HDM12 Dance

Documentation on a Data Base of Tango Motion Capture

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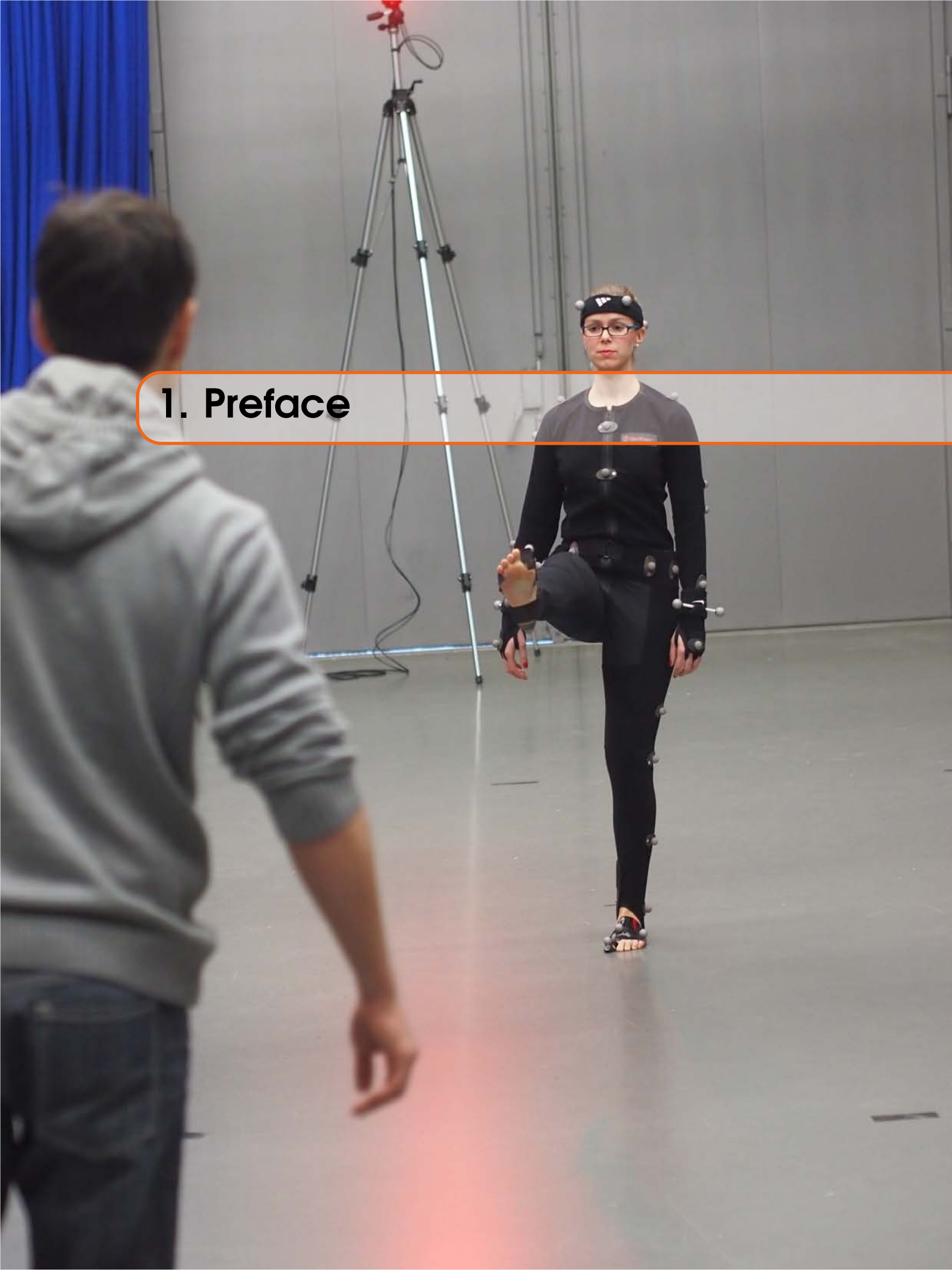


1. Preface

The term *Motion Capture (MoCap)* often refers to recording actions of human actors and implies using the information thus gained to animate digital character models in 2D or 3D. That is, one of its more popular uses is data-driven synthesis of realistic motion sequences in computer animation. Modern MoCap systems allow for tracking and recording the motion of animated subjects such as humans, animals or robots at high spatial and temporal resolutions. MoCap data is widely used for analysis of human and animal motion in fields such as medicine and sports for different purposes such as rehabilitation, diagnostics and increasing physical performance and fitness.

There is a growing amount of MoCap data of single subjects performing various movements ranging from every day activities to performing arts and physical exercise. However, the academic research community still lacks publicly available MoCap data of more interactive activities such as martial arts and dance. Such data collections would be a valuable resource of data for advanced research in motion analysis, retrieval and classification, and also for applications of motion synthesis. Providing a documented set of partner dance MoCap data for use by the research community is the goal of the motion capture data base HDM12.

The HDM12 data base contains more than 90 minutes of Argentine Tango dance sequences [1] recorded of 11 different dance couples (22 subjects). The data produced in the recordings can be described as 3D point-cloud trajectories over time and are provided both in the C3D as well as ASF/AMC format to support point-cloud based as well as as skeleton-based representation. A total of 149 motion clips are available containing between 21 and 78 seconds of motion data. Documentation of dance movements and figures is available for each dance sequence. Also, characteristics of dancers such as physical dimensions and level of expertise are documented for each subject in the data base.

In this documentation, we give a detailed description of the recordings in the MoCap database HDM12. Chapter 2 gives a general introduction of MoCap techniques as well as a survey of data bases and related work available to date. A documentation of technical details of recording and storing the data base is given in Chapter 3. Finally, Chapter 4 holds information on all dance couples as well as information on all available data clips and some documentation of Argentine Tango movements.

We appreciate any comments and suggestions that may help us improve the documentation of our data base.

Anna Vögele & Dr. Björn Krüger, July 2016

[1] The MoCap data was recorded at the Hochschule der Medien (HDM) in 2012 under the supervision of Bernhard Eberhardt and Jochen Bomm

2. Motion Capture

2.1 Contributors

The HDM12 Tango database has been designed and set up under the direction of Anna Vögele, University of Bonn, Germany, and Björn Krüger, Gokhale Method Institute, Palo Alto, CA, USA.

The motion capturing has been conducted at the Hochschule der Medien, Stuttgart, supervised by Prof. Dr. Bernhard Eberhardt and Jochen Bomm. HDM12 is a collaboration of the following three research groups:

1. Prof. Dr. Bernhard Eberhardt, Hochschule der Medien, Fachhochschule Stuttgart, Germany.
2. Prof. Dr. Andreas Weber, "Multimedia, Simulation and Virtual Reality", Computer Science Dept. II, University of Bonn.
3. Dr. Björn Krüger, Gokhale Method Institute, Stanford CA, United States.

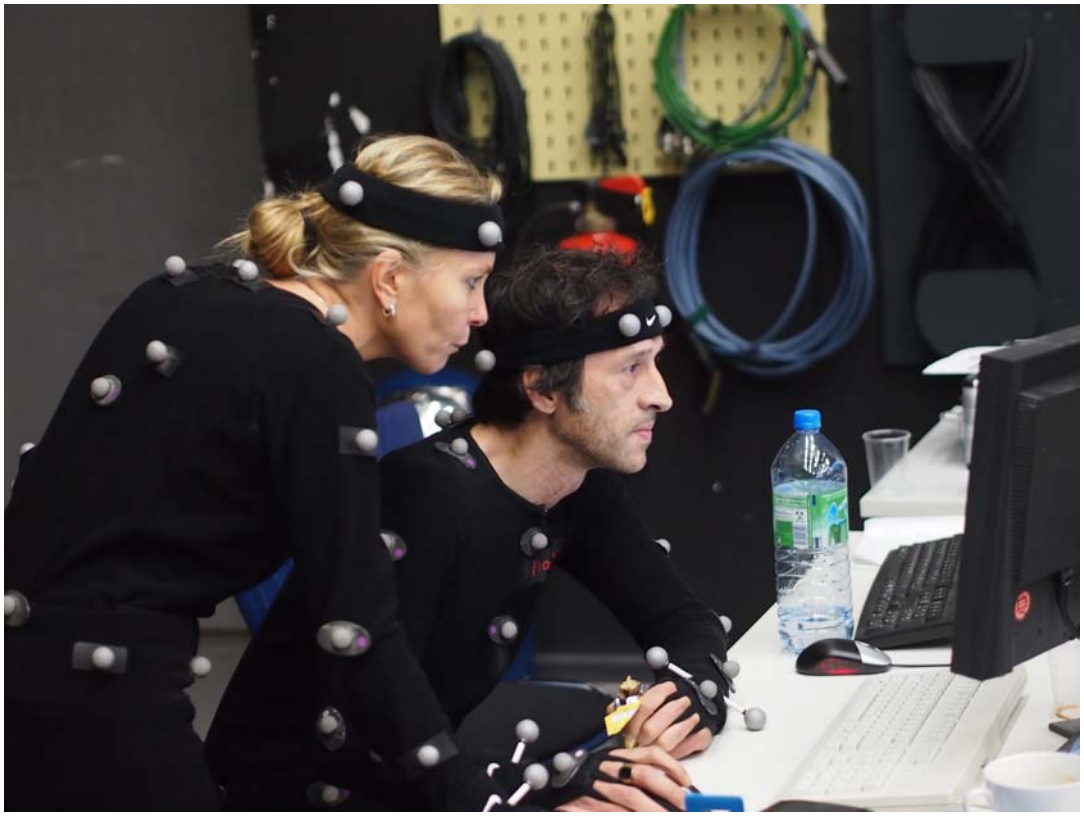
The contributors are listed in alphabetic order: Jochen Bomm (supported calibration, markering and setup), Bernhard Eberhardt (provided the opportunity to record in the HDM's MoCap studio), Björn Krüger (design, expertise, acquisition), Anna Vögele (design, execution, acquisition, scripts, cleaning), Andreas Weber (expertise and financial support). The dancers of Tango Ocho Stuttgart supported the recording of motion data by showing off their skills, by dancing for science and by patiently enduring suits, markers, waiting time and all.

