Ontology-Mediated Cultural Contact Detection Through Motion and Style in Southern Chinese Martial Arts

Alessandro Adamou, Yumeng Hou, Davide Picca, Mattia Egloff, Sarah Kenderdine

SWODCH 2021

Living Heritage Series

Traditional Martial Arts
As Intangible Cultural Heritage
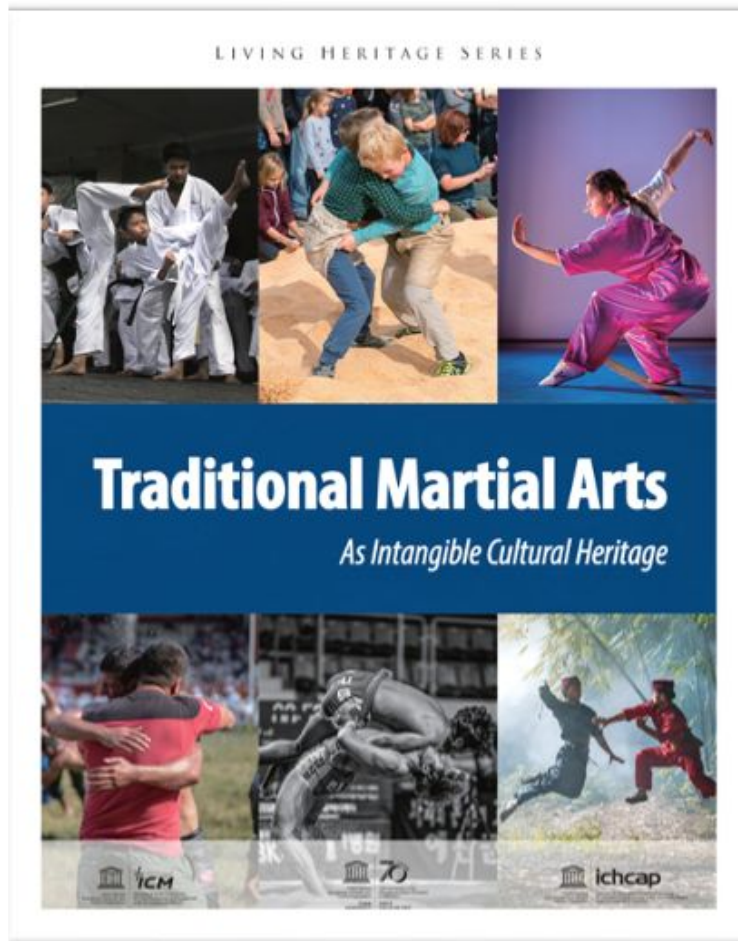
CONTEXT

Intangible Cultural Heritage (ICH)

- **"the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith" (UNESCO, 2003)**

Chinese Martial Arts as ICH

- **Chinese physical culture is a rich, multi-layered cultural system that reflects China's complex social history, multiculturalism, and joint creative efforts of diverse ethnic groups over many centuries. (Ma, 2003, 2009).**

CROSSINGS

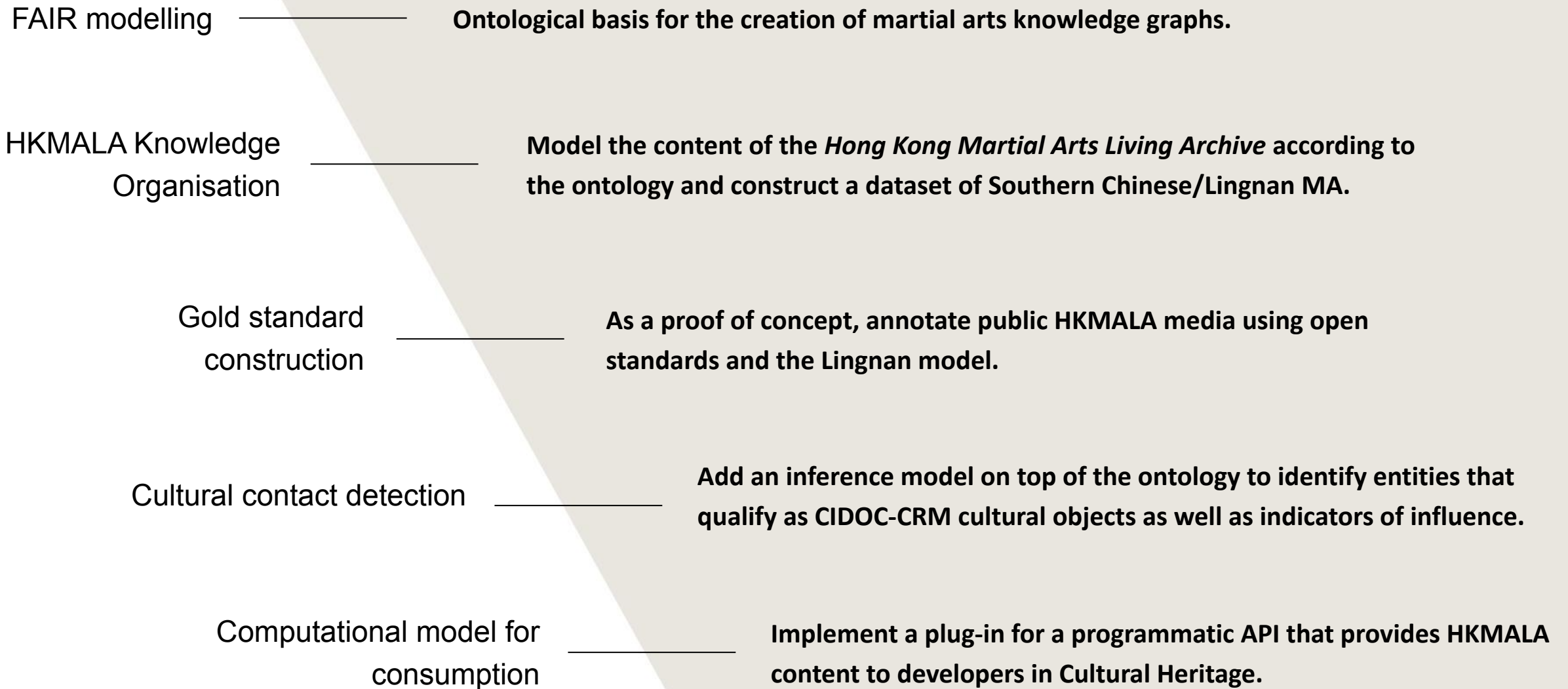A one-year, joint exploratory project by Uni Lausanne and EPFL funded by the CROSS 2021 programme.

