July 03, 2009

1. Abstract

The HumanEva dataset is made available to the research community to support the development and comparison of algorithms that perform human motion capture from video. Here we describe a basic Matlab implementation of a baseline algorithm that uses particle filtering to track a moving person in a sequence of multiple synchronized images. The method assumes known camera calibration and body dimensions.

2. Introduction

The software included in this package is provided for free for research purposes only*. It provides a basic Matlab implementation for tracking a moving person in a sequence of multiple synchronized images, with known camera calibration information and body dimensions. For bug reports, questions, suggestions and comments, feel free to email me at alb@cs.brown.edu. Improvement suggestions are welcome.

Published research reports using this code (or a modified version) should cite [1].

3. Method

Details of the algorithm used in our implementation will be presented in [1]. It is related to Deutscher's annealed particle filtering [2].

4. System Requirements

The software has been tested successfully in Matlab 7.4 under Linux and Windows.

Important note: The current version of the software (ver 2. and later) is not backward compatible to earlier versions (ver 1.0 and earlier). For reference, the earlier versions can be found here: http://www.cs.brown.edu/~alb/software.htm. Significant modifications have been made to the source code and to the function headers without changing the function names. If you already have ver1.0 or earlier, make sure none of its functions are on the Matlab path when using ver2. and later.

5. Packages and Installation

The code can be downloaded from:
http://vision.cs.brown.edu/humaneva/baseline.html

This code is configured to run on the HumanEva-II dataset:
http://vision.cs.brown.edu/humaneva/download2.html

Other standard Matlab packages needed are the Image Processing Toolbox, the Optimization Toolbox and the Statistics Toolbox.

6. Setting up the paths

Files:
./InitPath_EVA2.m

This file should contain the base location of the HumanEva-I and HumanEva-II datasets:

- EVA2_DATASET_BASE_PATH = ...

Optional: HumanEvaI dataset is needed only for training data for computing joint angle limits and dynamics.

- EVA_DATASET_BASE_PATH = ...

7. Release code to interface with the HumanEva-II dataset

Files:
./SupportCode/Release_Code_v1_1_alb/*

IMPORTANT: This version of Release_Code_v1_1_alb is derived from the original Source Code v.1.1 released on the HumanEva-II website, but it is totally incompatible with the original. The function names have been overloaded and the behavior was changed. Therefore this tracking code only works with Release_Code_v1_1_alb. It does not work with any release code from the HumanEva website.

8. Processing training data

Files:
./S01_1ProcessTrainSets.m
./S01_2ProcessTestSets.m
./S02_LearnModelParameters_AngStat.m
./S03_LearnModelParameters_LIMBS.m

- Extract limb lengths and joint angles from motion capture data (c3d).
- The training data is used for computing joint angle limits and dynamics (HumanEvaI).
- The test data is used for initializing the tracker in the first frame (HumanEva-II)

- These have been pre-computed and saved in ./ProcessedData.

9. Setting Tracking Parameters

Files:
./R_baseConfigScript.m or R_quickConfigScript.m
./Track.m

- Track(options) is the main tracking application that takes a configuration structure *options*.
- R_baseConfigScript is a script that configures the base configuration before running Track()
- R_quickConfigScript is a script that configures a quick configuration for demo purposes. It runs faster and for only 10 frames, but the tracking results are not as good.

options.SEQ	= 1 or 2, corresponding to S2 and S4 respectively in the HumanEvaII dataset.
options.LIKELIHOOD	= typically either {'edge','silhouette'} or {'allfg'} • allfg - uses a bi-directional symmetric silhouette matching (slower) • silhouette - uses a uni-directional asymmetric silhouette matching (faster); typically combined with edges
options.ACT_KNOWN_FOR_PRIOR	= 'Generic' or 'Walking' or 'WalkingJog'
options.PRIOR	= typically {'range','intersect'} or any subset • range - enforce joint angle limits • intersect - prevent limb interpenetration
options.NUM_PARTICLES	= 200 - number of particles per layer
options.NUM_LAYERS	= 5 - number of annealing layers
options.VIEWS	= 1:4 - list of camera views to use for tracking

options.RESET_RANDOM_GEN	= true or false
	• Used for resetting the random number generator at the beginning of each sequence
	  • true -> seed=0
	  • false -> different seed each time

options.FREEZE_LEAF_JOINTS	= true or false • The optimizer optimizes only a reduced set of joint angles that excludes twists for the elbows, knees and head
options.UNTWIST_HIPS	= true or false • Since the knee has one major degree of freedom, you may want to un-twist the hips in the first frame to align with the flexing knee
options.SHOW_MEANPOSE	= true or false • Shows the result while each frame is processed

10. Results

```
Files:
    ShowResults.m
    animate3Dskeleton.m

ShowResults(rezFile,0);
animate3Dskeleton(rezFile,'skip',1);
```

11. Quick Demo

- Download HumanEvaII data (http://vision.cs.brown.edu/humaneva/download2.html)
- Edit InitPath_EVA2 to point to it
- Run R_quickConfigScript.m (it will run for 10 frames)
- ShowResults(rezFile,0);
- animate3Dskeleton(rezFile,'skip',1);

12. References

[1] L. Sigal, A. O. Balan and M. J. Black. HumanEva: Synchronized Video and Motion Capture Dataset and Baseline Algorithm for Evaluation of Articulated Human Motion. *To appear.*

[2] J. Deutscher and I. Reid. Articulated Body Motion Capture by Stochastic Search. *IJCV*, 61(2):185-205, 2005.

13. Copyright