For comments and suggestions for improvement please contact

- Anna Vögele **voegele.cs@gmail.com** or
- Dr. Björn Krüger **kruegerb.cs@gmail.com**

2.2 Capturing Human Motion Data

This section is dedicated to the introduction of MoCap and the MoCap data bases that are available. A brief introduction of how optical MoCap works is given in Section 2.2.1 An overview of the publicly available MoCap data bases is found in Section 2.2.2. Sections 2.2.3 and 2.2.4 discuss their impact and some related work.



2.2.1 Introduction to Optical Motion Capture

MoCap systems capture data by two or more (typically up to 48) cameras to triangulate the 3D position of a subject by overlapping projections. The space between the cameras is called the *capture volume*.

Recording movement of objects or humans with the help of cameras and reflective markers is called *passive* optical MoCap - as opposed to *active* optical MoCap. Passive optical systems use rubber ball markers that are coated with a retro-reflective material which makes them reflect light. Sources of light are usually placed near the cameras' lenses. The cameras are calibrated in such a way that they sample only the bright reflective markers and no other materials such as skin, fur, fabrics or floors and walls. Actors subject to a MoCap recording typically wear velcro suits that have the retro-reflective markers attached to them. However, markers may also be attached to skin or other surfaces. An object with markers attached at known positions is used for calibration of cameras. Common optical systems capture large numbers of markers at frame rates usually around 120 to 160 frames per second at a high spatial resolution (less than a millimeter). This makes passive optical MoCap a very accurate, flexible and popular type of MoCap. Since all markers have the same appearance, additional software and processing are needed in order to track markers correctly and consistently over time.

2.2.2 Publicly Available MoCap Data Bases

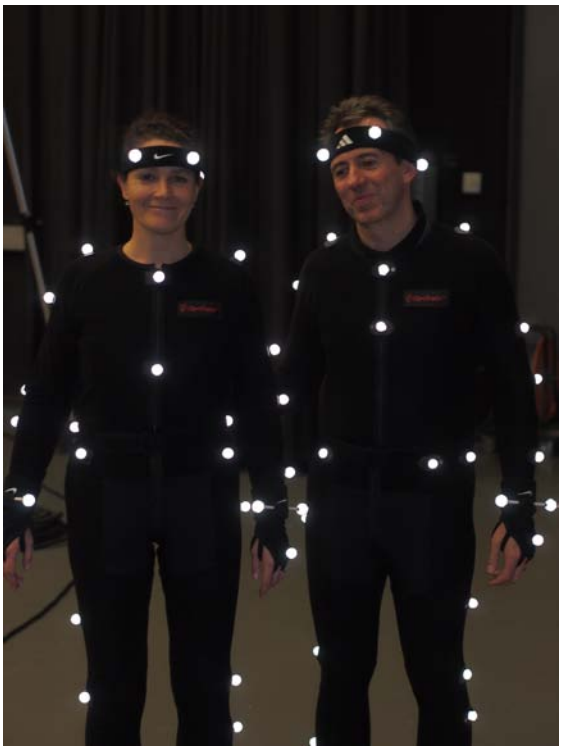
There is a growing amount of publicly available MoCap data of single-actor movement. An overview on existing MoCap data bases is found in the article by Mandery et al. [Man+]. In the following, a list of well-known MoCap data bases is given.

1. The Carnegie Mellon (CMU) MoCap data base [CMU13] contains mostly single

actor movements of over 100 subjects associated with a variety of activities ranging from dance to cooking, but also a number of two-subject interactions such as handshakes or throwing/catching a ball. A total of 2605 trials in 6 categories is currently available. Data are available in the C3D as well as in ASF/AMC format.

2. The HDM05 data base [Mül+07] contains motions of 5 male actors from categories like locomotion, exercise, and every-day movement. Data are available in the C3D as well as in ASF/AMC format.
3. The Pollick Lab Body Movement Library [MPP06] contains movement of 30 actors (15 female). Actions present in the data base belong to categories such as locomotion and social interaction, and are combined with emotion such as happy or sad. All data files are available in the text-based CSM format.
4. The Leuven Action Database consists of both 3-D coordinate-files and movie-files showing 22 short "loopable" actions from various viewpoints. The database is described in more detail in Vanrie and Verfaillie [VV04].
5. The ICS Action Database [MST03, MST03] of the Shimosaka Research Group contains publicly available data of single subjects performing every-day tasks and gestures. All data are available in the BHV format.
6. The 'Human Eva' data sets [SB06] contain synchronized video and motion capture data of multiple actors.

There are very few MoCap data sets available that feature human interaction between two or more subjects as opposed to single-actor movement. Some examples of salsa dance as well as some martial arts are found in the CMU data base though [CMU13].



2.2.3 Impact

Due to the high cost and effort factors, only few institutions have MoCap systems of their own. However, comparing the results of different methods referring to publicly available motion data is vital. Moreover, available data sets trigger research in various scientific directions.

Data sets like the above ones are needed and frequently used for experiments and for reference.

Since the database HDM05 [Mül+07] was published in 2007, there have been more than 170 citations of this data set within a range of contexts. As there are very few data available of two-subject interaction, creating the HDM12 data base will provide the community with the opportunity to refer to data of interacting subjects in a similar way as for single subjects.

2.2.4 Methods and Applications

MoCap data are used for research in many areas. One example is research and development of multivariate time series segmentation methods [Krü+15; VKK14]. Another example is more general motion analysis such as identification of subgroups or classification[Ber+13; Wil+15]. Also, retrieval [Krü+10] and synthesis [Har+15; Krü12; Vög+12] are fields that benefit from being able to refer to standards established by known MoCap data bases [RKW16]. For an overview of the role of MoCap data in vison-based human motion analysis refer to the survey by Moeslund et al. [MHK06].

In the following, a portfolio of our own research in the field of multivariate time series, in particular motion data is given.

Kinematics-Based Analysis of Motion Data

Our work group has gained substantial knowledge on processing different types of motion data over the last decade. This includes the recording and managing (Riaz et al. [RKW15; RKW16], the analysis of existing data as well as the synthesis of novel motion contents.

The research focuses on efficient searches of data bases, reconstruction of motion from sparse sensor setups, motion analysis, motion synthesis with constraints, segmentation and visualization of multivariate time series and motion data.

Major advances of efficient searches were published by Krüger et al. [Krü+10]. The authors discuss a number of feature sets suitable for fast nearest-neighbor searches by means of kd-trees. The feature sets are evaluated with state of the art features and distance measures in the literature. Moreover, they introduce extensions of the technique to pose-based searches for sequences. These techniques are based on so called lazy neighborhood graphs (LNGs) and are a means to transfer data-driven techniques to larger data bases.

The software *MotionExplorer* was created and published by Bernard et al. [Ber+13] in cooperation with the Fraunhofer IGD in Darmstadt, Germany, enabling interactive search and analysis of MoCap data bases. The concept was extended to the analysis of quadruped motion data by the software *FuryExplorer* [Wil+15]. Bernard et al. [Ber+16]

With the fast similarity search algorithms in hand motion data can be easily tested for cyclic components. This allows for fast automatic segmentation of longer sequences into semantically meaningful subsequences and transition phases. [VKK14] Even more fine-granular segmentation is achieved when mirrored poses are used in addition to the original poses, thus enabling segmentation of phase-shifted primitive motion sequences such as right and left steps.

