Record Type 10,11, & 12 Recommendations

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Topic 21: New Record Types-11 and 12

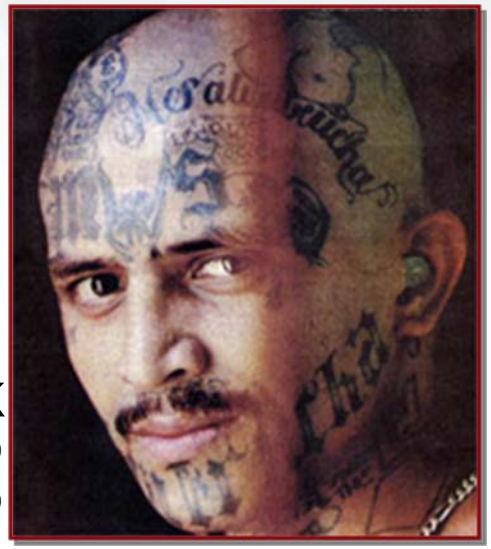
Current State:

Record Type 10 is a hybrid of face and Scar, Mark, and Tattoo (SMT) data

Issue:

Much of the data is mislabeled--or left blank

Likely Frontal, not labeled = 52%
Likely Profile, not labeled = 55%



Questions:

- Would groups do any better separating them into two different record types or will this present a new set of problems?
- Is the SMT ready to constitute its own record type or should advancements in taxonomy and hierarchical classification be considered first?

Type-10 Record & Tattoos

- Type-10 originally developed for face and SMT
- Face portion of record enhanced in 2007
- University of Michigan report describes major limitations with existing tattoo taxonomy
- New hierarchical classification system proposed
  - Organize tattoo images as a tree structure
  - Each branch has a small number of divisions
- Proposed classification not complete

IAFIS Photo Stats

- As of March 1, 2010
  - 10,802,775 photos
  - From February 14 through February 20, 2010, 23.04% of criminal submissions (for the TOTs of CAR, CARC, CNA, and CNAC) contained at least one photo
  - Approximately 3% of the images submitted with fingerprint transactions are those of an SMT (324,000 SMT images)

Next Generation Identification

- The FBI has a vested interest
  - Face Recognition Service
  - Text-based SMT Service

ANSI/NIST Tattoo Classes

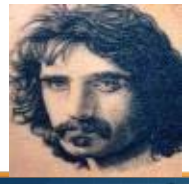
8 major classes; 70 subclasses

ANSI/NIST ITL 1-2000 Tattoo Classes

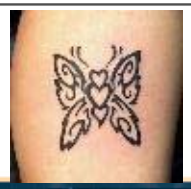
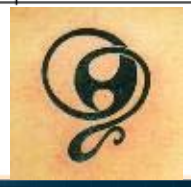
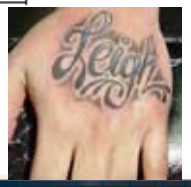
Class description	Class code
Human Forms and Features	HUMAN
Animals and Animal Features	ANIMAL
Plants	PLANT
Flags	FLAG
Objects	OBJECT
Abstractions	ABSTRACT
Insignias & Symbols	SYMBOL
Other Images	OTHER

ANSI/NIST ITL 1-2000 Animal Tattoo Subclasses

Subclass	Subclass code
Cats & Cat Heads	CAT
Dogs & Dog Heads	DOG
Other Domestic Animals	DOMESTIC
Vicious Animals (Lions, Tigers, etc.)	VICIOUS
Horses (Donkeys, Mules, etc.)	HORSE
Other Wild Animals	WILD
Snakes	SNAKE
Dragons	DRAGON
Birds (Cardinal, Hawk, etc.)	BIRD
Spiders, Bugs, and Insects	INSECT
Abstract Animals	ABSTRACT
Animal Parts	PARTS
Miscellaneous Animal Forms	MANIMAL





Human Animal Plant Flag Object Abstract Symbol Other

Limitation - I

- ANSI/NIST classes have very broad meaning which introduces large ambiguity and subjectivity in image labeling

(a)

(b)

(c)

Examples of three different tattoo images in the “Abstract” class. Each image could also be annotated with one or more additional classes: (a) Symbol, (b) Object, Symbol, and (c) Object

Limitation - II

- There is a large overlap within the sub-classes of each major class
  - A tattoo could be assigned to any one of the overlapping classes !

