EPC Exhibit 137-12.1

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Via: Michael Panzer, Editor in Chief

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Re: 004-006 Computer science: Updates

Relocation

|  |  |  |
| --- | --- | --- |
| **From** | **To** | **Topic** |
| 006.454 | 006.248 392 | Speaker recognition, voice recognition |
| 570.15195 | 006.248 | Biometric identification |

Expansions

|  |  |
| --- | --- |
| **New number** | **Topic** |
| 006.248 2 | DNA fingerprinting |
| 006.248 3 | Physiological biometric identification |

This exhibit addresses two areas:

1. Mapping of recently and frequently used LCSH
2. Biometric identification

**Mapping of recently and frequently used LCSH**

To identify current computer science topics that need to be accommodated in the DDC, the following investigation was undertaken:

* Records in WC/BIB were located by searching for :yr=2011-2015 and (:dd=004\* or :dd=005\* or :dd=006\*). From these records LCSH were identified; main headings appearing 5 or more times in that set and without a corresponding LCSH mapping or parallel Relative Index term were retained for further investigation.
* LCSH created or changed in 2013, retrieved by :me=(data\* or comput\* or network\* or program\* or internet\* or web\*) were identified. Of the topics identified, some are not considered in this exhibit because of insignificant literary warrant or because they are at best only tangentially related to 004–006.

The table below gives proposed DDC class numbers for the mapping of LCSHs:

| **Heading** | **WC count[[1]](#footnote-1)** | **DDC number(s)** |
| --- | --- | --- |
| Ajax (Web site development technology) | 848 | **006.76** |
| Android (Electronic resource) | 998 | **005.445** |
| Arduino (Programmable controller) | 61 | **006.22, 621.381** |
| Assistive computer technology | 46 | **004.087** |
| BlackBerry (Smartphone) | 237 | **004.1675, 621.38456** |
| COBIT (Information technology management standard) | 53 | **004.06** |
| Cocoa (Application development environment) | 165 | **005.268** |
| Command languages (Computer science) | 56 | **005.432, 005.434** |
| Computer scheduling | 84 | **004.35, 004.36,** **005.434** |
| Context-aware computing | 107 | **004** |
| Digital music players | 189 | **006.5** |
| Document Object Model (Web site development technology) | 70 | **006.74** |
| Droid (Smartphone) | 89 | **004.1675, 621.38456** |
| Graphics processing units | 75 | **006.6** |
| Heuristic programming | 156 | **006.3, 005.1** |
| Information technology projects | 82 | **004.0684, 005.0684** |
| Internet Protocol multimedia subsystem | 85 | **004.62, 621.38212** |
| Internet users | 293 | **004.678, 025.042** |
| Invisible Web | 25 | **004.678, 025.042** |
| iPhone (Smartphone) | 1843 | **004.1675, 621.38456** |
| iPod (Digital music player) | 549 | **006.5** |
| iPod touch (Digital music player) | 228 | **006.5** |
| JAVA (Programming language) | 17 | **005.133** |
| Kindle (Electronic book reader) | 63 | **004.1675** |
| Location-based services | 131 | **004.6, 621.384192** |
| Low voltage integrated circuits | 460 | **621.3815** |
| Metadata harvesting | 14 | **025.3** |
| Mobile games | 54 | **794.81525, 794.81535** |
| Model-driven software architecture | 183 | **005.12** |
| Model-integrated computing | 29 | **005.1** |
| MOOCs (Web-based instruction) | 0 | **371.358** |
| MPEG (Video coding standard) | 266 | **621.38833, 006.6960218** |
| Multimodal user interfaces (Computer systems) | 63 | **005.437** |
| Multiparadigm programming (Computer science) | 42 | **005.11** |
| Multiprogramming (Electronic computers) | 68 | **005.434** |
| Natural computation | 133 | **006.38** |
| Near field communication | 41 | **004.62, 621.384** |
| Non-relational databases | 12 | **005.758** |
| Nook (Electronic book reader) | 22 | **004.1675** |
| Portable media players | 57 | **006.72** |
| Raspberry Pi (Computer) | 73 | **004.165** |
| RDF (Document markup language) | 24 | **025.0427** |
| Reinforcement learning | 100 | **006.31** |
| Rendering (Computer graphics) | 121 | **006.6** |
| Representational State Transfer (Software architecture) | 39 | **005.12,** **005.276,** **006.76** |
| Rigging (Computer animation) | 20 | **006.696** |
| Samsung Galaxy S (Smartphone) | 47 | **004.1675, 621.38456** |
| Semantic networks (Information theory) | 100 | **006.332** |
| Systems on a chip | 634 | **621.3815, 006.22** |
| UML (Computer science) | 1402 | **005.117** |
| User-generated content | 969 | **025.04, 302.231** |
| WebGL (Computer program language) | 5 | **006.68** |

**Biometric identification**

Several months ago LC classifier Mark Behrens brought to our attention the following volume:

Title: Iris biometrics:  from segmentation to template security

Summary: Iris Biometrics: From Segmentation to Template Security provides critical analysis, challenges and solutions on recent iris biometric research topics, including image segmentation, image compression, watermarking, advanced comparators, template protection and more. Open source software is also provided on a dedicated website which includes feature extraction, segmentation and matching schemes applied in this book to foster scientific exchange. Current state-of-the-art approaches accompanied by comprehensive experimental evaluations are presented as well. This book has been designed as a secondary text book or reference for researchers and advanced-level students in computer science and electrical engineering.