The primary goal of the work of Vögele et al. [Vög+12] is the data-driven synthesis of new motion data from existing recordings. Their approach is learning linear models describing the relationship between low-dimensional motion data and mesh animations in order to generate new motion sequences. Synthesis of motion sequences meeting various numerical and semantic constraints is the focus of the paper of Hartmann et al. [Har+15]. The authors propose an approach based on efficiently grouping the segments instead of creating a search structures for the entire set of segments. This results in smaller graphs that can be used to efficiently find optimal solutions.

Reconstruction from Accelerometers

Reconstruction of full-body motion from sparse setups of only four accelerometers is an important result of research by Tautges et al. [Tau+11]. The lazy neighborhood graph (LNG) used in their approach was extended to an online version for real-time analysis of

motions in a data base of local acceleration data without any additional information on orientation. The results of the experiments showed that even with this very sparse setup it was possible to reconstruct full-body poses. Extensions of the algorithm also facilitate robustly estimating ground contact information thus further advancing the estimation of poses [Ria+15].

Reconstruction and Analysis Based on Video Data

Reconstruction and analysis of motions from data of a single RGB camera is another interesting related research topic. The works of Yasin et al [Krü+14a; YKW13] demonstrate how extremities of humans and animals may be tracked by MSCR and SURF features and used for searches in MoCap data bases. Exploiting the projection of formerly reconstructed poses and their k nearest neighbors makes the feature-tracking algorithm more robust [YKW14; Yas+15]. This method also enables stabilization of 2D pose tracking [Yas+16].

Interdisciplinary projects such as with the polysomnographic clinic of the Charité in Berlin, Germany show that our methods can contribute to the analyis of human sleep stages based on RGBD videos [Krü+14b; Krü+14c].

3. Recording The HDM12 Data Base

3.1 Recording Setup

The HDM12 data base was recorded using a Vicon MX system [Pea05] based on an optical marker-based technology. Each actor is equipped with a set of 46 retro-reflective markers attached to a suit. A detailed description of the marker positions is given in Table 3.1. The markers are attached to a velcro suit (suits by Optitrack, [Poi09]), respectively to terry cloth head bands and the actors' shoes.

Tracking is done by an array of twelve high-resolution cameras at a frame rate of 128 frames per second. Six of the twelve cameras operate in the visible red range and another set of six cameras operate in the infrared range. The camera setup covers a viewing volume of approximately five meters in diameter. The 2D images of the marker positions obtained by the cameras are used to reconstruct the 3D marker positions. After the 3D reconstruction, the data are cleaned by a semi-automatic gap filling algorithms exploiting kinematic constraints (see Section 3.2).

All recorded motion is based on the movements presented by the couples performing their own dance routines. Each of the couples was asked to combine groups of steps following a list of typical steps and figures. Also, each couple was asked to repeat the sequences several times. A description of typical steps and figures of Argentine Tango is found in Table 4.13.

3.2 Data Processing

Cleaning data is necessary to account for all markers throughout each sequence. It helps identify and eliminate defects due to marker occlusions and tracking errors, to fill temporal gaps, and to filter the resulting trajectories. The Vicon iQ software [Pea05] is used for all steps associated with data cleaning. It outputs a 3D trajectory stored as a C3D MoCap file (described also in Section 3.3.1). Finally, conversion with Vicon Body Builder maps the motion to a pre-defined skeleton avatar which is then converted to an ASF/AMC file (described in Section 3.3.2)

3.3 Data Formats

The HDM12 data base provides each available motion sequence in two different versions, as a C3D file and as ASF/AMC files. The C3D data format holds the raw 3D biomechanics

Table 3.1: Table of all 46 optical markers and descriptions of their locations

Name	Location	Name	Location
RFHD	Right front head	LFHD	Left front head
RBHD	Right back head	LBHD	Left back head
RSHO	Right shoulder	LSHO	Left shoulder
C7	Cervical vertebra 7	T10	Thoracic vertebra 10
CLAV	Clavicule	STRN	Sternum
RBAC	Right back	LBAC	Left back
RUPA	Right upper arm	LUPA	Left upper arm
RELB	Right elbow	LELB	Left elbow
RWRI	Right forearm	LWRI	Left forearm
RWRB	Right wrist, distal	LWRB	Left wrist, distal
RWRA	Right wrist, proximal	LWRA	Left wrist, proximal
RFIN	Right hand, dorsal	LFIN	Left hand, dorsal
RMWT	Right waist	LMWT	Left waist
RFWT	Right waist, front	LFWT	Left waist, front
RBWT	Right waist, back	LBWT	Left waist, back
RHIP	Right thigh	LHIP	Left thigh
RKNE	Right knee	LKNE	Left knee
RSHN	Right shin	LSHN	Left shin
RANK	Right ankle	LANK	Left ankle
RTOE	Right hallux (big toe)	LTOE	Left hallux (big toe)
RMT1	Base of right hallux	LMT1	Base of left hallux
RMT5	Base of right little toe	LMT5	Base of left toe
RHEE	Right heel	LHEE	Left heel

data of both dance partners per trial. ASF and AMC files are provided storing the skeleton respectively motion for each partner separately. In the following, a brief overview on the two formats and their usage is given.

3.3.1 The C3D Format

The C3D (Coordinate 3D) format has become a standard for the storage and exchange of raw 3D biomechanics data since its introduction in the 1980ies. This file format allows storage of different modalities of motion data and their associated parameters within a single file instead of needing separate files for different data modalities and parameters.

3.3.2 The Acclaim ASF/AMC Format

ASF/AMC is a motion capture data format designed by the former game company Acclaim. It was developed for creating animated skeletons from optical tracker data. The format comprises two files, one for storing the *skeleton* (ASF file, *Acclaim Skeleton File*), one for storing the *motion data* (AMC file (*Acclaim Motion Capture data*). This makes sense because mostly, a single skeleton fits many different motions, e. g. all trials of one subject.

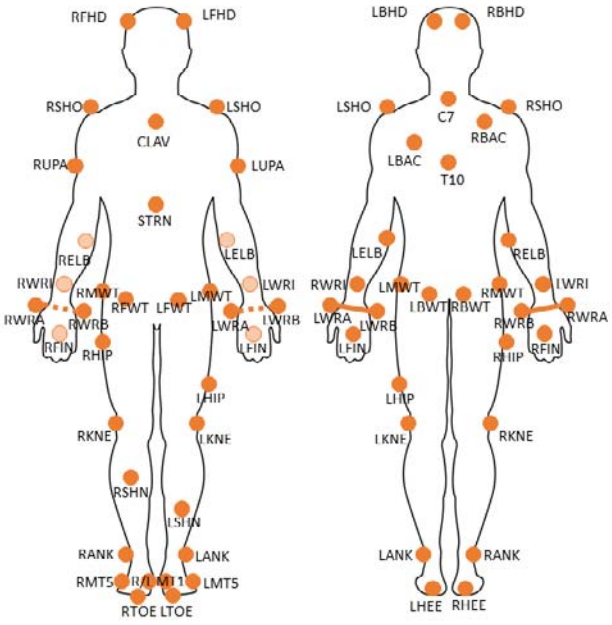


Figure 3.1: Markering of the full body: Front view and Back view

Figure 3.5: Markering of the left foot

In the ASF file, a canonical pose is defined the for skeleton. From this initial pose, the motion data can be applied in order to animate the skeleton. Each part of the skeleton contains information on the representation of the skeleton as well as on details used for further processing such as dynamics, inverse kinematics or skinning. Such information can be orientation of the segment or bone, its length, units, and degrees of freedom. Each skeleton must contain only one root and must be continuous in the sense that there are no gaps between its individual segments. An exemplary ASF file is found in Table 3.2. As can be seen, keywords always start with a colon ":". This colon indicates global values or beginnings of new data sections. In the example in Table 3.2, the version (":version") is 1.10, the name (":name") is VICON.

The ":root" section defines the root segment of the skeleton hierarchy. There is no information on direction and length. The "axis" and "order" keywords give the rotation order of the root object, respectively the channels of motion applied to the root in the way they are referred to in the AMC file. The "position" and "orientation" keywords indicate the starting position and orientation of the root. These are typically, but not necessarily,

Figure 3.2: Markering for both partners from the front an from behind

zero.

The "bonedata" keyword indicates the beginning of a section describing each of the segments hierarchically. That is, each section defined by a "begin" and "end" phrase represents one segment of the skeleton giving information on its id, name, location etc.

