SLOVENSKI STANDARD
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Ergonomija - Postopki 3D-skeniranja za mednarodno združljive baze antropometrijskih podatkov - 1. del: Protokol ovrednotenja telesnih mer, povzetih iz skeniranih teles (ISO/DIS 20685-1:2017)

Ergonomics - 3-D scanning methodologies for internationally compatible anthropometric databases - Part 1: Evaluation protocol for body dimensions extracted from 3-D body scans (ISO/DIS 20685-1:2017)

Ergonomie - 3D-Scanverfahren für international kompatible anthropometrische Datenbanken - Teil 1: Prüfprotokoll für aus 3D-Scans extrahierte Körpermaße (ISO/DIS 20685-1:2017)

Ergonomie - Méthodologies d'exploration tridimensionnelles pour les bases de données anthropométriques compatibles au plan international - Partie 1: Protocole d'évaluation pour les dimensions corporelles extraites de balayages corporels en 3 D (ISO/DIS 20685 -1:2017)

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Ergonomics — 3-D scanning methodologies for internationally compatible anthropometric databases —

Part 1: Evaluation protocol for body dimensions extracted from 3-D body scans

Ergonomie — Méthodologies d'exploration tridimensionnelles pour les bases de données anthropométriques compatibles au plan international —

Partie 1: Protocole d'évaluation pour les dimensions corporelles extraites de balayages corporels en 3 D

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Accuracy of extracted measurements **5**
4.1 Selection of extracted measurements 5
4.2 Standard values 7
5 Research designs for establishing accuracy of body dimensions extracted from scanners **7**
5.1 General 7
5.2 Validation study procedures 7
5.3 Sampling size and test subject selection 8
5.4 Analytical procedures 8
5.5 Validation study reporting 9
6 Method for estimating the number of subjects needed **9**
Annex A (informative) **Methods for reducing error in 3-D scanning** **11**
Bibliography **20**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20685-1 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*.

This third edition cancels and replaces the second edition (ISO 20685:2010), of which it constitutes a minor revision and a title change.

Introduction

Anthropometric measures are key to many International Standards. These measures can be gathered using a variety of instruments. An instrument with relatively new application to anthropometry is a three-dimensional (3-D) scanner. 3-D scanners generate a 3-D point cloud of the outside of the human body that can be used for clothing and automotive design, engineering and medical applications. There are currently no standardized methods for using 3-D point clouds in the design process. As a result, many users extract one-dimensional (1-D) data from 3-D point clouds. This International Standard concerns the application of 3-D scanners to the collection of one-dimensional anthropometric data for use in design.

There are a number of different fundamental technologies that underlie commercially available systems. These include stereophotogrammetry, ultrasound and light (laser light, white light and infrared). Further, the software that is available to process data from the scan varies in its methods. Additionally, software to extract dimensions similar to traditional dimensions varies markedly in features and capabilities.

As a result of differences in fundamental technology, hardware and software, extracted measurements from several different systems can be markedly different for the same individual. Since 3-D scanning can be used to gather measurements, such as lengths and circumferences, it was important to develop an International Standard that allows users of such systems to judge whether the 3-D system is adequate for these needs.

The intent of ISO 20685-1 is to ensure comparability of body measurements as specified by ISO 7250-1 but measured with the aid of 3-D body scanners rather than with traditional anthropometric instruments such as tape measures and callipers. It is further intended that by conformance with this International Standard any data extracted from scans will be suitable for inclusion in international databases such as those described in ISO 15535.

Ergonomics — 3-D scanning methodologies for internationally compatible anthropometric databases —

Part 1: Evaluation protocol for body dimensions extracted from 3-D body scans

1 Scope

This part of ISO 20685 addresses protocols for the use of 3-D surface-scanning systems in the acquisition of human body shape data and measurements defined in ISO 7250-1 that can be extracted from 3-D scans. It does not apply to instruments that measure the location and/or motion of individual landmarks.

While mainly concerned with whole-body scanners, it is also applicable to body-segment scanners (head scanners, hand scanners, foot scanners).

