

# Digital Criticism – Non-Textual “Close Reading” through the Comparison of Sources

Center for Open Data in the Humanities (CODH)

National Institute of Informatics / SOKENDAI

Asanobu KITAMOTO – Computer Scientist

<http://agora.ex.nii.ac.jp/~kitamoto/>

Collaborator:

Yoko Nishimura (Toyo University) – Historian of Chinese History

# History of Our Presentations

1. Asanobu KITAMOTO, Yoko NISHIMURA, "**Data Criticism: a Methodology for the Quantitative Evaluation of Non-Textual Historical Sources with Case Studies on Silk Road Maps and Photographs**", Third Annual Conference of the Japanese Association for Digital Humanities (JADH2013).
2. Asanobu KITAMOTO, Yoko NISHIMURA, "**Data Criticism: General Framework for the Quantitative Interpretation of Non-Textual Sources**", Digital Humanities 2014.
3. Asanobu KITAMOTO, Yoko NISHIMURA, "**Digital Criticism Platform for Evidence-based Digital Humanities with Applications to Historical Studies of Silk Road**", Digital Humanities 2016.

# Digital is more than Quantitative

## Quantitative Humanities

- Quantitative analysis
- Statistical tools
- Oriented toward distant reading

## Digital Criticism or Digital Critique

- Critical interpretation
- Semantic tools
- Oriented toward close reading

# Digital Criticism or Digital Critique

1. (Historical) source criticism (e.g. for **trustworthiness**) is enhanced by digital tools.
2. We mainly focus on **non-textual sources**, e.g. maps and photos, but the concept could also be applied for textual sources.
3. We obtain **qualitative or quantitative evidences** through the comparison of multiple sources and their relationship.