The AMC file contains the motion data for a skeleton given by an ASF file. An exemplary representation of an AMC file is found in Table 3.3. As can be seen, the motion is given in the AMC file by blocks of rows comprising a data sample (e. g. all data points) at a given time. Each block consists of a number of lines specifying each segment animated at the time of the sample. The beginning of a sample is denoted by the frame (sample) number. Each segment is listed with the according numbers (coordinates of location) in the order specified by the "dof" (degrees of freedom) keyword in the associated ASF file.

Together, the ASF and AMC file can be used to display the full motion of the skeleton.

Table 3.2: ASF Example File

```
# AST/ASF file generated using VICON BodyLanguage
# - – - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
:version 1.10
:name VICON
:units
   mass 1.0
   length 0.45
   angle deg
:documentation
.ast/.asf automatically generated from VICON data using VICON BodyBuilder and BodyLanguage model
FoxedUp.MOD
:root
   order TX TY TZ RX RY RZ
   axis XYZ
   position 0 0 0
   orientation 0 -0 0
:bonedata
   begin
      id 1
      name lhipjoint
      direction 0.563964 -0.7194 0.405473
      length 2.26885
      axis 0 -0 0 XYZ
   end
   begin
      id 2
      name lfemur
      direction 0.34202 -0.939693 0
      length 6.85335
      axis 0 -0 20 XYZ
      dof rx ry rz
      limits (-160.0 20.0)
             (-70.0 70.0)
             (-60.0 70.0)
   end
   ...
   begin
      id 30
      name rthumb
      direction -0.707129 -4.07629e-005 0.707085
      length 0.796426
      axis -90 -45 -2.19362e-014 XYZ
      dof rx rz
      limits (-45.0 45.0)
             (-45.0 45.0)
   end
:hierarchy
   beginv       root lhipjoint rhipjoint lowerback
      lhipjoint lfemur
      lfemur ltibia
      ltibia lfoot
      lfoot ltoes
      rhipjoint rfemur
      rfemur rtibia
      rtibia rfoot
      rfoot rtoes
      lowerback upperback
      upperback thorax
      thorax lowerneck lclavicle rclavicle
      lowerneck upperneck
      upperneck head
      lclavicle lhumerus
      lhumerus lradius
      lradius lwrist
      lwrist lhand lthumb
      lhand lfingers
      rclavicle rhumerus
      rhumerus rradius
      rradius rwrist
      rwrist rhand rthumb
      rhand rfingers
   end
```

Table 3.3: AMC Example File

```
#!OML:ASF E: . . . \ hdm12_dance \ couple01_f.ASF
:FULLY-SPECIFIED
:DEGREES
1
root 7.85027 17.5027 16.6772 -163.911 50.7263 -177.252
lowerback -15.6161 0.807961 -1.25786
upperback -6.25965 1.76374 0.784922
thorax 2.05467 1.1369 1.84021
lowerneck -9.37314 -4.06043 -6.23779
upperneck 29.2939 -3.34887 0.833475
head 11.1647 -1.57496 1.07153
rclavicle 2.54444e-014 -9.14409e-015
rhumerus -5.091 -28.7394 -5.61132
rradius 20.1982
rwrist 30.9216
rhand -21.3248 -15.9603
rfingers 7.12502
rthumb 5.06074 -45.8798
lclavicle 2.54444e-014 -9.14409e-015
lhumerus -0.81904 22.6419 11.118
lradius 21.1847
lwrist -20.1513
lhand -18.1385 19.7432
lfingers 7.12502
lthumb 8.13668 49.5666
rfemur -17.3979 -8.40014 15.5875
rtibia 17.3161
rfoot -9.79018 1.35764
rtoes -31.2481
lfemur -22.7607 9.59039 -15.6172
ltibia 31.6952
lfoot -17.5394 5.14662
ltoes -22.3457
2
root 7.84993 17.4969 16.6782 -164.088 50.8052 -177.387
lowerback -15.5815 0.703569 -1.44499
upperback -6.14987 1.6344 0.968634
thorax 2.14622 1.0699 2.11803
lowerneck -9.66865 -3.94346 -6.53923
upperneck 29.3627 -3.08366 0.777048
head 11.2487 -1.49788 1.13143
rclavicle -9.54166e-015 -1.07344e-014
rhumerus -4.39304 -29.7311 -5.89612
rradius 20.0666
rwrist 31.7225
rhand -21.3114 -15.8838
rfingers 7.12502
rthumb 5.07367 -45.8031
lclavicle -9.54166e-015 -1.07344e-014
lhumerus -1.22895 23.2972 11.1287
lradius 21.1329
lwrist -20.4851
lhand -18.2021 19.6628
lfingers 7.12502
lthumb 8.07532 49.4885
rfemur -17.337 -8.49148 15.5145
rtibia 17.3473
rfoot -10.0015 1.05049
rtoes -31.6475
lfemur -22.6772 9.61817 -15.6979
ltibia 31.6884
lfoot -17.6512 4.86648
ltoes -22.1422
. . .
4080
root 6.81214 17.53 26.4851 -342.161 -228.956 -356.848
lowerback -17.2644 0.285063 -2.44427
upperback -6.33185 1.33545 1.00777
thorax 2.83168 0.956347 2.71791
lowerneck -10.9866 -3.97009 -6.0589
upperneck 28.1433 -3.99497 2.95417
head 11.1011 -1.66276 1.69153
rclavicle -2.22639e-014 -1.15295e-014
rhumerus -13.612 -27.8193 -2.48409
rradius 22.0191
rwrist 25.6411
rhand -18.5415 -16.8429
rfingers 7.12502
rthumb 7.74771 -46.681
lclavicle -2.22639e-014 -1.15295e-014
lhumerus -6.97474 22.699 4.20373
lradius 19.4736
lwrist -14.4233
lhand -20.8445 21.8646
lfingers 7.12502
lthumb 5.52446 51.7726
rfemur -23.3554 -20.4687 23.4869
rtibia 22.3528
rfoot -12.4281 14.6621 rtoes -24.5825
lfemur -26.226 12.9479 -19.0325
ltibia 33.6668
lfoot -19.0461 -2.79282
ltoes -24.025
```

Figure 3.3: Two partners dancing in open embrace

Figure 3.4: Two partners dancing in close embrace

4. Documentation of Subjects and Trials

4.1 Subjects and Couples

All in all, there are 11 couples in the data base, i. e. 22 subjects who are at different levels of expertise in Argentine Tango. All couples consist of a leading part (man) and a following part (lady). Only one couple are teachers of Argentine Tango. Table 4.1 shows an overview of all subjects taking part in the recording sessions along with their body measurements. The average height of the men is 180.9 cm (average weight: 76 kg), average height of the ladies is 163.8 cm (average weight: 57.4 kg).

4.2 Trials Per Couple

In the acquisition of Argentine Tango movements, a total number of 149 trials comprising 701831 frames, i. e. 5848.60 seconds (97.48 minutes) of dance MoCap data was recorded. Each trial comprises the synchronous motion of the two partners. Both partners always start and end in a T-pose (if not otherwise noted in the respective table).

4.3 Glossary of Argentine Tango Figures

Argentine Tango is a social dance which originates from South America but is now a popular dance all over the world. It is said to have developed in the late 19th century in working-class neighborhoods of Buenos Aires, Argentina and Montevideo, Uruguay. There is a number of dancing styles in Argentine Tango that have developed over time and that may vary largely with regions and eras. This results in a rich repertoire of typical

Table 4.1: Table of all Argentine Tango Couples (M = Man, F=Lady, *not available)

ID	Height (M) in cm	Weight (M) in kg	Height (F) in cm	Weight (F) in kg	Number of Trials	Total Number of Frames	Additional Info
Couple 1	180	63.0	162.5	54.4	14	67941 (566.17 sec.= 9.44 min.)	-
Couple 2	179	68.4	163	71.0	14	72317 (602.6417 sec. = 10.04 min.)	-
Couple 3	176	74.0	167	54.0	14	54006 (450.05 sec. = 7.50 min.)	-
Couple 4	177	73.9	167	61.9	14	78187 (651.56 sec. = 10.86 min.)	-
Couple 5	*	*	159.5	52.0	8	51794 (431.62 sec. = 7.19 min.)	-
Couple 6	185	81.2	168	57.1	23	93051 (775.42 sec. = 12.92 min.)	Argentine Tango Teachers
Couple 7	188	78.0	175	64.0	13	54227 (451.90 sec. = 7.53 min.)	-
Couple 8	194	90.5	174	54.1	13	61207 (510.06 sec. = 8.50 min.)	Lady is wearing flat shoes but dances on the tip of her toes
Couple 9	172	72.0	152	65.0	16	86344 (719.53 sec. = 11.99 min.)	Lady's position is shifted upward throughout trials
Couple 10	180	80.0	154	46	6	21008 (175.07 sec. = 2.92 min.)	-
Couple 11	178	79.0	160	52.0	14	61749 (514.57 sec. = 8.58 min.)	-