OBJECTIVE

To explore the potential for standardising the consumption of tangible and intangible cultural heritage by instantiating a use case for the Hong Kong Martial Arts Living Archive (HKMALA).

METHOD

An ontological study on the intangible heritage of martial arts and generating a linked knowledge graph that a computational model (implemented as a tool) can exploit for the delivery of cultural content to applications.
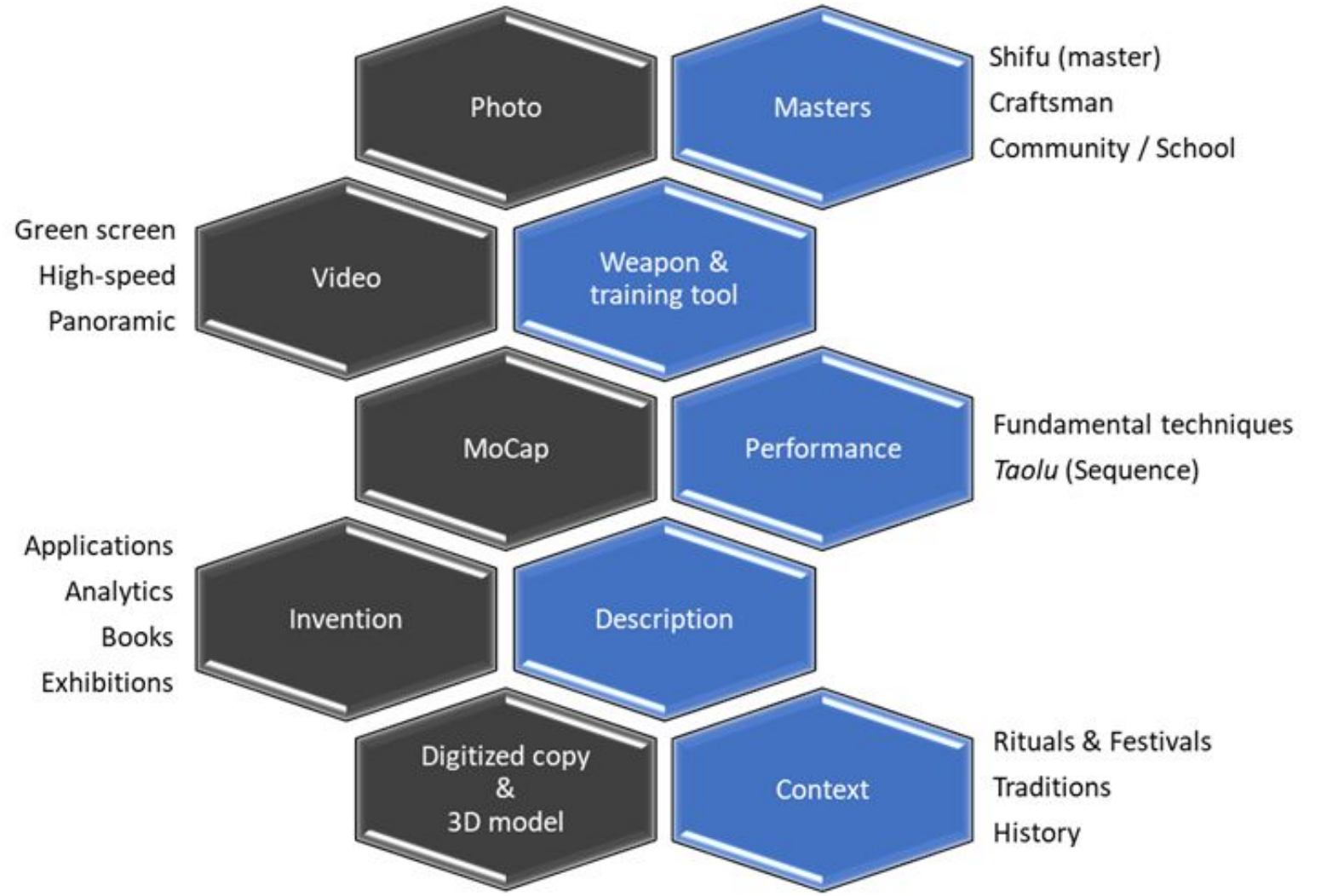
FAIR modelling ——————— **Ontological basis for the creation of martial arts knowledge graphs.**

HKMALA Knowledge Organisation ——————— **Model the content of the *Hong Kong Martial Arts Living Archive* according to the ontology and construct a dataset of Southern Chinese/Lingnan MA.**

Gold standard construction ——————— **As a proof of concept, annotate public HKMALA media using open standards and the Lingnan model.**

Cultural contact detection ——————— **Add an inference model on top of the ontology to identify entities that qualify as CIDOC-CRM cultural objects as well as indicators of influence.**

Computational model for consumption ——————— **Implement a plug-in for a programmatic API that provides HKMALA content to developers in Cultural Heritage.**