# Topics

## **1. Case Studies in Digital Silk Road Project**

1. Qianlong Map (Beijing)
2. Stein Map (Silk Road)
3. Grünwedel Map (Gaochang)

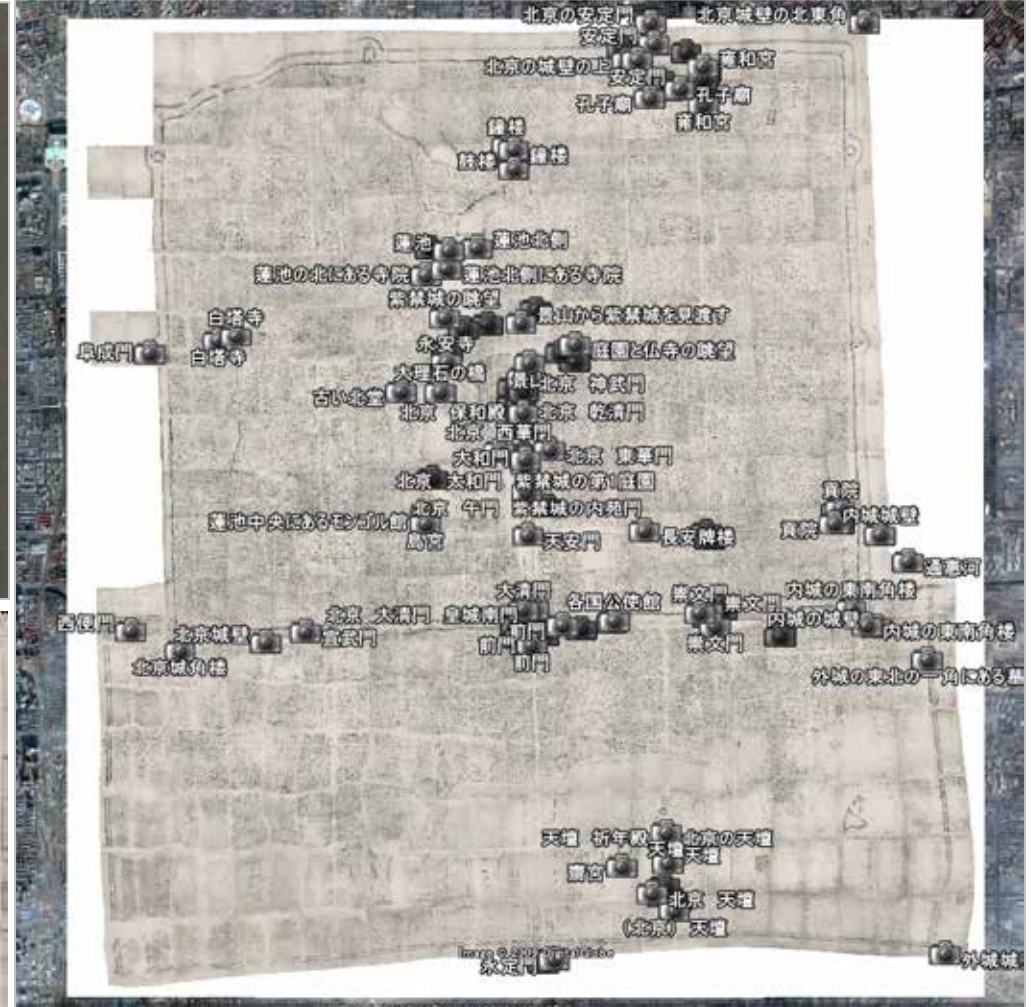
## **2. Memorygraph**

## **3. Differential Reading**

## **4. Evidence Network**

# CASE STUDIES IN DIGITAL SILK ROAD PROJECT

# 1. Qianlong Map (Beijing)



# Massive Geometric Correction

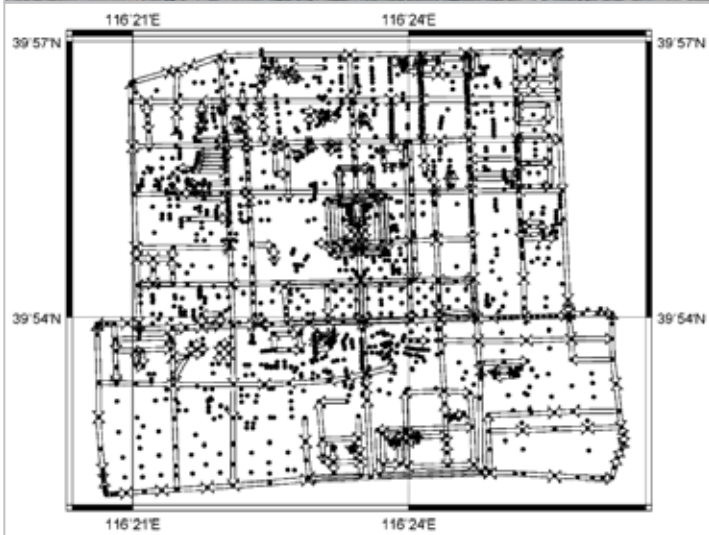


**Huge size** = W 13 m x H 14 m

**Many sheets** = 203 sheets in total

**Massive pixels** = 29 billion pixels

**Control points + lines:** We proposed a new geometric correction.





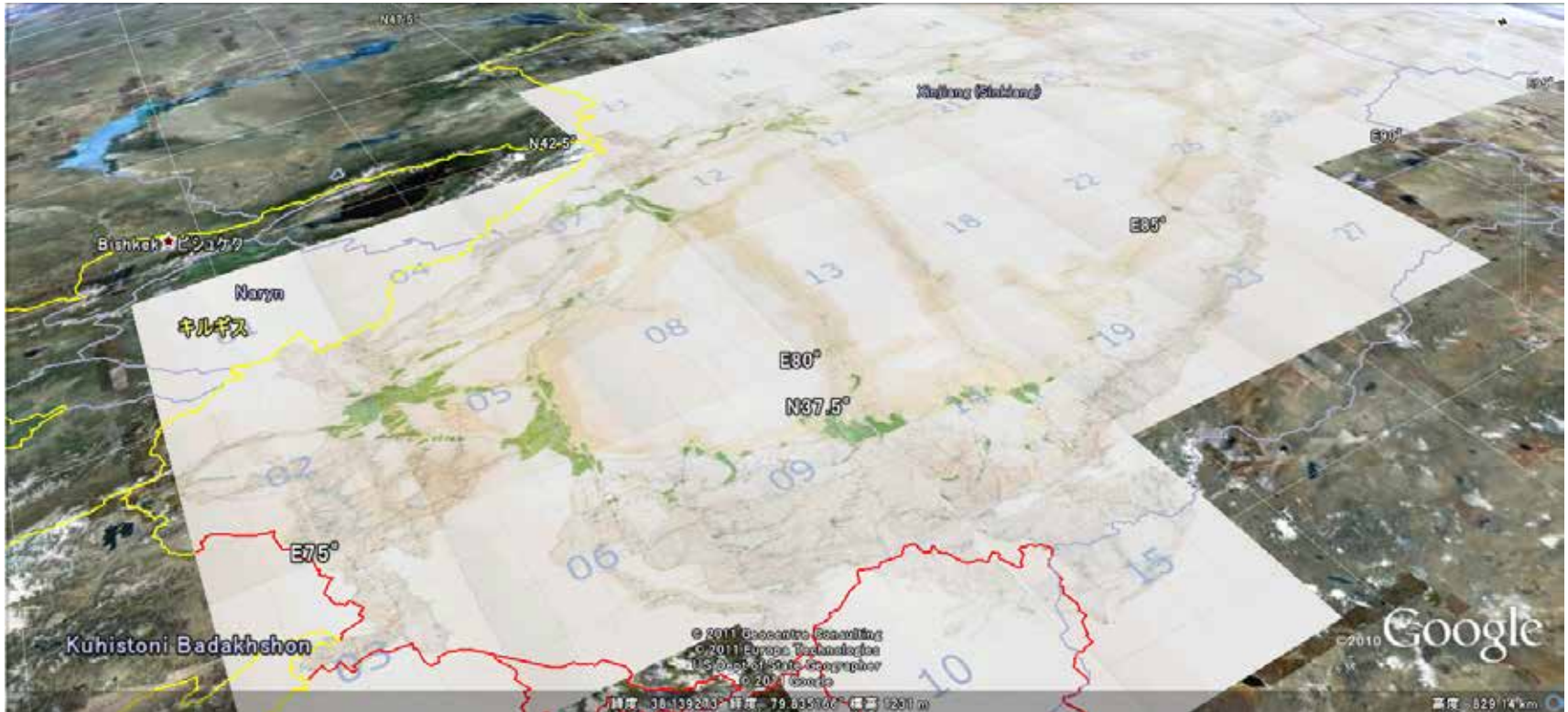
# Discovery and Digital Survey



**Unexpected discovery:** five sheets were mis-arranged due to an improper reconstruction in the past.

**Digital survey:** Place-names were examined for a complete gazetteer.

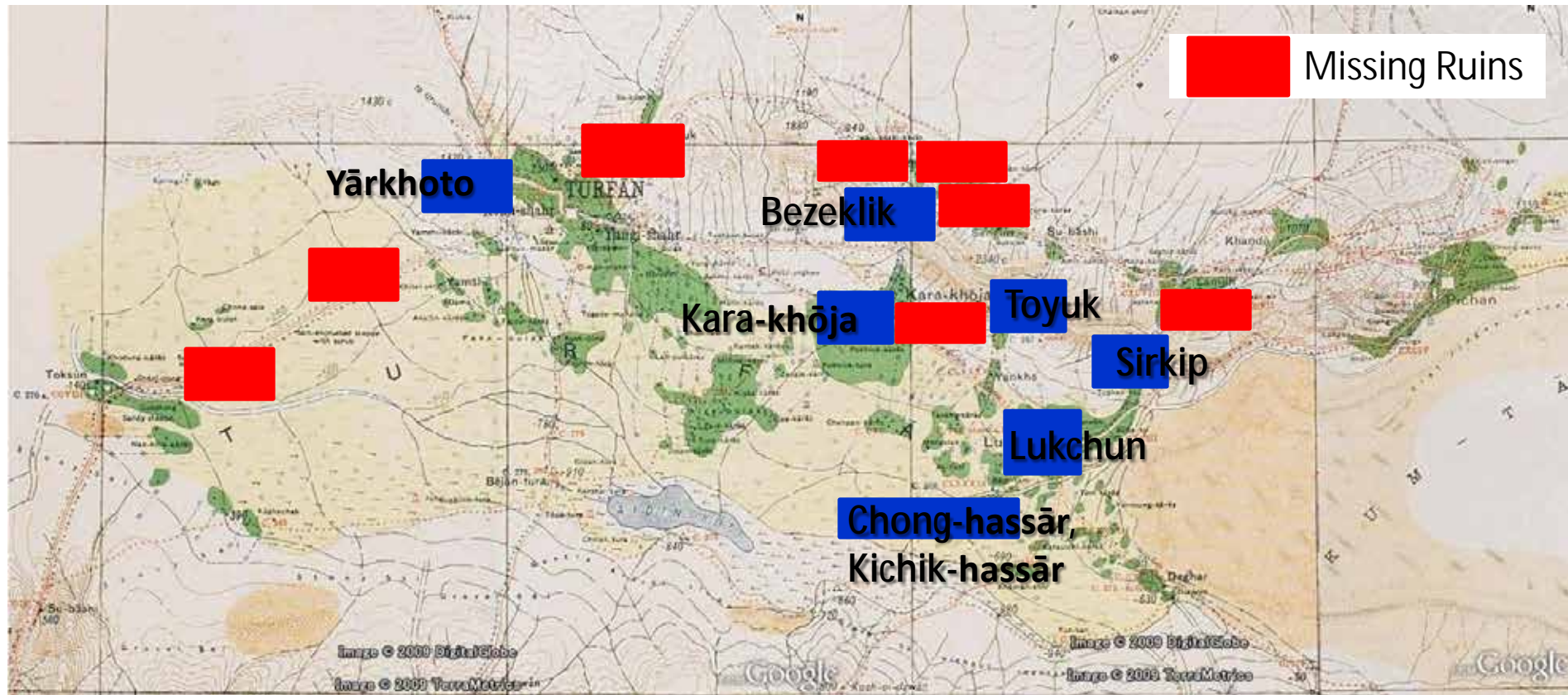
## 2. Stein Map (Silk Road)