Table 4.2: Trials Couple 1

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple01Trial01_m.AMC	hdm12_couple01Trial01_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	4080	Basics, Corte		
hdm12_couple01Trial02_m.AMC	hdm12_couple01Trial02_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	4126	Basics, Corte		
hdm12_couple01Trial03_m.AMC	hdm12_couple01Trial03_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	4320	Ochos		
hdm12_couple01Trial04_m.AMC	hdm12_couple01Trial04_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	4063	Ochos		
hdm12_couple01Trial05_m.AMC	hdm12_couple01Trial05_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3286	Ochos		
hdm12_couple01Trial06_m.AMC	hdm12_couple01Trial06_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3457	Ochos, Sandwich		
hdm12_couple01Trial07_m.AMC	hdm12_couple01Trial07_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3811	Ochos, Sandwich		
hdm12_couple01Trial08_m.AMC	hdm12_couple01Trial08_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3542	Ochos, Sandwich		
hdm12_couple01Trial09_m.AMC	hdm12_couple01Trial09_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	4523	Ganchos		Fliping knee, frames 1561-1578
hdm12_couple01Trial10_m.AMC	hdm12_couple01Trial10_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3788	Ganchos		
hdm12_couple01Trial11_m.AMC	hdm12_couple01Trial11_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	3509	Ganchos		
hdm12_couple01Trial12_m.AMC	hdm12_couple01Trial12_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	8382	Milonga; Crosses, Ochos		Movement irregularity at frames 1577-1637
hdm12_couple01Trial13_m.AMC	hdm12_couple01Trial13_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	8515	Milonga; Crosses, Ochos	Flip at frames 1314-1427 and frames 1472-1586	Flip at frames 1506-1519
hdm12_couple01Trial14_m.AMC	hdm12_couple01Trial14_f.AMC	hdm12_couple01m.ASF	hdm12_couple01f.ASF	8539	Ochos, Turns, Ganchos		Flip at frames 4041-4225

elements and figures making a documentation complicated. In order to make it easier to follow the documentation of the Tango couples, a glossary of Argentine Tango steps and figures is given in Table 4.13. One of the most important elements of Argentine Tango is the embrace. If not otherwise documented, the couples dance in open embrace, i. e. with some space between the partners. However, the amount of space may vary depending on the couple and the figure.

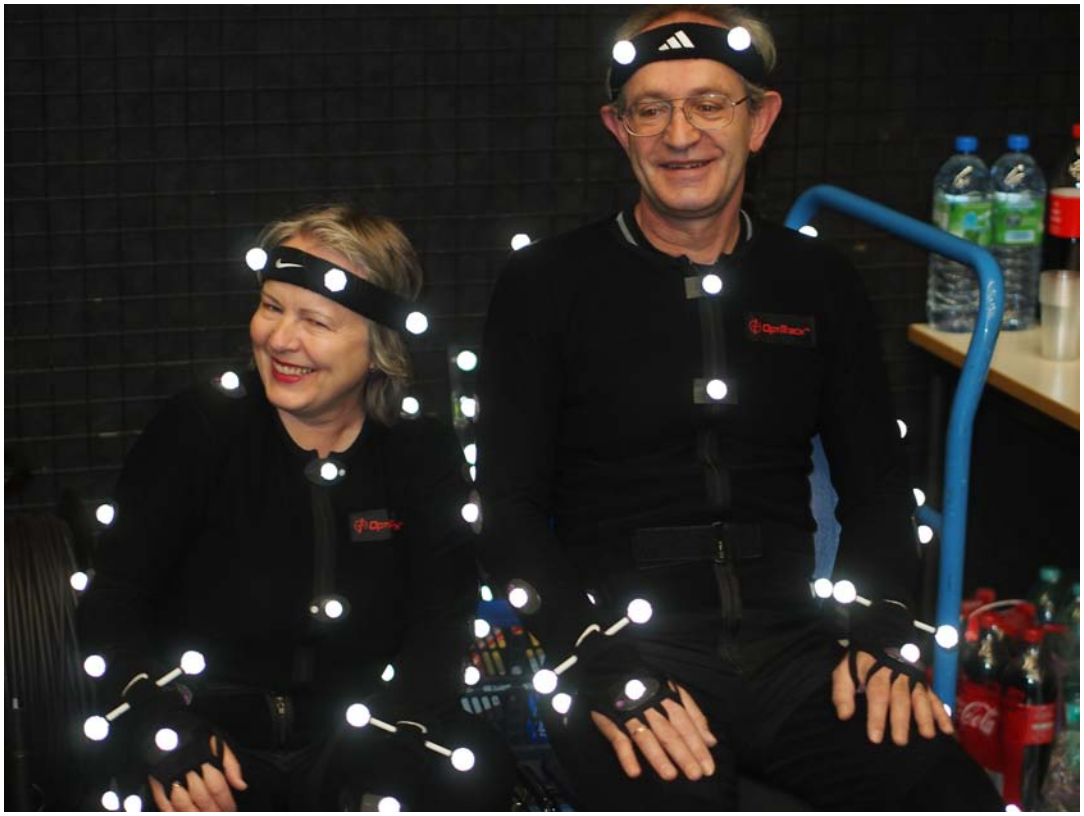
4.4 Music

As a musical genre Argentine Tango is known for its 4/8 metre. A typical elements of its lyrics and music is nostalgia. Often, it is played by melodic instruments including the bandoneon, a type of concertina.

Argentine Tango dancers usually dance two other related dances, the Vals and the Milonga.

Music for the Vals is in 3/4 time. The Vals is danced in a relaxed, smooth flowing dancing style which marks a difference to the Viennese Waltz in European ballroom dance. Often, the one-beat-per-measure walk is alternated with double time steps making this dance appear faster than the Tango.

Music for the Milonga is in 2/4 time. The Milonga dance has an accented beat, and sometimes an underlying "habanera" rhythm. The basic elements of the Milonga are the same as of the Tango but the dancers tend to show less complex figures and emphasize the rythm more. The Milonga is often danced without any pausing and using many double time steps which makes the dance appear speedier than other Tango varieties.



The word Milonga has a double - or triple - meaning. Milonga is also the name given to events for dancing Argentine Tango or even to places where these events are held. People who attend Milongas are typically called milongueros.

Table 4.3: Trials Couple 2

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple02Trial01_m.AMC	hdm12_couple02Trial01_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4305	Basic steps in hold		
hdm12_couple02Trial02_m.AMC	hdm12_couple02Trial02_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	5689	Saccadas (shallow), Boleos (low, front)		Irregularities at frames 2544-2736, frames 4318-4361 knee and foot flip
hdm12_couple02Trial03_m.AMC	hdm12_couple02Trial03_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4647	Saccadas (shallow), Boleos (front)		
hdm12_couple02Trial04_m.AMC	hdm12_couple02Trial04_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4565	Saccadas (shallow), Boleo, Ochos		Motion corrupt at frames 3043-3373
hdm12_couple02Trial05_m.AMC	hdm12_couple02Trial05_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	3035	Boleos (M)		
hdm12_couple02Trial06_m.AMC	hdm12_couple02Trial06_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4162	Boleos (both partners)		
hdm12_couple02Trial07_m.AMC	hdm12_couple02Trial07_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4321	Boleos (both partners)		Flipping knee at frames 2420-2570
hdm12_couple02Trial08_m.AMC	hdm12_couple02Trial08_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	3563	Boleos (both partners)		Flipping knee at frames 1980-2059
hdm12_couple02Trial09_m.AMC	hdm12_couple02Trial09_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	3308	Sacadas (shallow), Molinetes	Motion corrupt at frames 1-3	flip at frames 3009-3012
hdm12_couple02Trial10_m.AMC	hdm12_couple02Trial10_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4252	Sacadas (shallow), Molinetes, Boleo		Hip flip at frames 3440-3452
hdm12_couple02Trial11_m.AMC	hdm12_couple02Trial11_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	4044	Sacadas (shallow), Molinetes, Media Lunas, Boleo		Hip flip at frame 2859
hdm12_couple02Trial12_m.AMC	hdm12_couple02Trial12_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	8451	Molinete, Basic steps and turns, Ochos		
hdm12_couple02Trial13_m.AMC	hdm12_couple02Trial13_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	8662	Sacadas, Basic steps and turns, Molinete, Embellishments (Dibujo)		
hdm12_couple02Trial14_m.AMC	hdm12_couple02Trial14_f.AMC	hdm12_couple02m.ASF	hdm12_couple02f.ASF	9322	Sacadas, Volcada,Colgada, Pasada, Embellishments, Boleo, Ganchos		Knee flip at frame 6492, motion corrupt at frames 3738-3838 and frames 7179-7668