STEPS OF ONTOLOGICAL STUDY

電影・社群
百年嶺南洪拳

LING-NAN
HUNG-KUEN
ACROSS
THE CENTURY
KUNG FU
NARRATIVES
IN HONG KONG
CINEMA
AND COMMUNITY

THE HKMALA DATASET

Photo

Masters
- Shifu (master)
- Craftsman
- Community / School

Video
- Green screen
- High-speed
- Panoramic

Weapon & training tool

MoCap

Performance
- Fundamental techniques
- *Taolu* (Sequence)

Invention
- Applications
- Analytics
- Books
- Exhibitions

Description

Digitized copy & 3D model

Context
- Rituals & Festivals
- Traditions
- History

Examples of cultural contact dimensions

Kinesthetic

Arm/Hand simulates spear, consequent to prohibition to bear arms by dominating foreign authorities
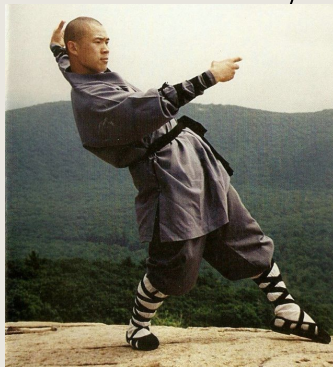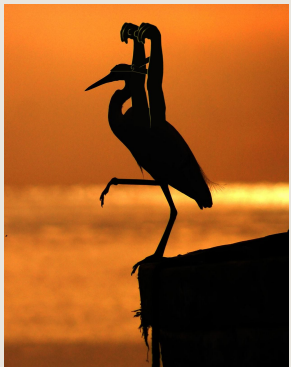
Stylistic

Techniques named after / inspired by crane or drunkard's movements, brought westward through TV/movies
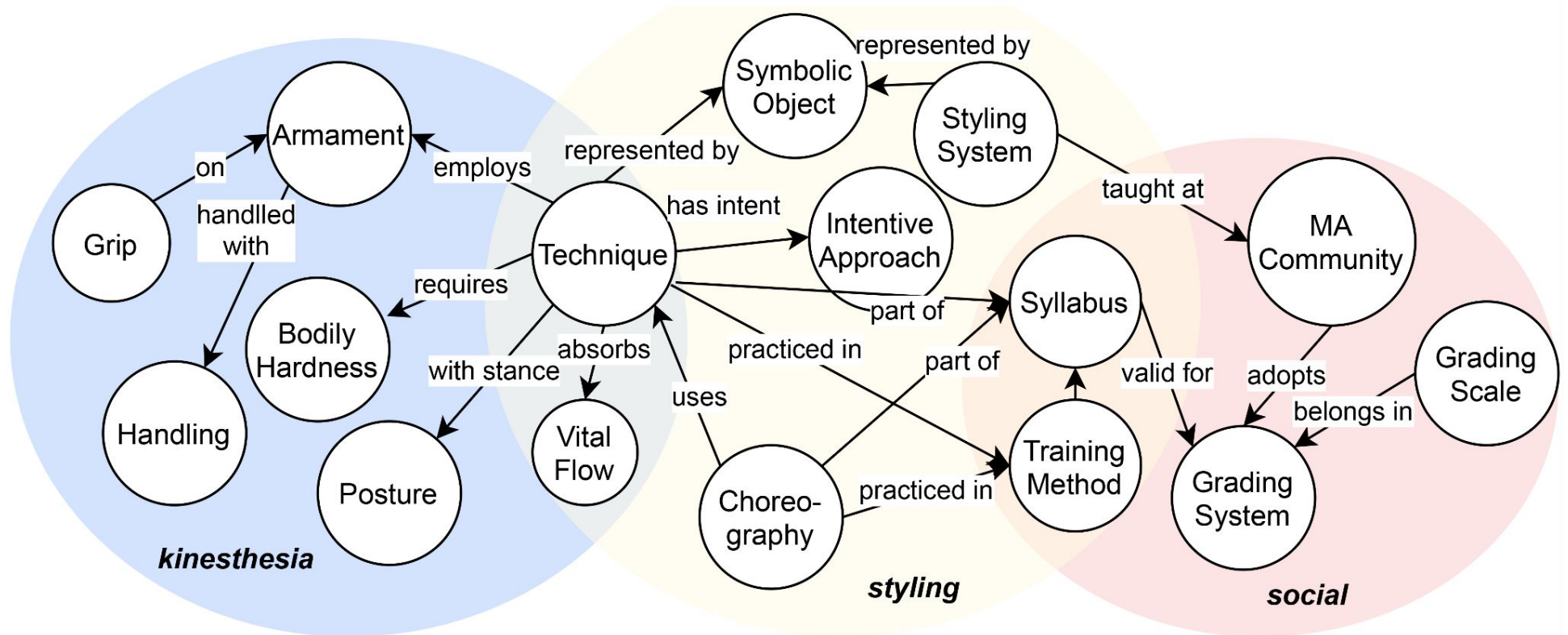
Social

Wing Chun federations adopting Japanese belt systems for grading to qualify for international competitions.

Ontology and Linked Data

Modularized ontology network + External alignments (DUL, Military Ont., etc)

METHODS

Annotation and Extraction

Manual annotation + ELAN/EAF + SPARQL-Anything

TENETS OF ONTOLOGY DEVELOPMENT

Grounding on foundational model

Find extension points from an upper ontology and towards domain ontologies: do *not* directly extend a cultural heritage model.

Generality

Avoid over-specialisation and defer to controlled vocabularies / instance sets whenever the extensional dimension is predominant (actual arts/styles).

Modularity

Users must be able to take only a term subset of their interest into consideration.

Inferenceability

Make it easy and tractable (OWL 2 RL) to add a computational model that allows cultural traits (and other features of interest) to be detected.