Contents: The Human Iris as a Biometric Identifier -- Iris Biometric Processing -- State-of-the-Art in Iris Biometrics -- Eye Detection -- Iris Segmentation Methodologies -- Multi-Stage Real-Time Iris Preprocessing -- Experiments on Iris Image Processing -- Image Compression Impact on Iris Recognition -- Advanced Comparison Techniques for Challenging Iris Images -- Experiments on Biometric Comparators -- Iris Biometric Cryptosystems -- Cancelable Iris Biometrics -- Potential Attacks -- Experiments on Iris Biometric Template Protection -- Advances, Applications and Challenges -- Watermarking.

The subject of biometrics is dealt with in the following Manual note:

519.5, T1—015195 vs. 001.422, T1—0727

Statistics

The subject of statistics can be divided into three parts:

1. How to obtain and arrange statistical data

2. How to manipulate the data by mathematical means to produce information regarding the topic being examined

3. How to interpret the statistical results

Use 519.5, or the number in 001–999 for the subject, plus notation 015195 from Table 1, for works containing only 2, or 2 with 1 or 3 or both as incidental information. Use 001.422, or the number in 001–999 for the subject, plus notation 0727 from Table 1, for works giving equal treatment to 1, 2, and 3, or containing information about only 1 or 3 or both 1 and 3.

In many disciplines a word derived from the discipline name combined with –metrics or -statistics is used for statistical work, e.g., sociometrics, econometrics, biometrics, biostatistics. Commonly works on these subjects concentrate on 2 from the above list, with secondary treatment of 3 or 1 or both. Use the number in 001–999 for the subject plus notation 015195 from Table 1 for these works. Use the number in 001–999 for the subject plus notation 0727 from Table 1 for works of broader treatment, emphasizing 1 or 3 or both 1 and 3.

If in doubt, prefer 519.5 or T1—015195.

*See also discussion at 510, T1—0151 vs. 003, T1—011.*

Biometrics is indexed to 570.15195 Statistical mathematics, which has biometrics and biostatistics in its class-here note.

In our discussions, several issues emerged:

* Biometrics at 570.15195 is inherently statistical in nature. While the biometrics of the target volume may also involve statistics (at least in the sense of statistical data), more fundamentally it involves computational processes. Thus, the target volume belongs somewhere in 006, rather than in 570.15195. We need to distinguish between statistically-oriented biometrics and computationally-oriented biometrics.
* The two LCSHs, “Biometry” and “Biometric identification” correspond to statistically-oriented biometrics and computationally-oriented biometrics, respectively. Biometry has the following 450s: Biological statistics, Biology – Statistical methods, Biometrics (Biology), and Biostatistics; Biometric identification has the following 450s: Biometric person authentication and Biometrics (Identification). Like LCSH, MeSH also uses the heading “Biometric Identification,” the concept in our target volume.
* Biometric identification can focus on many different biological traits. The scope note for the MeSH “Biometric Identification” mentions “DNA profiles or DNA fingerprints, hand fingerprints, automated facial recognition, iris scan, hand geometry, retinal scan, vascular patterns, automated voice pattern recognition, and ultrasound of fingers.” As significant literature exists for biometric identification based on a number of the specific traits mentioned, it would be optimal if our treatment of biometric identification would permit the biological trait or body part to be identified.

Relative to the first point, our indexing should distinguish between Biometrics—statistics (570.15195) and Biometrics—computer science (somewhere in 006). But which should be the interdisciplinary number for biometrics? Searches on the two LCSHs, “Biometry” and “Biometric identification,” over the past five years give the nod to 570.15195 (the ratio is 5:3 in favor of “Biometry”). Moreover, “Biometrics—computer science” equates (for now) to biometric identification, a more specific topic.

Candidate areas under 006 for biometric identification include 006.24 Automatic identification and data capture and 006.4 Computer pattern recognition. We note two see references from 006.24 Automatic identification and data capture to subdivisions of 006.4 Computer pattern recognition, namely, to 006.424 Optical character recognition (on the data capture side) and to 006.454 Speech recognition (on the automatic identification side). With the exception of the inclusion of speaker recognition as a standing room topic at 006.454, the remainder of 006.4 concerns recognition of linguistic content. The focus of 006.24 contrariwise is identification of objects. Is the identification of persons better aligned with the identification of objects or with the recognition of linguistic content? We have to come down on the side of 006.24 Automatic identification and data capture. (This move also calls for the relocation of speaker recognition out of 006.454.)