**Maps considered as trustworthy can be really used as it is?**



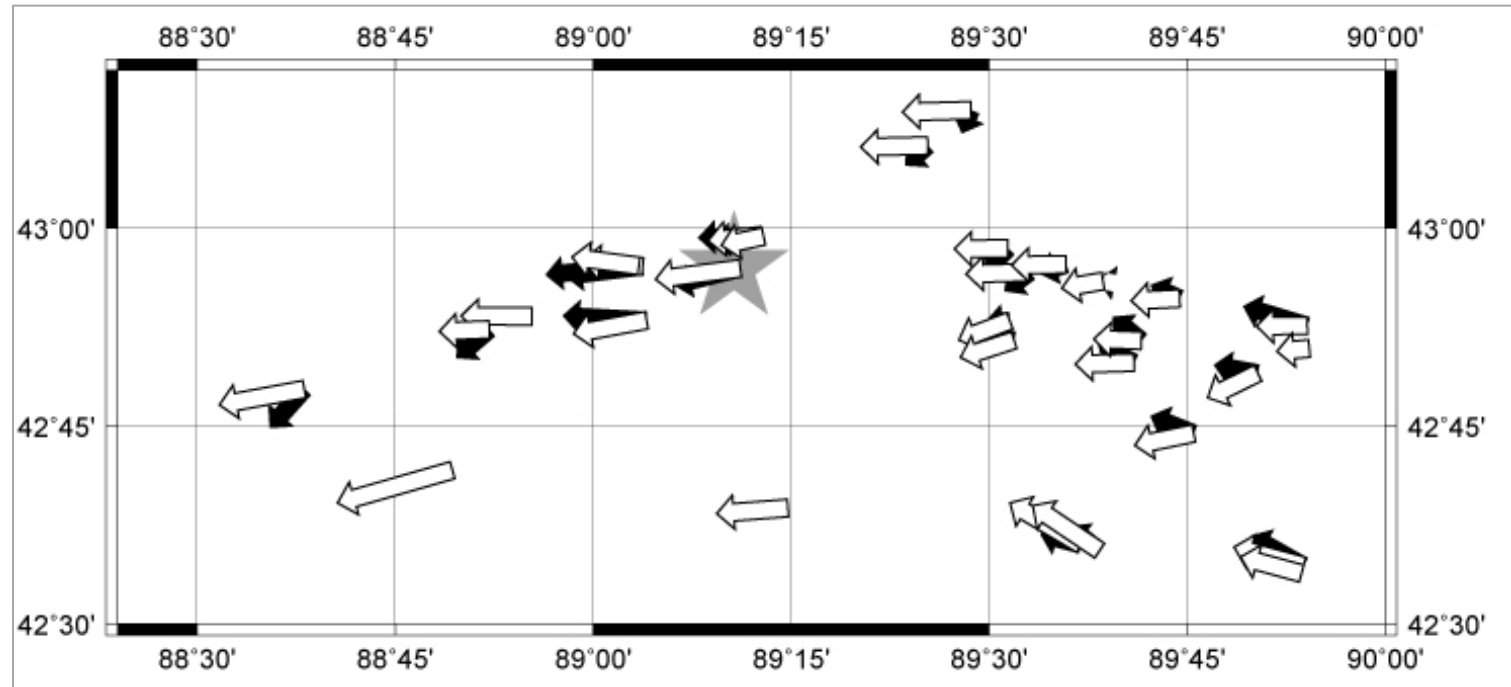
# Problem of “Missing” Ruins



Oi-tam, ruined fort  
 Bögan-tura  
 Buluyuk ( Shipang, Sassik-bulak, Kazma )  
 Murtuk-ruins

Yoghan-tura  
 Chikkan-köl  
 Bedaulat's town, Bēsh-kāwuk, Kosh-gumbaz  
 Yutōgh

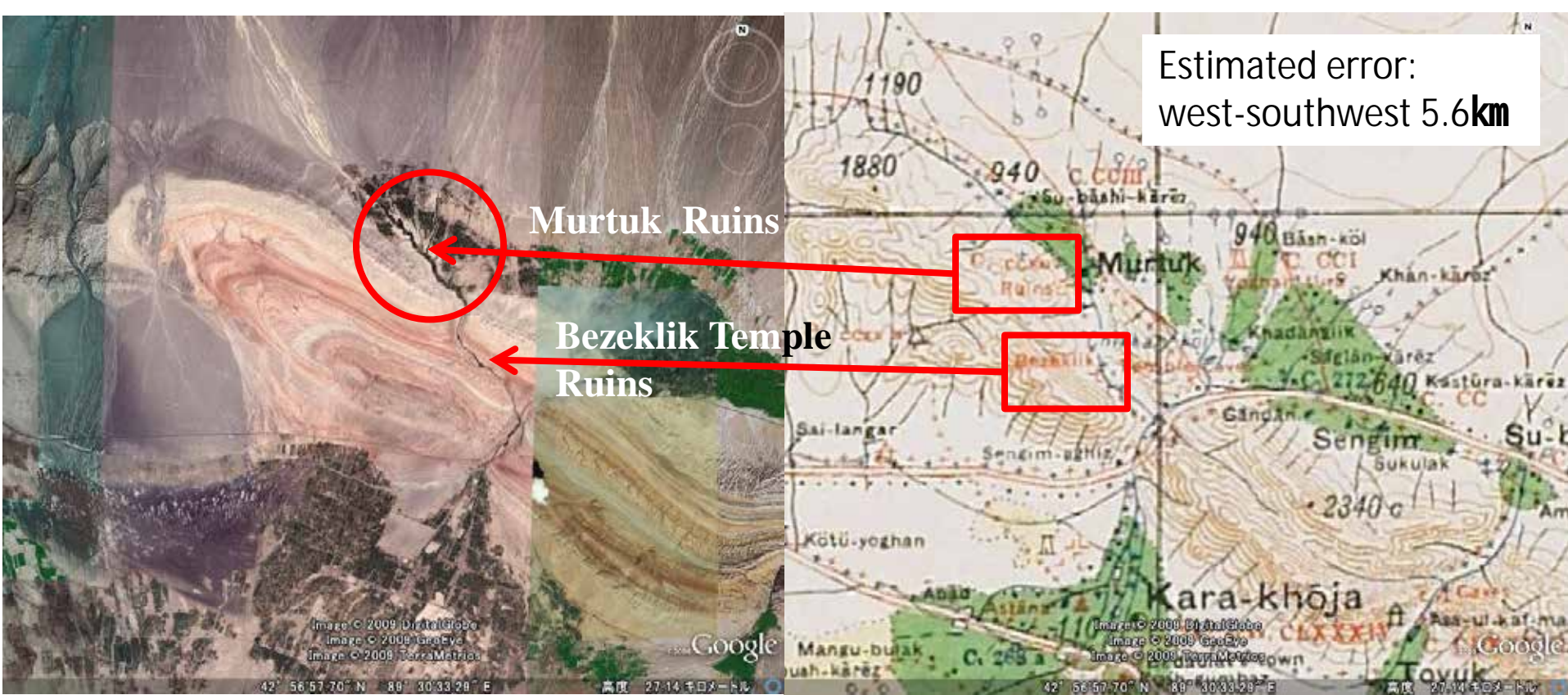
# Error Distribution in Turfan



Error Distribution in Turfan Basin / White: Innermost Asia / Black: Serindia

Some ruins were reported by 20th expeditions, but are missing in recent survey reports.