The Martial Arts ontology: Kinesthetic framework

IRI:
http://crossings.github.io/ont/martialmotion

Authors:
https://orcid.org/0000-0002-9272-908X

Other visualisation:
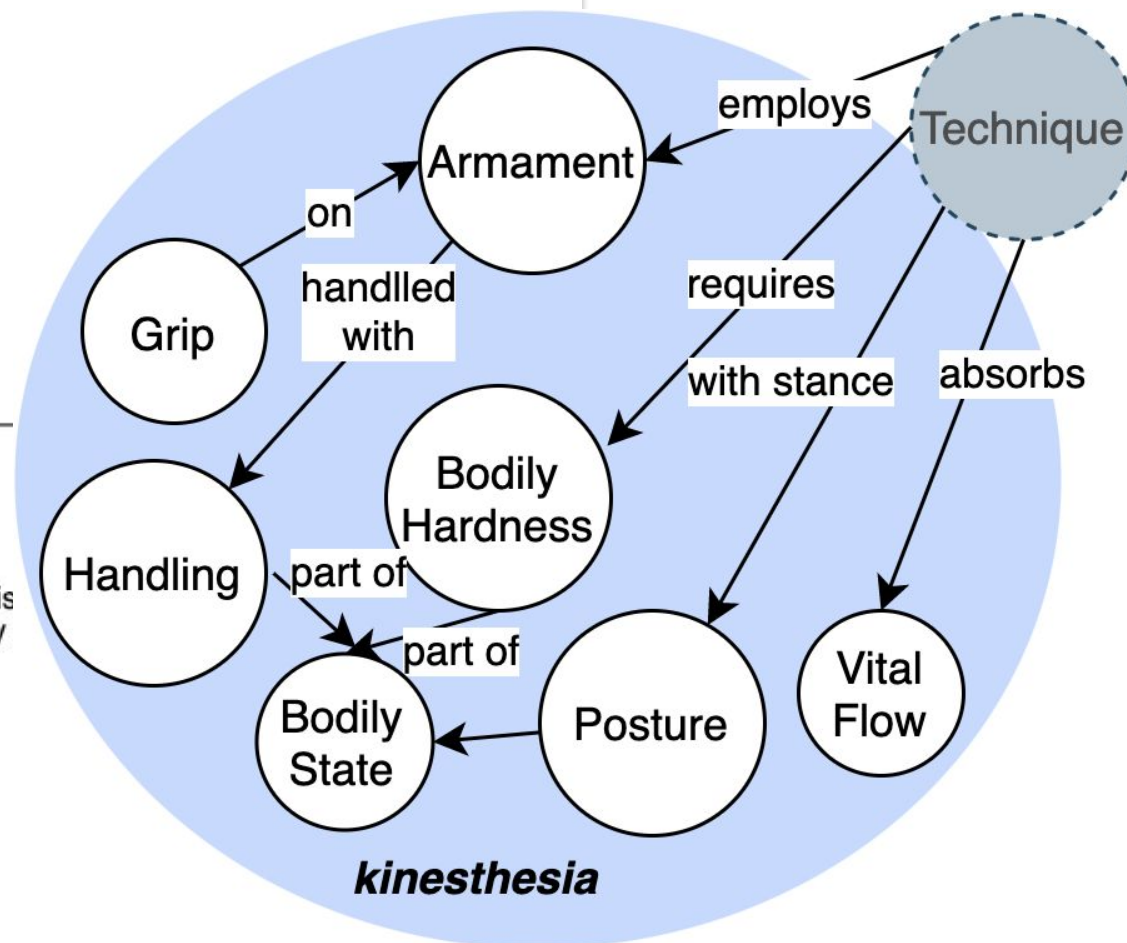Ontology source

Abstract

This ontology is currently set to encompass both kinetic and cultural traits of martial dis
in future iterations, possibly covering distinct arts/cultures.nnTODO: model the anatomy

Table of Content

Classes

armament   bodily hardness   bodily state   body part type   grip   handling   melee weapon type   posture   step
vital flow   weapon type

- 11 classes, 3 obj. properties
- Standalone module
- Reuses DUL Qualities
- Military Ontology alignment