Table 4.4: Trials Couple 3

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple03Trial01_m.AMC	hdm12_couple03Trial01_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3703	Basic steps and Corte	Motion corrupt at frames 1-3 and frames 1307-1381 and frames 16:00-18:00	
hdm12_couple03Trial02_m.AMC	hdm12_couple03Trial02_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3532	Basic steps and Corte	Motion of upper back corrupt	
hdm12_couple03Trial03_m.AMC	hdm12_couple03Trial03_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3759	Basic steps and Corte	Motion corrupt at frames 1413-1670	
hdm12_couple03Trial04_m.AMC	hdm12_couple03Trial04_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3675	Ochos, Ganchos, Boleos, Sacada		Flip of knees at frames 1293-1318 and foot flip at frames 1787-1794, right lower leg corrupt at frame 2879
hdm12_couple03Trial05_m.AMC	hdm12_couple03Trial05_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3719	Ochos, Ganchos, Boleos, Sacada		Flip of knee at frames 1664-1704
hdm12_couple03Trial06_m.AMC	hdm12_couple03Trial06_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3558	Ochos, Ganchos, Boleos, Sacada, Molinete		Flip of knees at frames 1359-1370
hdm12_couple03Trial07_m.AMC	hdm12_couple03Trial07_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	2828	Ochos, Boleos		
hdm12_couple03Trial08_m.AMC	hdm12_couple03Trial08_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	2759	Boleos		
hdm12_couple03Trial09_m.AMC	hdm12_couple03Trial09_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	2847	Boleos		Flip at frames 1518-1543
hdm12_couple03Trial10_m.AMC	hdm12_couple03Trial10_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3234	Boleos,Planeo, Colgada	Foot backwards at frames 2296-2605	Flip of knee at frames 1630-1710
hdm12_couple03Trial11_m.AMC	hdm12_couple03Trial11_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3685	Planeo, Embellishments (F), Ochos, Sacada, Barridas, Soltada (F)	Foot flip at frames 2633-2786	Foot flip at frames 903-930
hdm12_couple03Trial12_m.AMC	hdm12_couple03Trial12_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	3186	Planeo, Embellishments (F), Sandwich, Soltada		Knee flip at frames 1357-1383, jerky feet
hdm12_couple03Trial13_m.AMC	hdm12_couple03Trial13_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	6729	Milonga	Motion corrupt at frames 2342-2415	
hdm12_couple03Trial14_m.AMC	hdm12_couple03Trial14_f.AMC	hdm12_couple03m.ASF	hdm12_couple03f.ASF	6812	Milonga	Motion corrupt at frames 1860-1980	Leg flip at frames 3595-3665

Table 4.5: Trials Couple 4

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple04Trial01_m.AMC	hdm12_couple04Trial01_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4447	Basic steps, Corte		
hdm12_couple04Trial02_m.AMC	hdm12_couple04Trial02_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	7289	Basic steps, Embellishment (F)		
hdm12_couple04Trial03_m.AMC	hdm12_couple04Trial03_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	7500	Basic steps	Corrupt motion of upper body	Corrupt motion of upper body, especially second half
hdm12_couple04Trial04_m.AMC	hdm12_couple04Trial04_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4858	Basic steps		Corrupt motion of upper body starting at frame 3478
hdm12_couple04Trial05_m.AMC	hdm12_couple05Trial04_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4284	Boleos		Knee flip at frames 1973-2013 and at frames 2528-2565, foot flip
hdm12_couple04Trial06_m.AMC	hdm12_couple04Trial06_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4037	Boleos		
hdm12_couple04Trial07_m.AMC	hdm12_couple04Trial07_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4930	Boleos		
hdm12_couple04Trial08_m.AMC	hdm12_couple04Trial08_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4636	Ochos		
hdm12_couple04Trial09_m.AMC	hdm12_couple04Trial09_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	5737	Ochos, Embellishment (F)		
hdm12_couple04Trial10_m.AMC	hdm12_couple04Trial10_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	5152	Ochos, Embellishment (F)		
hdm12_couple04Trial11_m.AMC	hdm12_couple04Trial11_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	5427	Ochos, Sandwich, Embellishment (F)		
hdm12_couple04Trial12_m.AMC	hdm12_couple04Trial12_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	5951	Ochos, Sandwich, Embellishment (F)		
hdm12_couple04Trial13_m.AMC	hdm12_couple04Trial13_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	4811	Ochos, Sandwich, Embellishment (F)		
hdm12_couple04Trial14_m.AMC	hdm12_couple04Trial14_f.AMC	hdm12_couple04m.ASF	hdm12_couple04f.ASF	9128	Ochos, Enganche, Turn, final pose, open legs		Hip flip at frames 2612-2700, foot flip at frames 2956 - 3283

Table 4.6: Trials Couple 5

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple05Trial01_m.AMC	hdm12_couple05Trial01_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	6299	Basic steps, Ochos, Cross, Corte	Knee artifact at frames 4898-4954	Unintentional lift at frames 5070-5102
hdm12_couple05Trial02_m.AMC	hdm12_couple05Trial02_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	5965	Volcadas, Molinete, Boleos		
hdm12_couple05Trial03_m.AMC	hdm12_couple05Trial03_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	5628	Basic steps, Crosses, Ochos, Sacada		Knee flip at frames 3702-3732, foot and knee flip at frames 3883-3933
hdm12_couple05Trial04_m.AMC	hdm12_couple05Trial04_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	6463	Basic steps, Crosses, Ochos, Sacada		Motion corrupt at frames 3177-3337, knee flip at frames 4387-4417
hdm12_couple05Trial05_m.AMC	hdm12_couple05Trial05_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	6460	Ochos, Corte, Volcadas, Boleos		at frames 1946-2456: unintentional down-shift in motion
hdm12_couple05Trial06_m.AMC	hdm12_couple05Trial06_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	6253	Basic steps, Volcadas, Sacadas, Crosses		
hdm12_couple05Trial07_m.AMC	hdm12_couple05Trial07_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	6098	Basic steps, Turns, Sacada,Crosses, Embellishment (F, foot taps)		Jerky right hand, head motion corrupt at frames 2135-2235
hdm12_couple05Trial08_m.AMC	hdm12_couple05Trial08_f.AMC	hdm12_couple05m.ASF	hdm12_couple05f.ASF	8628	Embellishments (F), basic steps, Ochos, Sandwich, Sacada	Motion corrupt at frames 1-3	Knee flips at frames 4131-4181