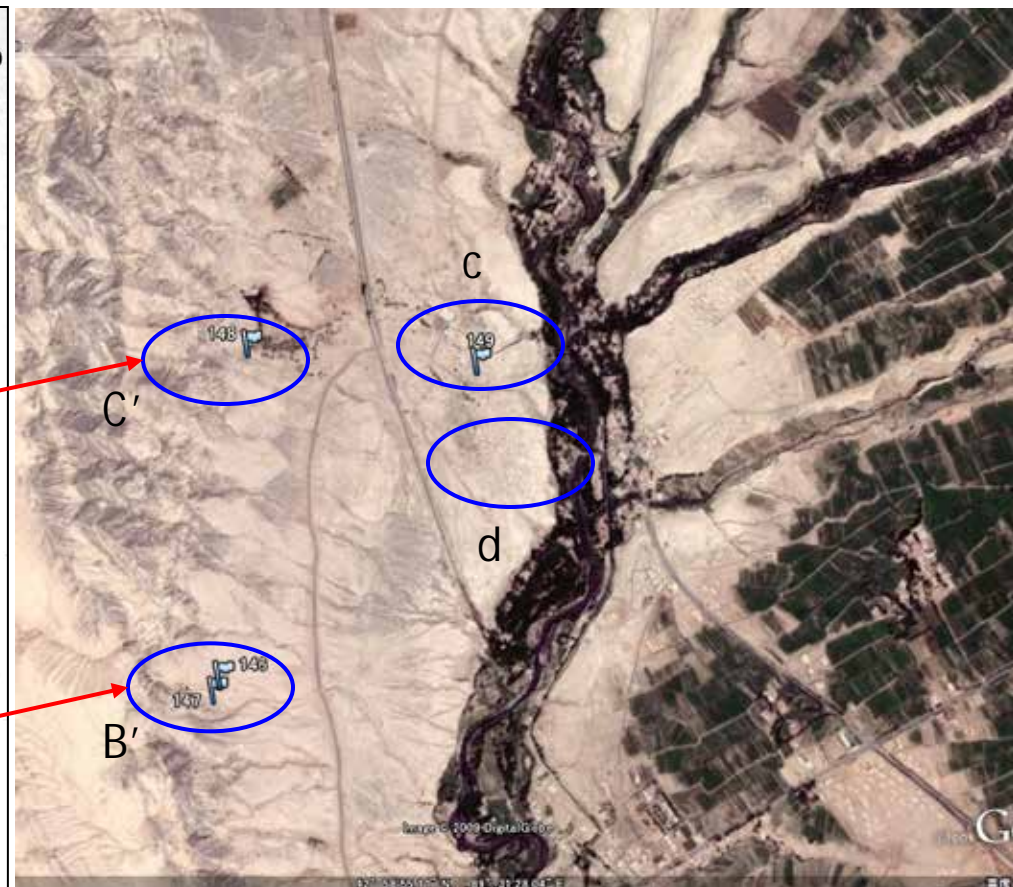
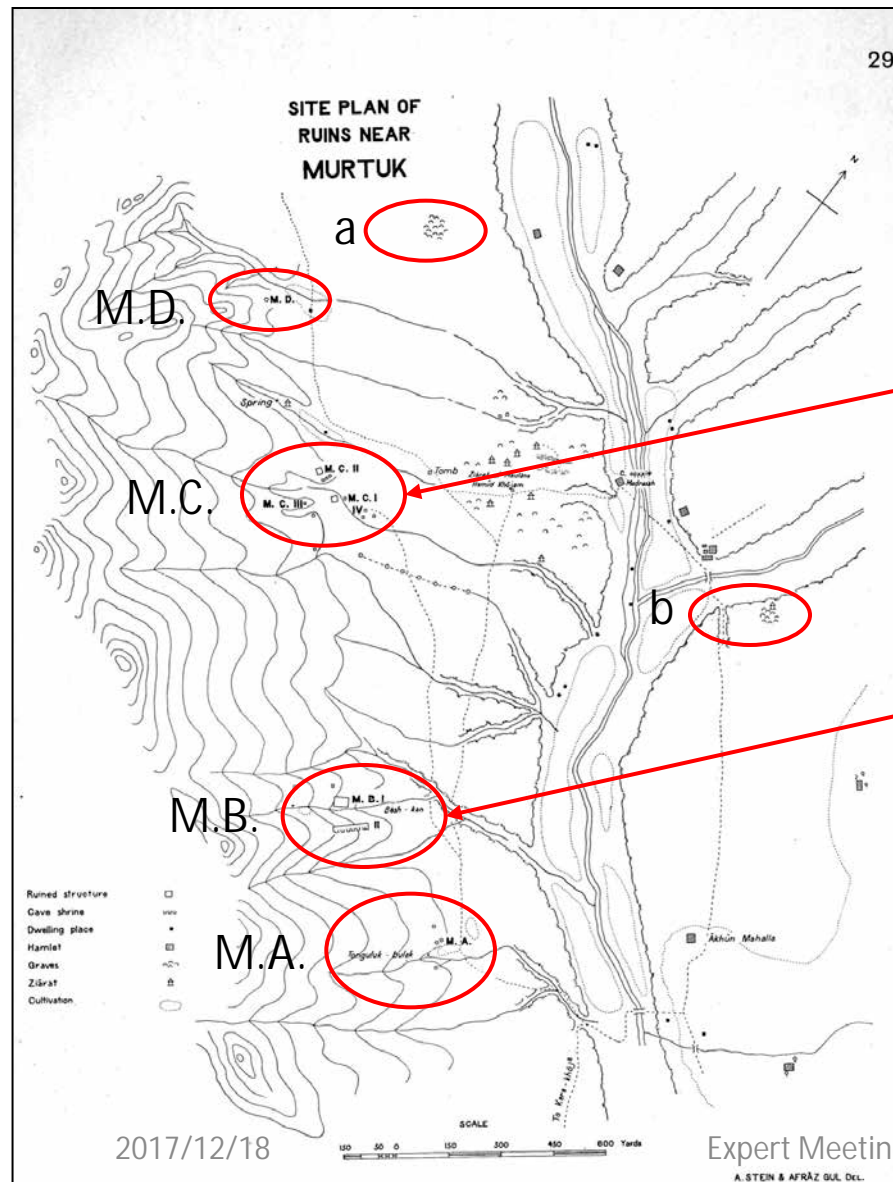
# Locating “Murtuk Ruins”



Based on error information of maps, our guess about the location of Murtuk Ruins is represented as



# Murtuk Ruins (Stein, 1915)



Stein's map and satellite images for the same area. Each source reports different ruins due to different conceptualization.