The Martial Arts ontology: Stylistic framework

IRI:
http://crossings.github.io/ont/martialstyle

Authors:
https://orcid.org/0000-0002-9272-908X
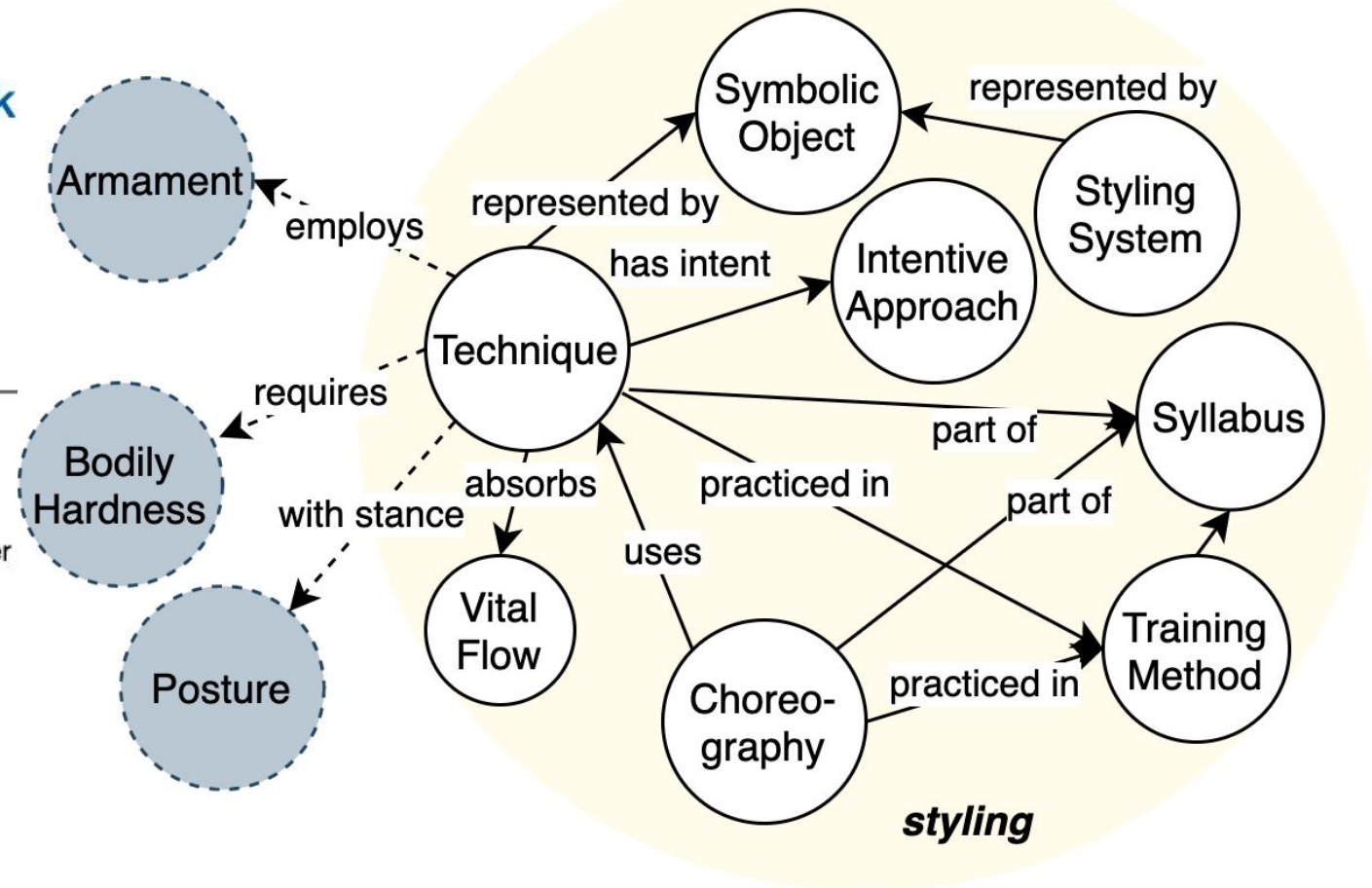
Other visualisation:
Ontology source

Abstract

This is the module where the kinetic and kinesthetic features come together techniques to styles and all the way complete martial arts.

Classes

ambivalent technique   choreography   dynamic training method   empty hand technique   frontal technique
hard approach   intentive approach   martial technique   reverse technique   soft approach   static training method
styling system   symbolic object   training method   training set   weapon technique

- 16 classes, 4 obj. properties
- Connection to kinesthetic
- DUL Method framework

The Martial Arts ontology: Social framework

IRI:
http://crossings.github.io/ont/martialsoc

Authors:
https://orcid.org/0000-0002-9272-908X

**Other visualisation:**
Ontology source

Abstract

Ontology module that covers the aspects related to how the notions of m
communicated to others. This is especially related to pedagogical aspects of te
things as dissemination and competition. However, aspects that are akin to
competitions or their rules) will not be covered.

Table of Content

Classes

degree   grading system   martial arts community   syllabus
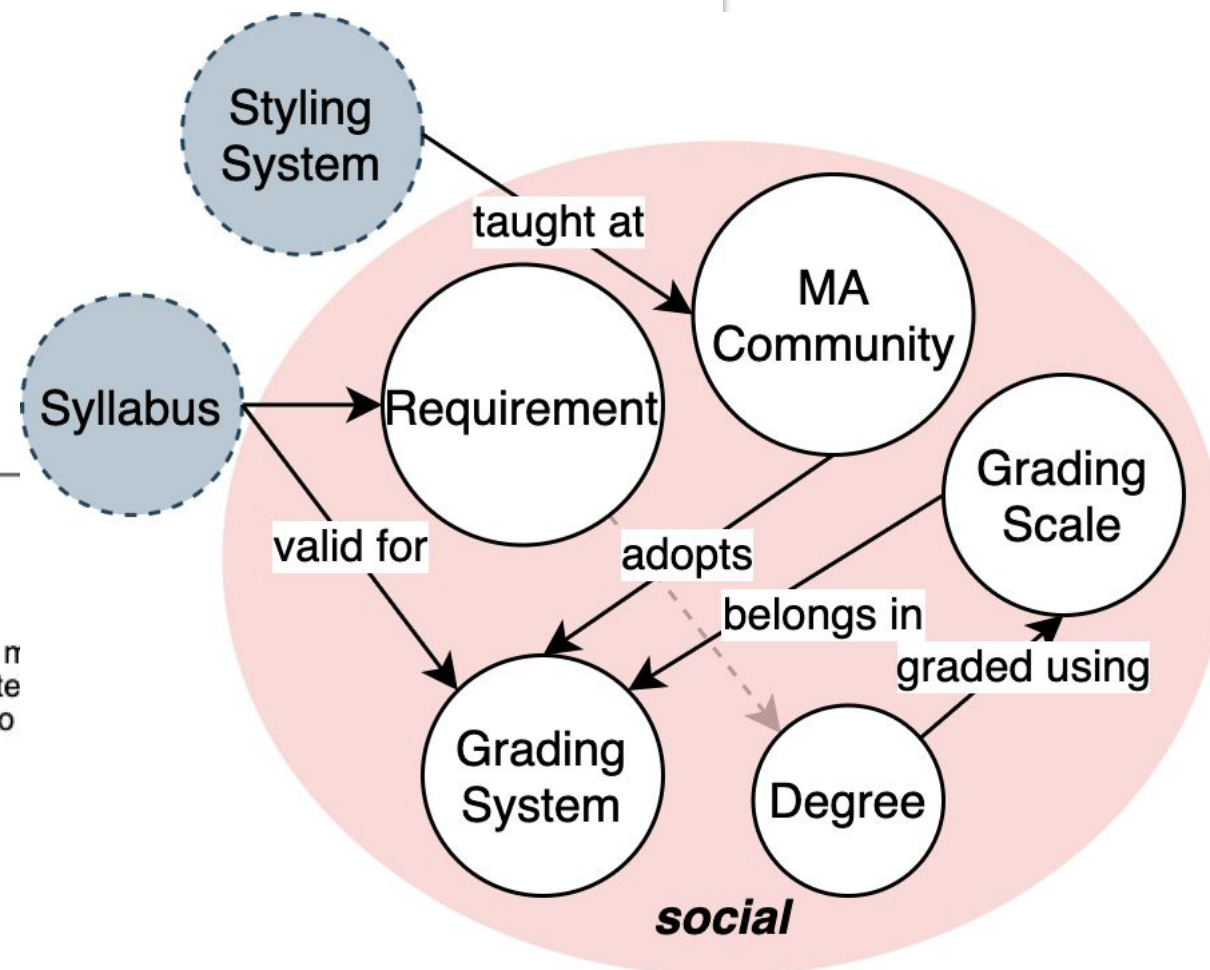
- 4 classes, 7 obj. properties
- Connected to Styling
- DUL Normative Framework