Table 4.7: Trials Couple 6

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple06Trial01_m.AMC	hdm12_couple06Trial01_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3899	Basic steps	Right arm corrupt at frames 2935-3075, elbow flip at frames 3366-3368	
hdm12_couple06Trial02_m.AMC	hdm12_couple06Trial02_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	4151	Basic steps		
hdm12_couple06Trial03_m.AMC	hdm12_couple06Trial03_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3841	Basic steps		
hdm12_couple06Trial04_m.AMC	hdm12_couple06Trial04_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	2809	Ochos (back)		
hdm12_couple06Trial05_m.AMC	hdm12_couple06Trial05_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3235	Ochos (back)		
hdm12_couple06Trial06_m.AMC	hdm12_couple06Trial06_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3318	Ochos (forward)		
hdm12_couple06Trial07_m.AMC	hdm12_couple06Trial07_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	2892	Ochos (forward), Sacada, Colgada, Pasada		
hdm12_couple06Trial08_m.AMC	hdm12_couple06Trial08_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	2892	Ochos (forward), Sacada, Colgada, Pasada,Caricia		
hdm12_couple06Trial09_m.AMC	hdm12_couple06Trial09_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3228	Ochos (forward), Sacada, Colgada, Pasada		
hdm12_couple06Trial10_m.AMC	hdm12_couple06Trial10_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3158	Ochos (forward), Barridas, Sandwich, Pasada, Caricia		
hdm12_couple06Trial11_m.AMC	hdm12_couple06Trial11_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3282	Barridas, Ochos (forward), Pasada		
hdm12_couple06Trial12_m.AMC	hdm12_couple06Trial12_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3506	Barridas, Sandwich, Pasada		
hdm12_couple06Trial13_m.AMC	hdm12_couple06Trial13_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3023	Boleos (forward)		
hdm12_couple06Trial14_m.AMC	hdm12_couple06Trial14_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3056	Boleos (forward)		Knee flip at frames 708-784
hdm12_couple06Trial15_m.AMC	hdm12_couple06Trial15_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3693	Boleos (forward)		Foot skating at frames 1194-1201
hdm12_couple06Trial16_m.AMC	hdm12_couple06Trial16_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	2736	Boleos (backward linear)		
hdm12_couple06Trial17_m.AMC	hdm12_couple06Trial17_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	2457	Boleos (backward linear)		
hdm12_couple06Trial18_m.AMC	hdm12_couple06Trial18_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	3254	Boleos		Knee flips at frames 1398-1413 and frames 2581-2632
hdm12_couple06Trial19_m.AMC	hdm12_couple06Trial19_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	7686	Boleos, Barridas, Sandwich, Pasada, Caricia, Ganchos, Ochos		
hdm12_couple06Trial20_m.AMC	hdm12_couple06Trial20_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	7074	Ganchos, Boleos, Soltadas, Ochos		Motion corrupt at frames 1048-1198, knee flip at frames 1866-1882 and at frames 2154-2172
hdm12_couple06Trial21_m.AMC	hdm12_couple06Trial21_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	7298	Ganchos, Boleos, Colgada Elevacion		Knee flips at frames 1099-1129 and 1641-1657
hdm12_couple06Trial22_m.AMC	hdm12_couple06Trial22_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	6040	Colgadas, Ganchos, Boleos, Colgada Elevacion, Pasadas, Soltada		Motion of leg corrupt at frames 2978-3086
hdm12_couple06Trial23_m.AMC	hdm12_couple06Trial23_f.AMC	hdm12_couple06m.ASF	hdm12_couple06f.ASF	6424	Basic steps, embellishments, Boleos, Planeos		Knee flips at frames 5488-5490 and

Table 4.8: Trials Couple 7

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple07Trial01_m.AMC	hdm12_couple07Trial01_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	4204	Basic steps		
hdm12_couple07Trial02_m.AMC	hdm12_couple07Trial02_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	4312	Basic steps		
hdm12_couple07Trial03_m.AMC	hdm12_couple07Trial03_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3806	Basic steps		
hdm12_couple07Trial04_m.AMC	hdm12_couple07Trial04_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3605	Ochos (back)		
hdm12_couple07Trial05_m.AMC	hdm12_couple07Trial05_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3619	Ochos (both partners)		
hdm12_couple07Trial06_m.AMC	hdm12_couple07Trial06_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3259	Ochos (back), Boleo, Ochos (front)		
hdm12_couple07Trial07_m.AMC	hdm12_couple07Trial07_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3429	Ochos, Cross		
hdm12_couple07Trial08_m.AMC	hdm12_couple07Trial08_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	4245	Basic steps, Crosses		
hdm12_couple07Trial09_m.AMC	hdm12_couple07Trial09_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3075	Basic steps, Crosses		
hdm12_couple07Trial10_m.AMC	hdm12_couple07Trial10_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3612	Ochos, Boleos		
hdm12_couple07Trial11_m.AMC	hdm12_couple07Trial11_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	3705	Basic steps, Corte, Boleos, Ochos		
hdm12_couple07Trial12_m.AMC	hdm12_couple07Trial12_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	4712	Basic steps, Ochos, Boleos		
hdm12_couple07Trial13_m.AMC	hdm12_couple07Trial13_f.AMC	hdm12_couple07m.ASF	hdm12_couple07f.ASF	8644	Molinetes, Boleos, Pasadas, Sandwich		

Table 4.9: Trials Couple 8

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple08Trial01_m.AMC	hdm12_couple08Trial01_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	6020	Basic steps	Jerky right hand movement at frame 2161 and frame 3906	
hdm12_couple08Trial02_m.AMC	hdm12_couple08Trial02_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4213	Basic steps		
hdm12_couple08Trial03_m.AMC	hdm12_couple08Trial03_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	5447	Basic steps	Jerky right arm between frames 2857 and 2897	
hdm12_couple08Trial04_m.AMC	hdm12_couple08Trial04_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4090	Ochos, Boleos	Jerky right hand throughout the trial	
hdm12_couple08Trial05_m.AMC	hdm12_couple08Trial05_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4431	Ochos, Boleos	Jerky right hand throughout the trial	
hdm12_couple08Trial06_m.AMC	hdm12_couple08Trial06_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4527	Ochos, Boleos	Jerky right hand throughout the trial	
hdm12_couple08Trial07_m.AMC	hdm12_couple08Trial07_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4385	Volcadas		
hdm12_couple08Trial08_m.AMC	hdm12_couple08Trial08_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	6071	Volcadas		
hdm12_couple08Trial09_m.AMC	hdm12_couple08Trial09_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	5476	Volcadas		
hdm12_couple08Trial10_m.AMC	hdm12_couple08Trial10_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4037	Soltadas		
hdm12_couple08Trial11_m.AMC	hdm12_couple08Trial11_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4214	Soltadas		
hdm12_couple08Trial12_m.AMC	hdm12_couple08Trial12_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	4525	Soltadas		
hdm12_couple08Trial13_m.AMC	hdm12_couple08Trial13_f.AMC	hdm12_couple08m.ASF	hdm12_couple08f.ASF	3771	Soltadas		

Table 4.10: Trials Couple 9

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple09Trial01_m.AMC	hdm12_couple09Trial01_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4545	Basic steps		NB: Lady's position seems shifted upward
hdm12_couple09Trial02_m.AMC	hdm12_couple09Trial02_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4564	Basic steps		
hdm12_couple09Trial03_m.AMC	hdm12_couple09Trial03_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4015	Basic steps		
hdm12_couple09Trial04_m.AMC	hdm12_couple09Trial04_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4415	Ochos	T-Pose missing. Jerky hand motion throughout trial	T-pose missing.
hdm12_couple09Trial05_m.AMC	hdm12_couple09Trial05_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	3814	Ochos		
hdm12_couple09Trial06_m.AMC	hdm12_couple09Trial06_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	3765	Ochos		
hdm12_couple09Trial07_m.AMC	hdm12_couple09Trial07_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4562	Ochos	Jerky arm movement at frame 2599	
hdm12_couple09Trial08_m.AMC	hdm12_couple09Trial08_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4086	Soltada, Ochos	Hand flips at frames 1996-2029	
hdm12_couple09Trial09_m.AMC	hdm12_couple09Trial09_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	7039	Ochos, Soltadas	Elbow flip at frame 3074, right arm corrupt at frames 3235-3282 and 3859-4040	
hdm12_couple09Trial10_m.AMC	hdm12_couple09Trial10_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	5767	Ochos, Soltadas	Corrupt motion at frames1856-1860	
hdm12_couple09Trial11_m.AMC	hdm12_couple09Trial11_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	6431	Sandwichs, Pasadas, Ganchos, Boleo	Motion corrupt at frame 1985	
hdm12_couple09Trial12_m.AMC	hdm12_couple09Trial12_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4446	Sandwich, Caricia, Pasadas		Motion corrupt at frames 2587-2807
hdm12_couple09Trial13_m.AMC	hdm12_couple09Trial13_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	4105	Ochos, Sandwich, Caricia, Gancho		
hdm12_couple09Trial14_m.AMC	hdm12_couple09Trial14_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	9043	Milonga		
hdm12_couple09Trial15_m.AMC	hdm12_couple09Trial15_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	6884	Milonga	Both T-poses are missing. Corrupt motion at frame 2982	Both T-poses are missing
hdm12_couple09Trial16_m.AMC	hdm12_couple09Trial16_f.AMC	hdm12_couple09m.ASF	hdm12_couple09f.ASF	8863	Milonga	Corrupt elbow throughout trial	