# Photographs as Evidence



伯西哈石窟(烏江不拉克仏塔)



烏江不拉克烽火台



305. RUIN, M.B. I, AT MURTUK IN COURSE OF CLEARING.

Murtuk Ruins (M. B. I)



303. RUINED SHRINE, M.C., AT MURTUK, TURFAN.

Murtuk Ruins (Ruined Shrine M. C. I)



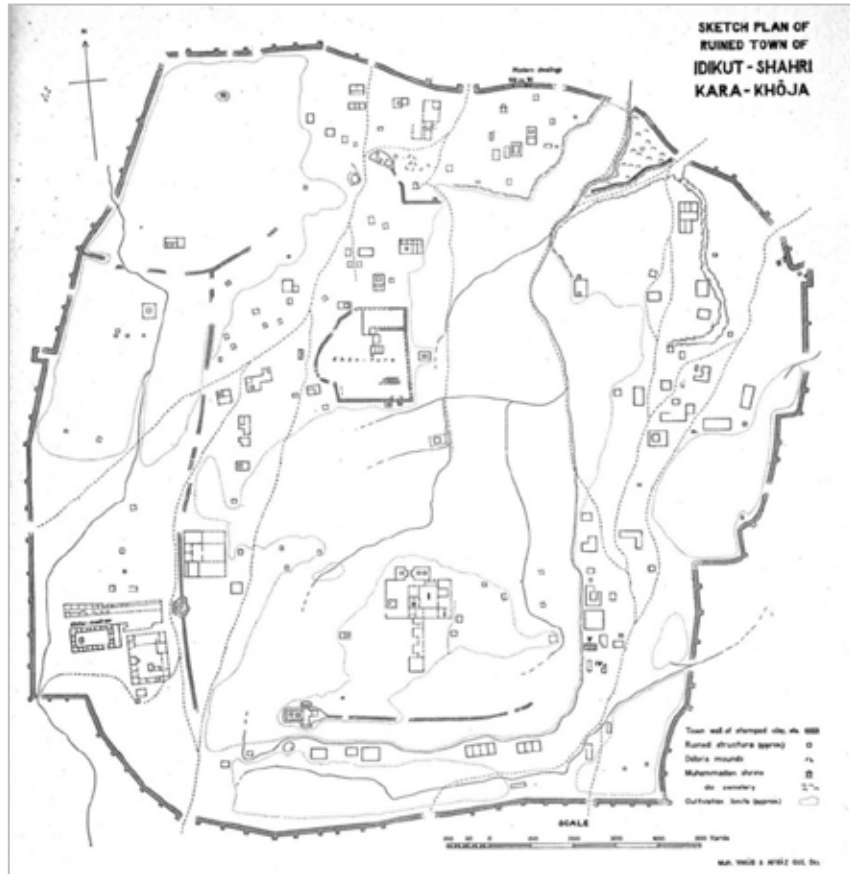
### 3. Grünwedel Map (Gaochang)



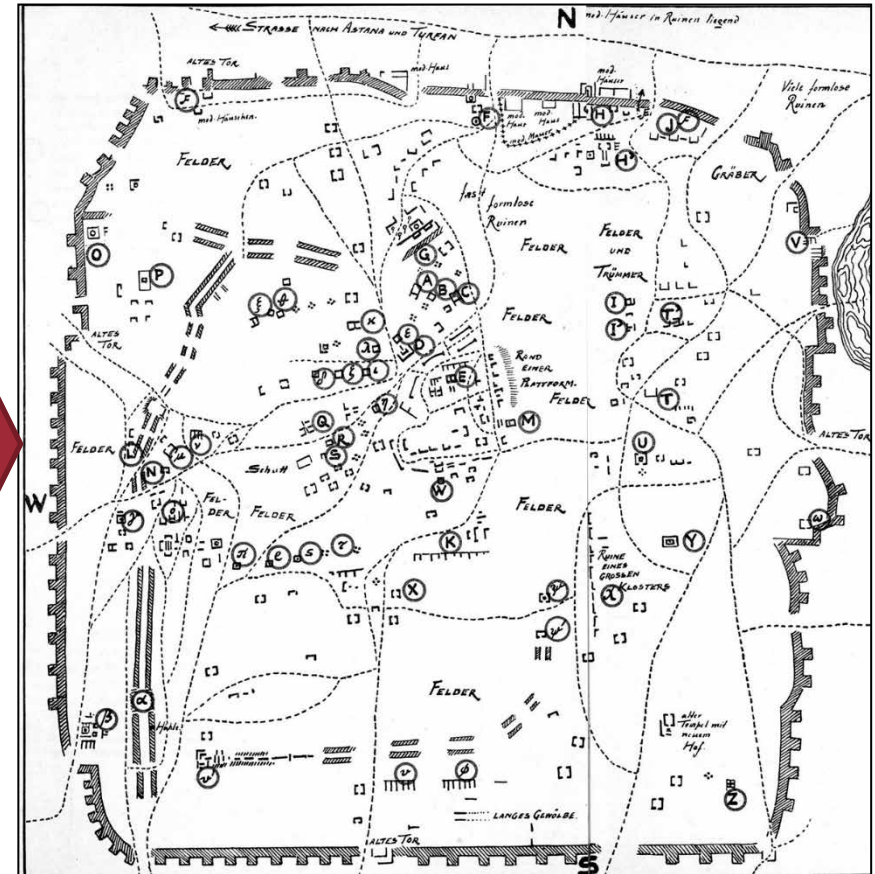
**Interpret a map not considered as trustworthy?**