CROSSINGS Part 2:

Applications

1. Knowledge graph construction

Source material

➢ Archive manifest tables

➢ Exhibition panel texts

➢ Media captions

➢ Subtitles to technique demonstrations and interviews to masters

Tools and methods

➢ Querying/re-engineering libraries (e.g. SPARQL-Anything)

➢ Manual labour (material for gold standard is not huge)

➢ Named entity recognition (for post-gold standard material)

2. Media annotation

In collaboration with the *Hong Kong Martial Arts Living Archive* related scholars and martial arts experts, accompanied by open accessible Kung Fu manuals.

EAF annotation format

http://www.mpi.nl/tools/elan/EAF_Annotation_Format.pdf

Interoperable with JSON-LD

Tiered; the implicit semantics of tiers can be adapted

- e.g. by intention or by bodily state feature

Some tool support

```
"type": "AnnotationCollection",
"@context": {
  "@base": "http://www.w3.org/ns/ldp.jsonld",
  "hakka" : "http://crossings.github.io/ctx/hakka/"
},
"first": {
  "startIndex": "0",
  "id": "urn:nl-mpi-tools-elan-eaf:32552693-a078-46ee-a7d3-1eec6762a30f#collect
  "type": "AnnotationPage",
  "items": [{
    "id": "urn:nl-mpi-tools-elan-eaf:32552693-a078-46ee-a7d3-1eec6762a30f#a1",
    "type": "Annotation",
    "body": {
      "purpose": "transcribing",
      "format": "text/plain",
      "type": "TextualBody",
      "value": "hakka:frontalPoleBlock"
    },
```

```
{
  "total": 1,
  "generated": "ELAN Multimedia Annotator 6.2",
  "id": "urn:nl-mpi-tools-elan-eaf:32552693-a078-46ee-a7d3-1eec6762a30f#collection2",
  "label": "Offense",
  "type": "AnnotationCollection",
  "@context": "http://www.w3.org/ns/ldp.jsonld",
  "first": {
    "startIndex": "0",
    "id": "urn:nl-mpi-tools-elan-eaf:32552693-a078-46ee-a7d3-1eec6762a30f#collection2-
    "type": "AnnotationPage",
    "items": [{
      "id": "urn:nl-mpi-tools-elan-eaf:32552693-a078-46ee-a7d3-1eec6762a30f#a2",
      "type": "Annotation",
      "body": {
        "purpose": "transcribing",
        "format": "text/plain",
```

3. Cultural contact detection

Domain Ontologies

Face
Script
Coin
Series

Deity
Tool
Garment

Cultural contact model

CIDOC CRM

Cultural Trait
Type of Contact
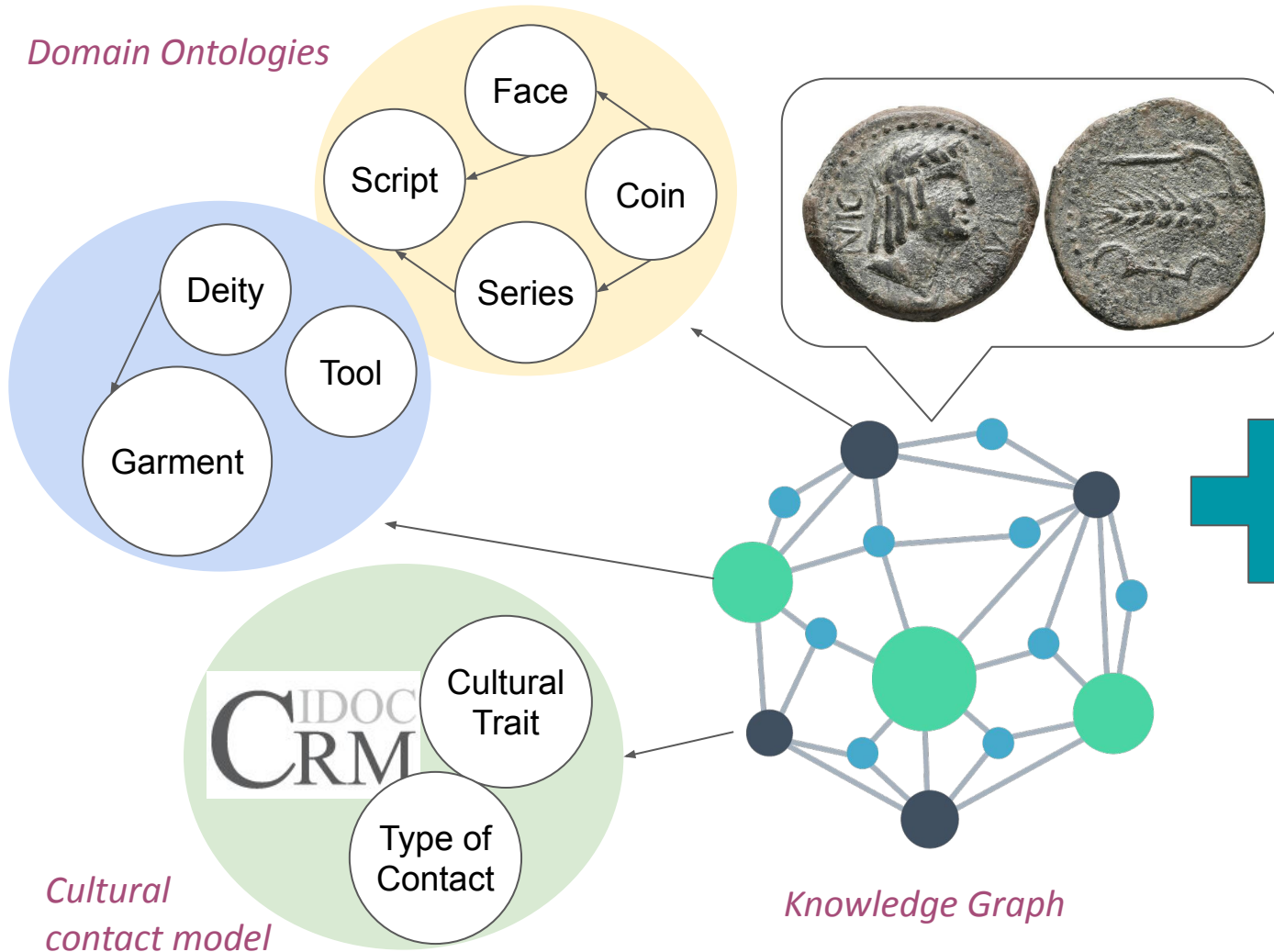
Knowledge Graph