Table 4.11: Trials Couple 10

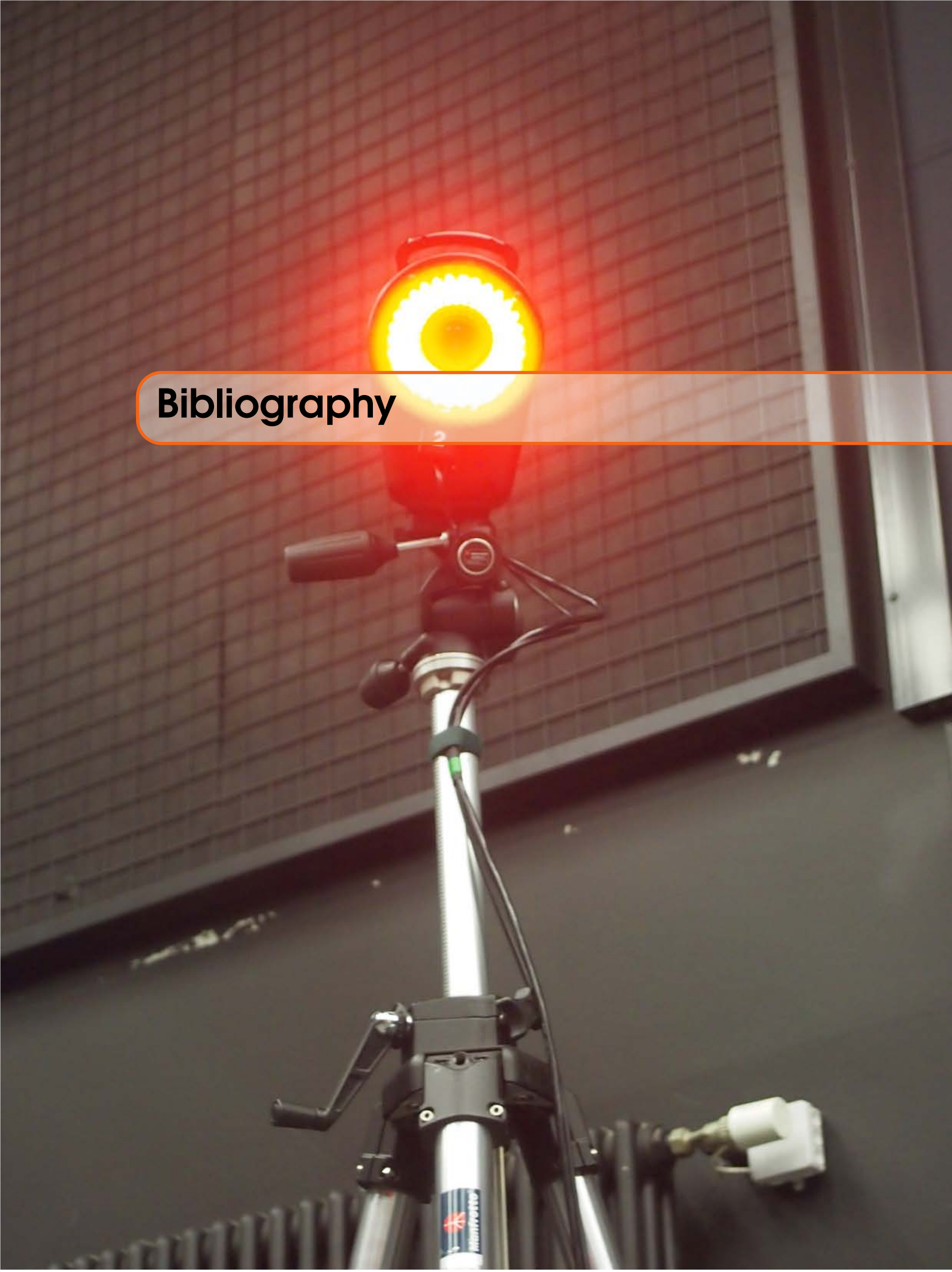
File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple10Trial01_m.AMC	hdm12_couple10Trial01_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	3770	Basic steps and Corte		
hdm12_couple10Trial02_m.AMC	hdm12_couple10Trial02_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	3781	Basic steps and Corte		Jerky shoulder movement at frames 437-916. Corrupt right foot from frames 1779.
hdm12_couple10Trial03_m.AMC	hdm12_couple10Trial03_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	3523	Basic steps and Corte		Corrupt foot from frame 1882.
hdm12_couple10Trial10_m.AMC	hdm12_couple10Trial10_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	3795	Ochos, Ganchos, Soltadas		Knee flip at frames 1973-1993.
hdm12_couple10Trial11_m.AMC	hdm12_couple10Trial11_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	3523	Ochos, Ganchos, Soltadas		Knee flip at frames 1603-1643.
hdm12_couple10Trial12_m.AMC	hdm12_couple10Trial12_f.AMC	hdm12_couple10m.ASF	hdm12_couple10f.ASF	2616	Ochos, Soltada, Gancho		Knee flip 1471-1551

Table 4.12: Trials Couple 11

File name AMC (M)	File name AMC (F)	File name ASF (M)	File name ASF (F)	Number of Frames (at 120 Hz)	Content/Moves	Remarks (M)	Remarks (F)
hdm12_couple11Trial01_m.AMC	hdm12_couple11Trial01_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3199	Basic steps	Jerk at frames 1856-1878	
hdm12_couple11Trial02_m.AMC	hdm12_couple11Trial02_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	4202	Basic steps		Corrupt leg motion at frames 3471-3492
hdm12_couple11Trial03_m.AMC	hdm12_couple11Trial03_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3398	Basic steps		
hdm12_couple11Trial04_m.AMC	hdm12_couple11Trial04_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3910	Ochos		
hdm12_couple11Trial05_m.AMC	hdm12_couple11Trial05_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3564	Ochos		
hdm12_couple11Trial06_m.AMC	hdm12_couple11Trial06_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3841	Ochos, Boleos		
hdm12_couple11Trial07_m.AMC	hdm12_couple11Trial07_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3605	Volcadas, Gancho		Leg motion corrupt at frames 2759-2799
hdm12_couple11Trial08_m.AMC	hdm12_couple11Trial08_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	2682	Volcadas, Corte		
hdm12_couple11Trial09_m.AMC	hdm12_couple11Trial09_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	4121	Volcadas, Gancho		Corrupt motion at frames 3219-3291
hdm12_couple11Trial10_m.AMC	hdm12_couple11Trial10_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3871	Molinetes, Ochos, Sanwich	Jerk at frame 2517 and 2853	Jerk at frame 1728 and 3242, corrupt elbow at frames 3307-3339
hdm12_couple11Trial11_m.AMC	hdm12_couple11Trial11_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	3410	Molinetes, Pasada		
hdm12_couple11Trial12_m.AMC	hdm12_couple11Trial12_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	4232	Molinetes, Pasada	Jerk at frame 1132	
hdm12_couple11Trial13_m.AMC	hdm12_couple11Trial13_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	8544	Ochos, Boleos, Soltada, Pasada, Ganchos, Volcadas, Sacada		Right knee flip at 6319
hdm12_couple11Trial14_m.AMC	hdm12_couple11Trial14_f.AMC	hdm12_couple11m.ASF	hdm12_couple11f.ASF	9170	Ganchos, Boleos, Soltada, Barrida, Sacada		Foot corrupt at frames 5994-6064 and 6902-7376, knee corrupt at frames 6227-6347

Table 4.13: Glossary of Common Argentine Tango Steps, Figures and Styles

Name (Commonly Spanish or English)	Description of Movement	Image
Ocho (front or back)	A figure 'eight' traced on the floor by the follower's feet. Can be done when follower walks forward or back.	
Turn (Giro)	Turning step of the follower around the leader's axis.	
Molinete	Composed of several turning steps which complete a circle. For the follower, it most commonly it is composed of 4 steps (forward step, open step, back step, open step). The leader pivots on the ball of either one foot, two feet or alternate feet.	
Embellishments	Tapping the floor or tracing circles on the floor with one foot. A popular embellishment is the Caricia.	
Pasada	Follower steps over the leader's foot in an elegant way.	
Caricia	Caressing movements like rubbing a foot down leader's leg.	
Sandwich	The leader places both feet on either side of the follower's foot.	
Gancho (hook)	One dancer hooks their leg around their partner's leg. Can be done high or low, also in overturned position.	
Enganche	One or both dancers wrap their leg around their partner's leg. Often sustained or frozen for a moment in time.	
Boleo (also: Voleo)	Sharp movement of the leg often interrupted or suspended. Typically, the follower lifts her foot from the floor and it flies to the side. When done from the front, the leg wraps around the standing leg in front of the knee (see image).	
Sacada	Displacement of partner's (commonly follower's) unweighted leg by other partner's (commonly leader's) movement.	
Colgada	Off-axis move in which follower leans back while being supported by leader's arms.	
Volcada	Off-axis move in which the follower leans forward and performs forward cross, back cross or embellishments with her legs.	
Planeo	One partner pivots on one leg with the other leg stretched out.	
Barrida	One partner moves the other partners foot by displacing it along the floor.	
Corte	Break or bow, often together with a change of direction.	
Soltada	One partner breaks embrace to execute a figure (such as an under-arm turn) on her or his own.	
Elevacion	Lifts	
Milonga	Refers to different style an music. Many of the figures described also occur in Milonga. But it is faster and the hold is closer, this is a natural restriction on the possible figures.	
Vals	Refers to different style an music.	



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