HUMAN class

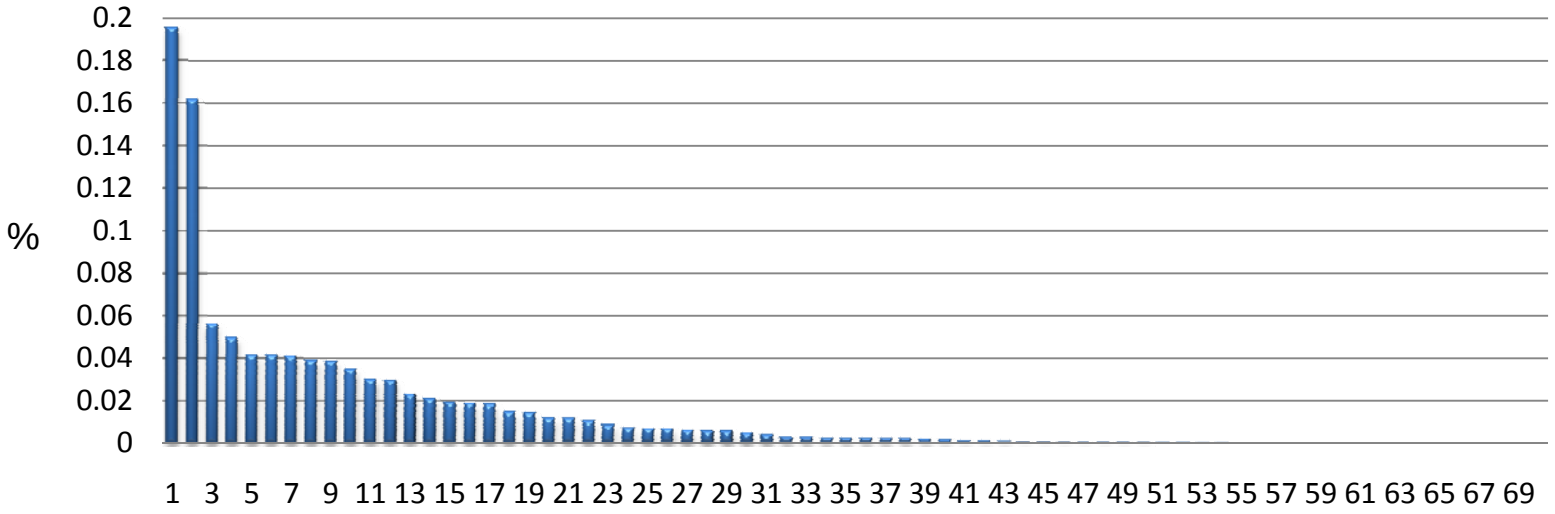
male face	male body	male body parts

PLANT class

red flowers	drawing of flowers	rose

Limitation - III

- The ANSI/NIST standard does not distribute the tattoo images into the classes uniformly
  - A large fraction of tattoo database is covered by a small number of (sub)classes



1: Other-Wording (3,909) 2: Symbol-MISC (3,233) 3: Human-Skull (1,120) 4: Human-Face (989)