Inference rules

```
CONSTRUCT {
  ?x :hasCulturalAssociation ?soc
  ?t a :CulturalTrait
} WHERE {
  ?t :type :Deity
  VALUES(?t ?soc) {
    ( data:Apollo data:Hellenistic )
    ….
} }
```
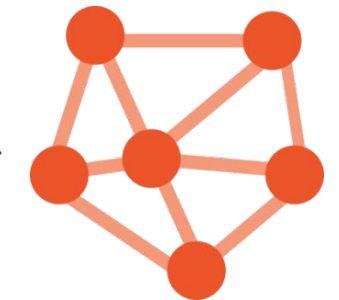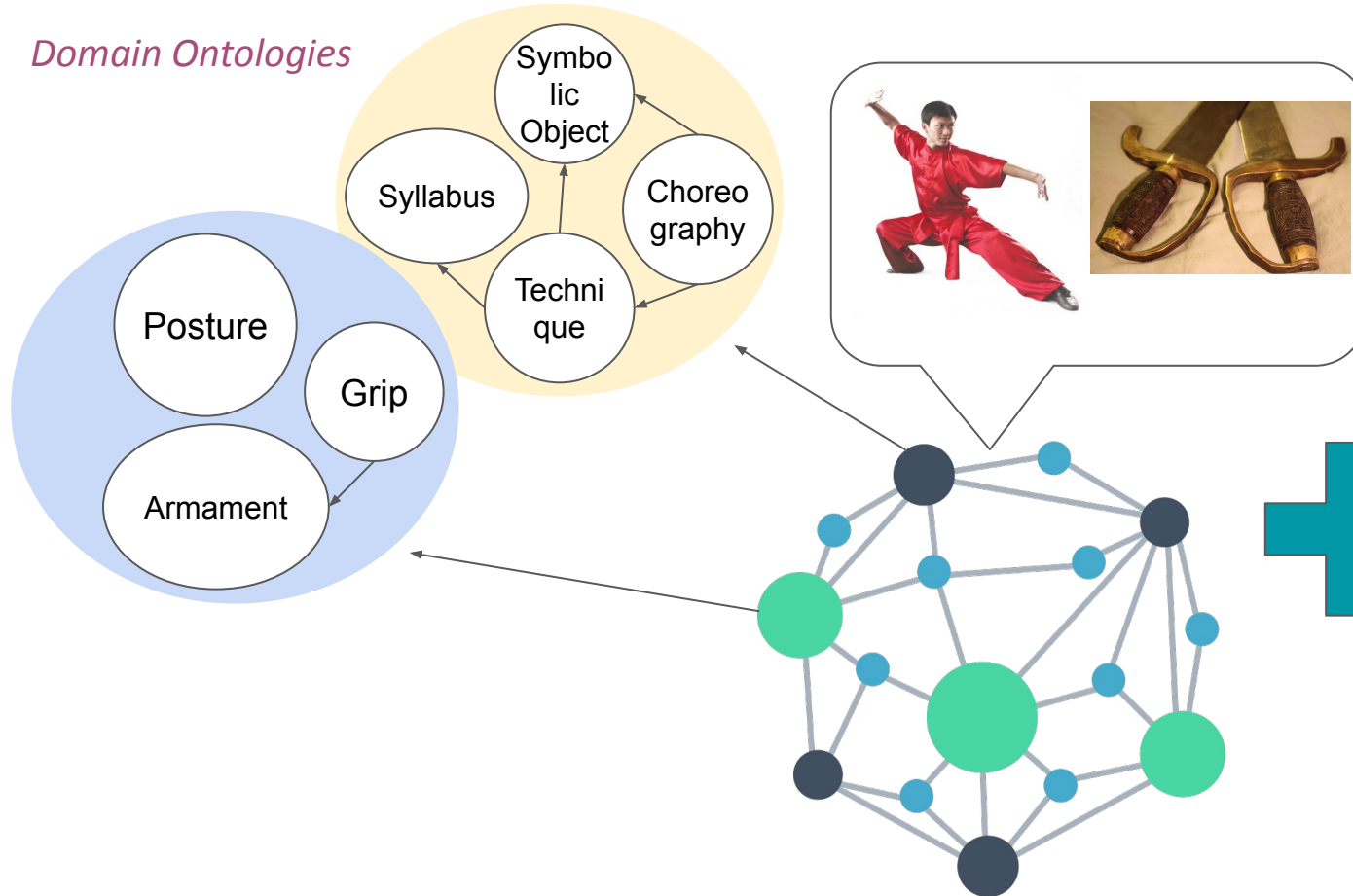
Cultural contact domain knowledge