The intended audience is those who use 3-D scanners to create 1-D anthropometric databases and the users of 1-D anthropometric data from 3-D scanners. Although not necessarily aimed at the designers and manufacturers of those systems, scanner designers and manufacturers will find it useful in meeting the needs of clients who build and use 1-D anthropometric databases.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7250-1:2017, *Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE In the case of definitions of terms for skeletal landmarks, when there is a separate term for the skin overlying the landmark and another for the landmark itself, the skin landmark term is used. Where there is no separate term, the skeletal term is used and assumed to refer to the skin overlying the landmark.

3.1
three-dimensional
3-D
pertaining to the use of three orthogonal scales on which the three coordinates, *x*, *y* and *z*, can be measured to give the precise position of any relevant anatomical point in the considered space

Note 1 to entry: Many anthropometric distances can be calculated from the coordinates of anatomical landmarks. Some additional points may be necessary to obtain circumferences.

3.2
3-D body scanner
hardware and software system that creates digital data representing a human form, or parts thereof, in three dimensions

3.3
3-D processing software
operating system, user interface, programs, algorithms and instructions associated with a 3-D scanning system

3.4
3-D scanner hardware
physical components of a 3-D scanner and any associated computer(s)

3.5
accuracy
extent to which the measured value approximates a true value

Note 1 to entry: Since it is difficult to trace the accuracy of complex hardware and software systems to recognized ISO sources, for the purposes of this International Standard *true value* is taken to mean the measured value obtained by a skilled anthropometrist using traditional instruments such as tape and calliper.

3.6
acromion
most lateral point of the lateral edge of the spine (acromial process) of the scapula

[SOURCE: ISO 7250-1:2017, 5.1]

3.7
anatomical landmark
clearly defined point on the body that can be used for defining anthropometric measurements

3.8
anthropometric database
collection of individual body measurements (anthropometric data) and background information (demographic data) recorded on a group of people (the sample)

[SOURCE: ISO 15535:2012, 3.8]

3.9
cervicale
tip of the prominent bone at the base of the back of the neck (spinous process of the seventh cervical vertebra) in the midsagittal plane, and projected posteriorly to the surface of the skin

[SOURCE: ISO 7250-1:2017, 5.2]

3.10
crotch level
highest palpable point of the perineum

Note 1 to entry: It is typically marked using the top of a horizontal straightedge.

[SOURCE: ISO 7250-1:2017, 5.3]

3.11
Frankfurt plane
standard horizontal plane at the level of the left tragion and left orbitale (infraorbitale) when the midsagittal plane of the head is held vertically

[SOURCE: ISO 7250-1:2017, 3.7]

3.12
glabella
most anterior point of the forehead between the browridges in the midsagittal plane

[SOURCE: ISO 7250-1:2017, 5.5]

3.13
iliocristale
most lateral palpable point of the iliac crest of the pelvis

3.14
iliospinale anterius
most downward-directed point of the iliac crest, projected anteriorly and horizontally to the surface of the skin

[SOURCE: ISO 7250-1:2017, 5.6]

3.15
lateral malleolus
most lateral point of the right lateral malleolus (outside ankle bone)

3.16
lowest point of rib cage
inferior point of the bottom of the rib cage (tenth rib), projected horizontally 45° from the midsagittal plane, to the surface of the skin

[SOURCE: ISO 7250-1:2017, 5.7]

3.17
menton
lowest point of the tip of the chin in the midsagittal plane

[SOURCE: ISO 7250-1:2017, 5.8]

3.18
mesosternale
point on the union of the third and fourth sternebrae in the midsagittal plane

[SOURCE: ISO 7250-1:2017, 5.9]

3.19
opisthocranion
most distant point from glabella in the midsagittal plane, when the head is held in the Frankfurt plane

[SOURCE: ISO 7250-1:2017, 5.13]

3.20
orbitale
lowest point on the anterior border of the bony eye socket**[**ISO 7250-1:2017, 5.12**]**

3.21
point cloud
collection of 3-D points in space referenced by their coordinate values

Note 1 to entry: A point cloud constitutes the raw data from a 3-D scanner and needs to be translated to a human axis system.

3.22
repeatability
extent to which the values of a variable measured twice on the same subject are the same

3.23
sellion
point of greatest indentation of the nasal root depression in the midsagittal plane, when the head is held in the Frankfurt plane

[SOURCE: ISO 7250-1:2017, 5.14]