Should biometric identification be treated as a class-here topic at 006.24, or should it be developed separately? The desire to identify the biological trait or body part involved argues for a separate development. We should also note that biometric identification applies not just to humans and but also to (other) animals. Therefore, in formulating an add instruction to indicate the biological trait or body part involved, we have added from the 570s rather than from the 610s.

The proposed development and ripple effects are shown in the following entries (including some entries given only for context):

006.24 \*Automatic identification and data capture (AIDC)

Including magnetic stripe encoding

Class here interdisciplinary works on automatic identification and data capture

*For optical character recognition, see 006.424; ~~for speaker recognition, see 006.454; for biometric identification, see 570.15195~~. For specific applications of automatic identification and data capture, see the application, plus notation 0285624 from Table 1, e.g., inventory control in business 658.7870285624*

006.248 \*Biometric identification [*formerly* 570.15195]

Class statistical biometrics in 570.15195

*For biometric identification of criminals, see 363.258*

006.248 2 \*DNA fingerprinting (DNA profiling)

Class interdisciplinary works on DNA fingerprinting in 572.8633

006.248 3 \*Physiological biometric identification

Add to base number 006.2483 the numbers following 573 in 573.1–573.9, e.g., facial recognition 006.2483995

006.248 392 \*Communication systems

Number built according to instructions under 006.2483

Class here speaker recognition [*formerly* 006.454]

*See also 006.454 for speech recognition*

006.248 399 \*Regional histology and physiology in animals

Number built according to instructions under 006.2483

006.248 399 8 \*Appendages

Number built according to instructions under 006.2483

Class here fingerprints, hand geometry

Class fingerprints in anthropometry in 599.945

006.4 \*Computer pattern recognition

Class pattern recognition as a tool of artificial intelligence in 006.3

. . .

006.454 \*Speech recognition

~~Including speaker recognition~~

Class here comprehensive works on speech recognition and speech synthesis

*For speech synthesis, see 006.54*

Speaker recognition relocated to 006.248392

\*Use notation 019 from Table 1 as modified at 004.019

363.258 Identification of criminals

Including artists’ sketches, fingerprints, lineups, photographs, voice prints

Class files resulting from criminal investigations in 363.24; class interdisciplinary works on biometric identification in 006.248

570 Biology

570.151 95 Statistical mathematics

Class here biometrics, biostatistics

*See Manual at 519.5, T1—015195 vs. 001.422, T1—0727*

Interdisciplinary works on biometric identification relocated to 006.248

572 Biochemistry

572.863 3 Molecular structure

Number built according to instructions under 572.5–572.8

Class here DNA topology, double helix, genetic code; chromosome,gene, genome mapping; base, gene, nucleotide sequences

Class amino acid sequence in 572.633

*For use of DNA fingerprinting* *in biometric identification, see 006.2482; for base and nucleotide sequence in RNA, see 572.8833*

573 Specific physiological systems in animals, regional histology and physiology in animals

Class here comprehensive works on specific physiological systems

Except for modifications shown under specific entries, add to each subdivision identified by \* as follows:

. . .

Class biometric identification based on physiological aspects in 006.2483; class comprehensive works on physiological systems in 571

*For specific physiological systems in plants, see 575; for specific physiological systems in humans, see 612; for specific physiological systems in domestic animals, see 636.0892*

*See Manual at 571–573 vs. 610*

599 \*Mammalia (Mammals)

. . .

599.94 Anthropometry

599.945 Skin

Including dermatoglyphics, fingerprints

Class use of fingerprints in biometric identification in 006.2483998; class use of fingerprints in criminal investigation in 363.258

Related indexing:

|  |  |
| --- | --- |
| Biometric identification | 006.248 |
| Biometric identification—criminal investigation | 363.258 |
| Biometric identification—computer science | 006.248 |
| Biometrics | 570.151 95 |
| Biometrics—computer science | 006.248 |
| Biometrics—statistics | 570.151 95 |
| DNA fingerprinting | 572.8633 |
| DNA fingerprinting—biometric identification—computer science | 006.248 2 |
| Facial recognition—biometric identification—computer science | 006.248 399 5 |
| Fingerprints—biometric identification—computer science | 006.248 399 8 |
| Fingerprints—biometric identification— criminal investigation | 363.258 |
| Gait analysis—biometric identification—computer science | 006.248 379 |
| Hand geometry—biometric identification—computer science | 006.248 399 8 |
| Human face recognition—biometric identification—computer science | 006.248 399 5 |
| Iris scan—biometric identification—computer science | 006.248 388 |
| Retinal scan—biometric identification—computer science | 006.248 388 |
| Scent recognition—biometric identification—computer science | 006.248 353 79 |
| Speaker recognition—biometric identification—computer science | 006.248 392 |
| Voice recognition—biometric identification—computer science | 006.248 392 |
| Voice recognition—biometric identification— criminal investigation | 363.258 |

1. Searches were of the form *dd:(004\* or 005\* or 006\* or 621.3\* or 025.04\*) and su:“xxx”*. [↑](#footnote-ref-1)