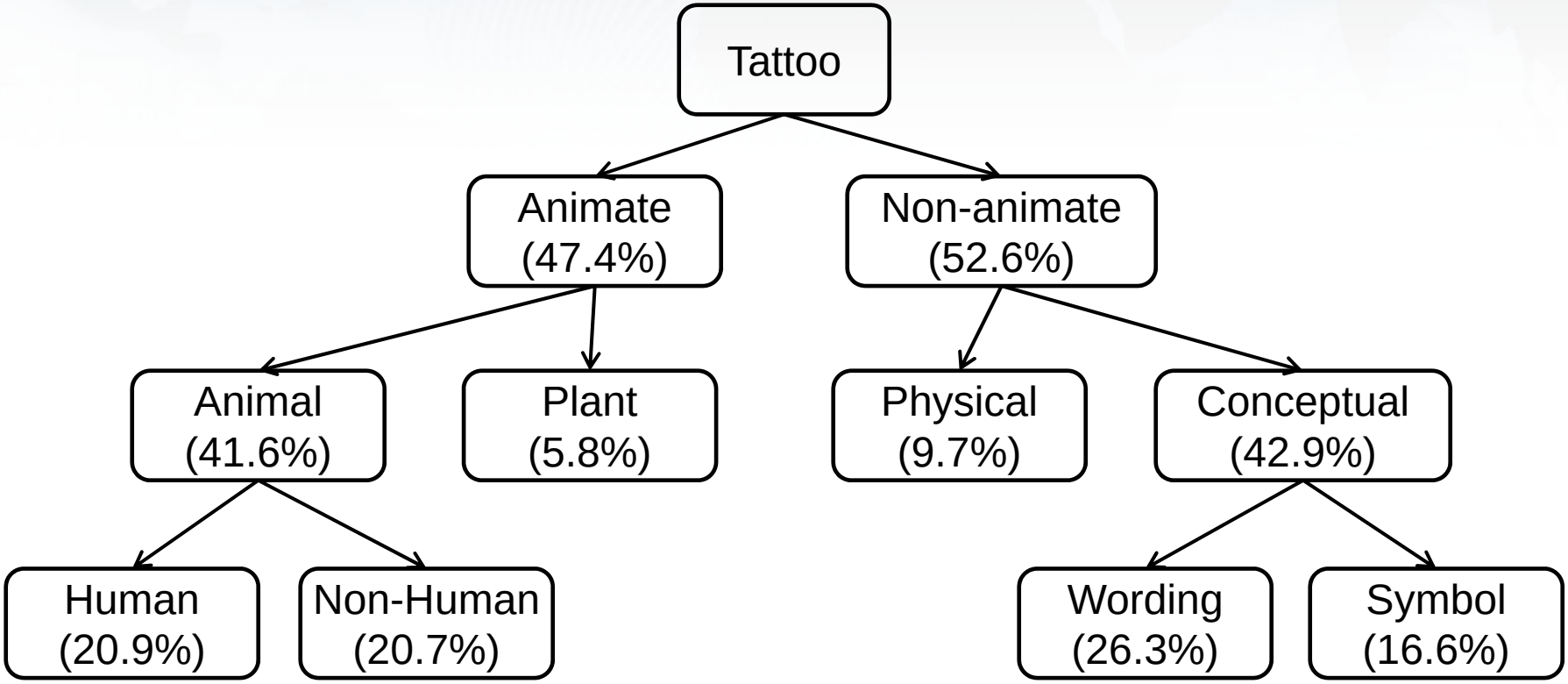
5: Abstract-Figure (825) 6: Human-MISC (820) 7: Plant-MISC (815) 8: Abstract-Brace (776)

Distribution of tattoo image subclasses based on ANSI/NIST standard over 20,000 images obtained from the Michigan State Police (MI-DB)

Proposed Hierarchical Classification

- Organize tattoo images as a tree structure with a small number of branches
  - Users have only a small number of options to choose from at each node which reduces the ambiguity
- Degree (depth) of class level can be provided as an input parameter for matching
- Updating the Standard and database images with new classes is simpler than the current approach

An example of hierarchical classification on MI-DB



Based on 20,000 images

Challenges

- SMT
  - Manual classification is subjective and error prone with existing structure
  - Any proposed changes to structure should be tested before adoption
- Face Detection Algorithms / Prescreen
  - Tattoos can be faces
  - Faces can have tattoos
- Is the separation going to fix the mislabeling problem?

Recommendations for Type-10, -11, -12 Records

- Retain the Type-10 record in its present form
- Do not assign record Type-11 & -12 to any function during this current revision process
- Continue to use the existing tattoo taxonomy as part of the Type-10 record
- Complete development and independent testing of the Michigan tattoo image classification scheme
- Consider adopting the Type-11 record for tattoos in the next revision process