# Inconsistencies in Gaochang Maps

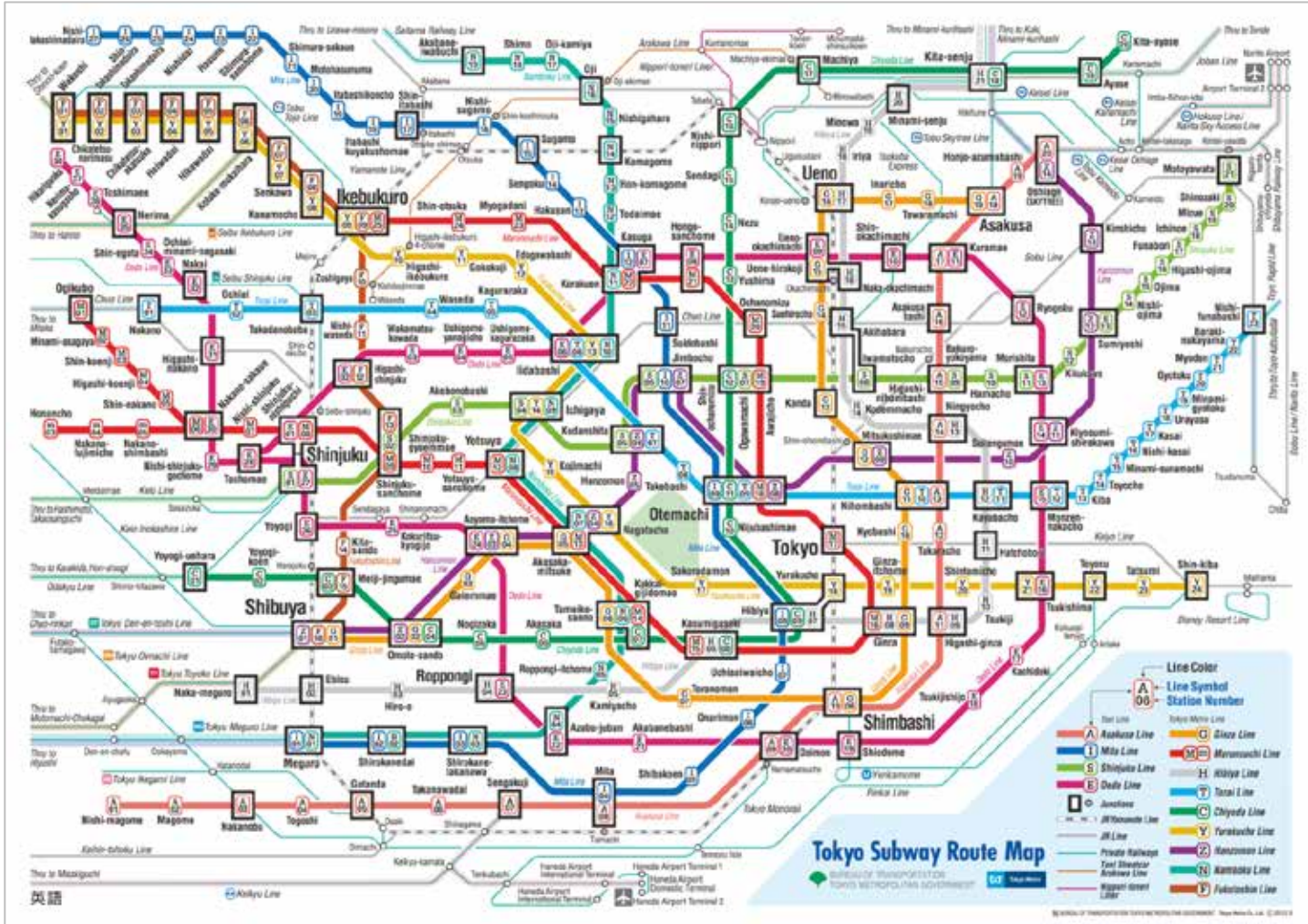


# Aurel Stein



# Albert Grünwedel

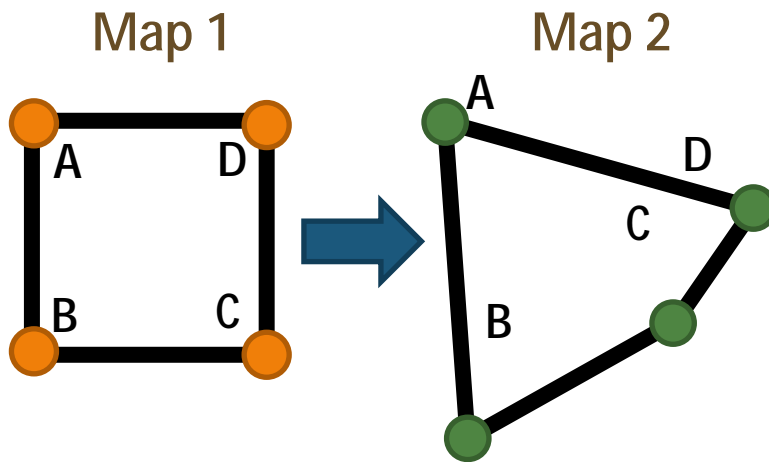
# Topological Map



Source: Tokyo Metro Co. Ltd. / [http://www.tokyometro.jp/station/common/pdf/rosen\\_eng.pdf](http://www.tokyometro.jp/station/common/pdf/rosen_eng.pdf)

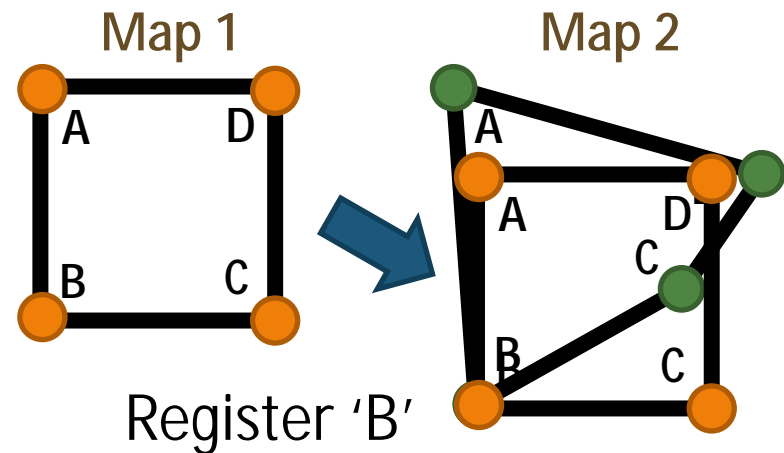
# Two Methods for Map Registration

## Geometric Correction



- All points are registered.
- Shapes are distorted.

## Interactive Georeferencing



- Single point is registered (but no other points).
- Shapes are not distorted.