Loreto Granados-Garcia, P.: *Cultural Contact in Early Roman Spain through Linked Open Data*. Ph.D. thesis, The Open University (October 2020), http://oro.open.ac.uk/73887/

17

3. Cultural contact detection

Domain Ontologies

Symbolic Object

Syllabus

Choreography

Technique

Posture

Grip

Armament

Knowledge Graph

Cultural contact model

ArCo?
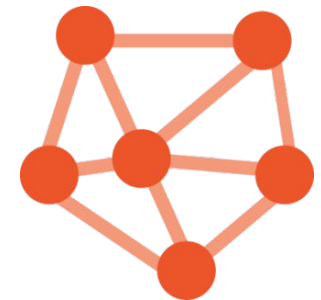
CIDOC CRM

Cultural Trait

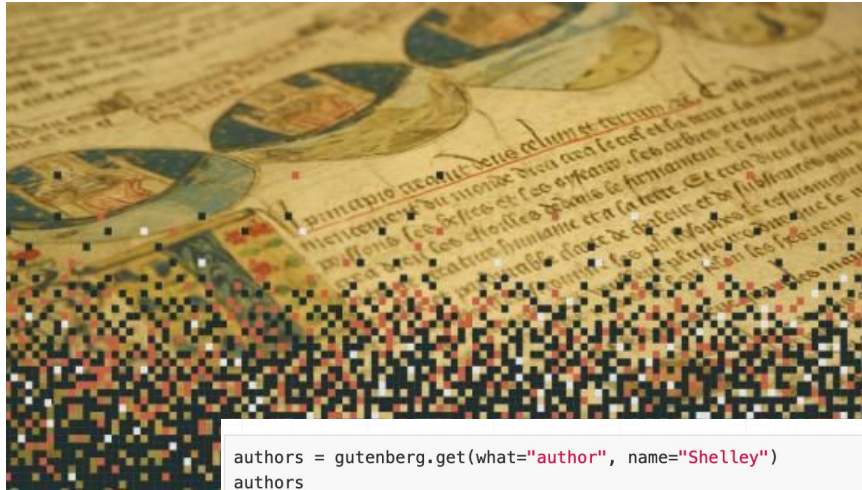Type of Contact

Inference rules

```
CONSTRUCT {
  ?x :hasCulturalAssociation ?soc
  ?t a :CulturalTrait
} WHERE {
  ?t :type :Armament
   VALUES(?t ?soc) {
    ( data:Hudiedao data:Guangdong )
    ....
} }
```

Cultural contact domain knowledge

18

4. Computational model for consumption


```
authors = gutenberg.get(what="author", name="Shelley")
authors
# {'Percy Bysshe Shelley': <Author: Shelley, Percy (http://www.gutenberg.org/2009/agents/1529>),
# 'Henry Charles Shelley': <Author: Shelley, Henry (http://www.gutenberg.org/2009/agents/2162>),
# 'Mary Wollstonecraft Shelley': <Author: Shelley, Mary (http://www.gutenberg.org/2009/agents/61>)]
```

then to access to *Mary Wollstonecraft Shelley* GutenbergAuthor object.

```
authors['Mary Wollstonecraft Shelley']
# <Author: Shelley, Mary (http://www.gutenberg.org/2009/agents/61>)
```

Similarly, Books are searched using the *what="book"* argument. This will return a list containing all

```
books = gutenberg.get(what="books", name="Frankenstein")
books
# {'Frankenstein; Or, Th (41445)': <GutenbergBook: Mary Wollstonecraft Shelley – Frankenstein; Or,
# 'Frankenstein; Or, Th (42324)': <GutenbergBook: Mary Wollstonecraft Shelley – Frankenstein; Or, T
# 'Frankenstein; Or, Th (84)': <GutenbergBook: Mary Wollstonecraft Shelley – Frankenstein; Or, The
books["Frankenstein; Or, Th (84)"]
# <GutenbergBook: Mary Wollstonecraft Shelley – Frankenstein; Or, The Modern Prometheus gutenberg_i
```

DHTK: The Digital Humanities Toolkit

➢ **http://dhtk.unil.ch**

➢ Python library for the consumption of any openly available cultural content backed by a cultural heritage Linked Dataset

➢ Due to go open source by end 2021

➢ Model has so far been adapted to textual content, looking to extend to multimedia(/modal?)

Picca, D. and Egloff, M.: *DHTK: The Digital Humanities Toolkit*. In WHiSe II (2017).

RESOURCES

DATA AND MODELS

- **The first version of the Martial Arts Ontology (continuous development - code and docs at: https://crossings.github.io/ont/)**

- **DHTK (computational model implementation): http://dhtk.unil.ch/**

- ***Coming soon*: HKMALA-based gold standard**

PUBLICATIONS

- ***Ontology-mediated cultural contact in Southern Chinese martial arts*. This paper, see CEUR-ws Vol. 2949**

- ***Digitizing Intangible Cultural Heritage Embodied: state of the art.* Journal paper submission, under review.**

THANK YOU - and to the Team

Davide Picca

Section des sciences du langage
et de l'information, UNIL

Sarah Kenderdine

Laboratory for Experimental
Museology (eM+), EPFL

Alessandro Adamou

Bibliotheca Hertziana - Max
Planck Institute for Art History

Mattia Egloff

Section des sciences du langage et
de l'information, UNIL

Yumeng Hou

Laboratory for Experimental
Museology (eM+), EPFL