# Mapping (Map+Pinning)

<http://dsr.nii.ac.jp/digital-maps/mapping/>

**Mapping**  
Interactive georeferencing by pinning old maps

Digital Silk Road > Database of Ruins in Silk Road > Mapping

日本語 | English | 简体中文

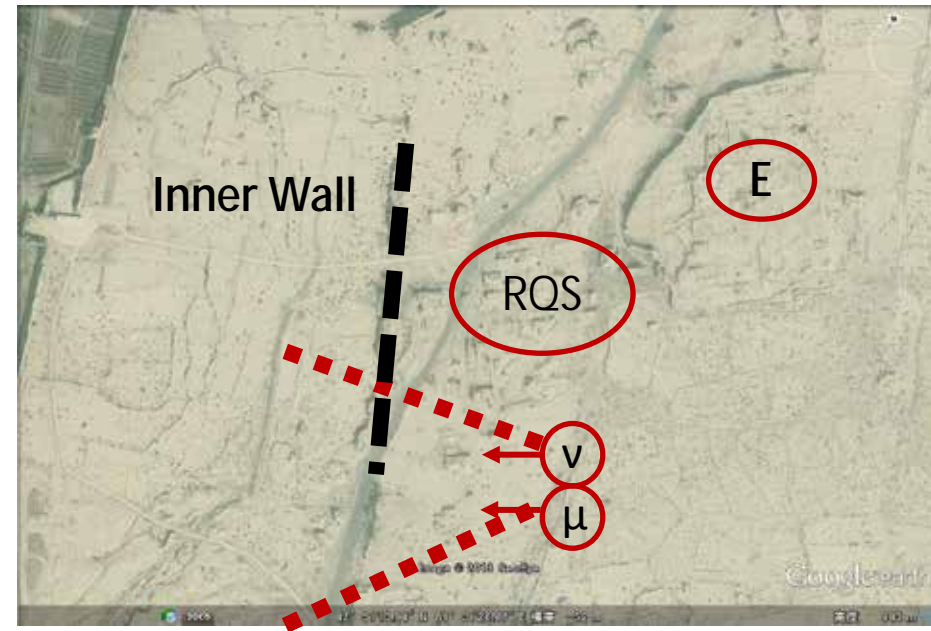
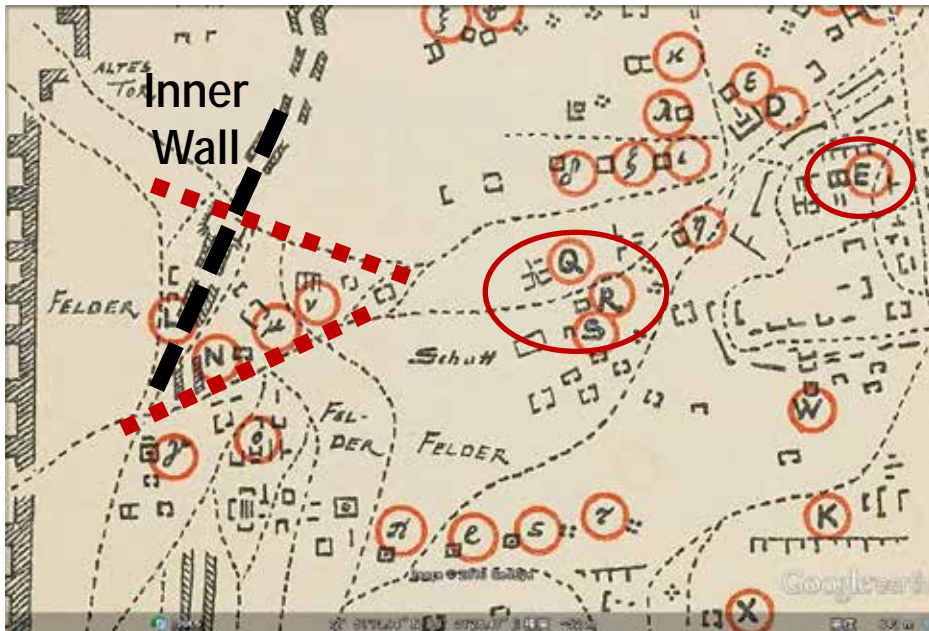
Map Satellite

Inmst Asia

**kara-khoja**  
Registrant:yoko  
Location:42.831,89.464  
Error:-0.02,-0.064  
5.69km  
高昌故城

Map data ©2013 Old Map: National Institute of Informatics "Digital Silk Road"  
Map data ©2013 AutoNavi, Google Imagery ©2013 TerraMetrics - Terms of Use

# Topological Interpretation



Where is  $v$  and  $\mu$ ?  
We have multiple  
candidates...

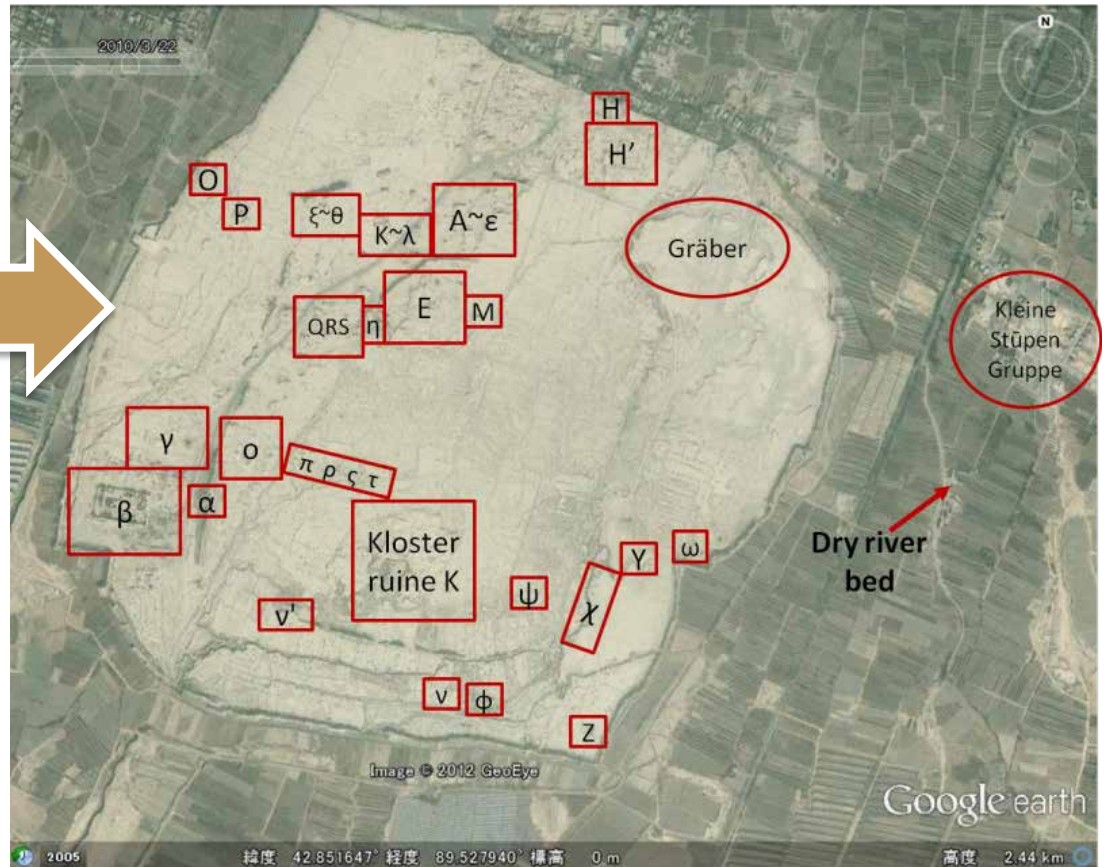
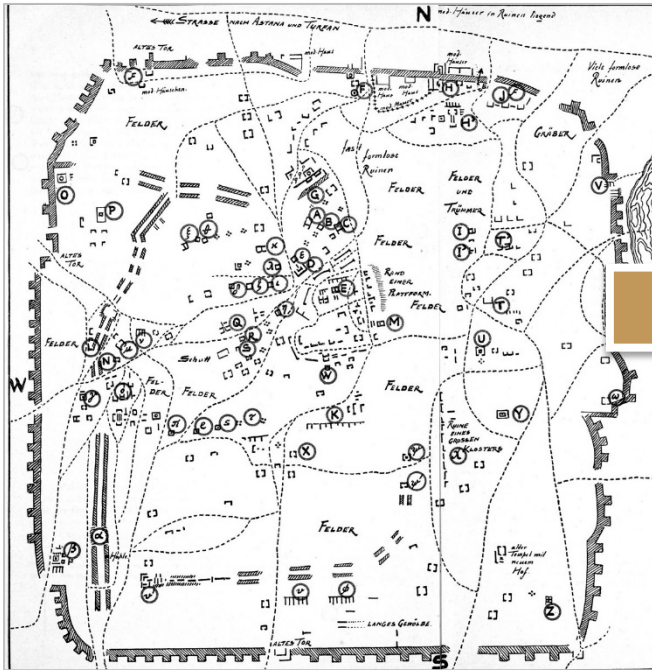
Search for a road in north of  $\gamma$   
and  $\alpha$ , and a road between the  
inner wall to the wall gate.

Hypothesize the  
location of  $v$  and  $\mu$  (to  
be verified later).

Maps designed for navigation purposes should preserve  
the topology, not to get lost when visiting there again.

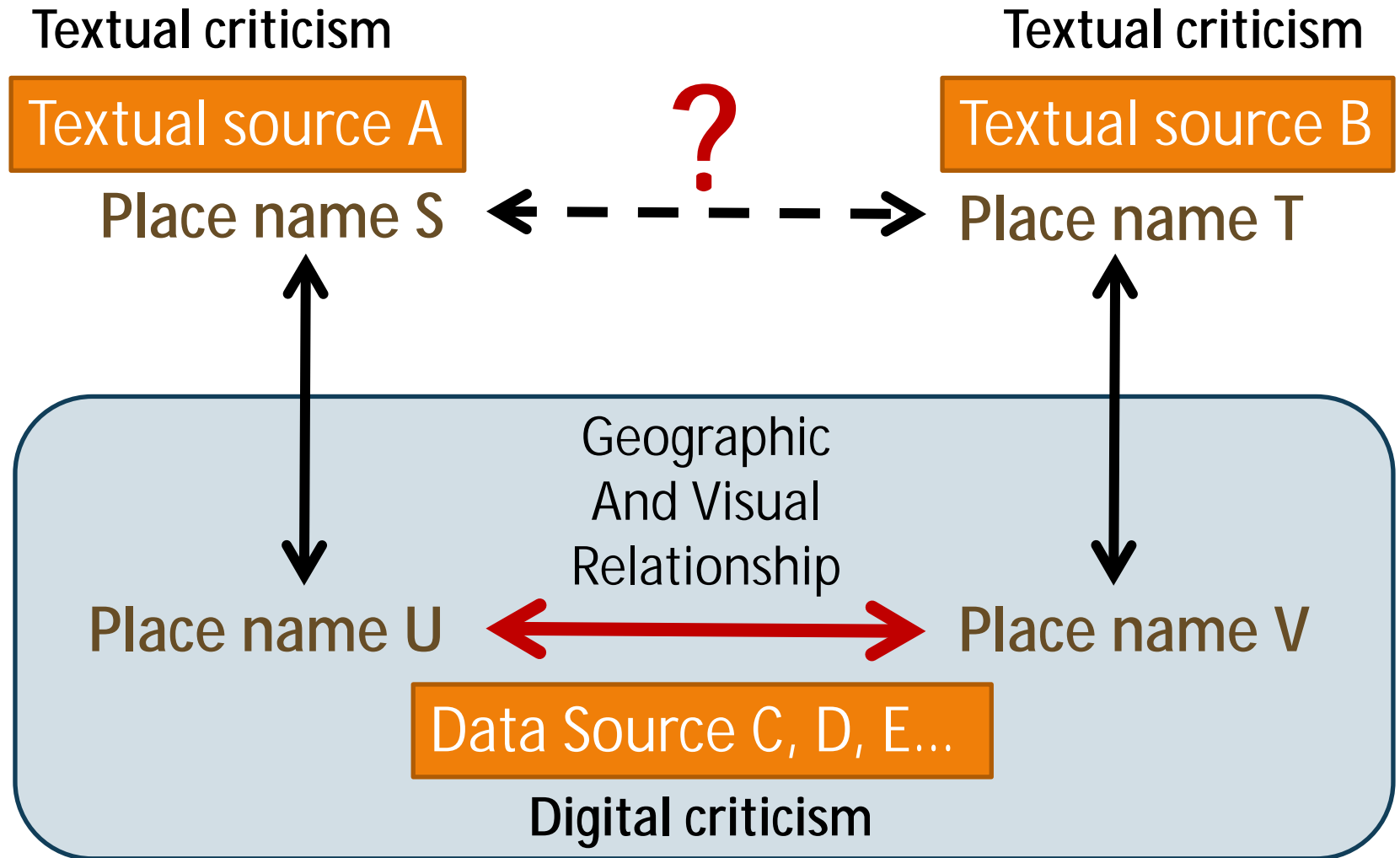


# Identification of Ruins



Linking expedition results to recent surveys may lead to new interpretations.

# Linking Entities Across Sources



# MEMORYGRAPH




# Memorygraph

<https://mp.ex.nii.ac.jp/mg/>



Mobile app for comparing old photos with the present world. **Active viewfinder with controllable transparency** to find the best match.



**M** MEMORY GRAPH <http://codh.rois.ac.jp/memory-platform/>

## MemoryGraph: Digital Critique of Old Photographs Using a Mobile App that Enhances the Interpretation of Landscape

Asanobu KITAMOTO, Center for Open Data in the Humanities (CODH), Joint Support-Center for Data Science Research, Research Organization of Information and Systems

*Memorygraph is a new photographic technique that creates a layer of memories, or time-series photographs taken by the same composition at different times.*

### Introduction and Method

#### \* Comparison with related methods:

- 1-a Time lapse animation:** high frequency observations using a fixed camera (on the tripod).
- 1-b Memorygraph:** low frequency observations using a mobile camera held by hand.
- 2-a Augmented reality:** a photograph can be seen as an overlay in the real space on a viewfinder.
- 2-b Memorygraph:** a photograph can be seen as an overlay on a viewfinder, not in the real space.
- 3-a Photo sharing service:** an exhibition tool for users to passively browse photographs.
- 3-b Memorygraph:** a participatory tool for users to actively be involved in field work.

#### \* Important concepts of the app:

- 1. Graphic reference:** an old photograph suggests the expected scene of the next photograph to take.
- 2. Direct comparison:** an opaque viewfinder with adjustable transparency allows direct comparison with the landscape without mental rotation.
- 3. Gamification effect:** users are motivated to search for better matching using visual feedback.

### Results and Discussion



Above: Comparison of two photographs of the same composition. "A view from Miyakezaka to the ministry of justice" taken around 1911 and the current landscape. Courtesy of National Diet Library.

Left: Participants walked along the moat to find the best match, and their trials are marked by icons. The final solution of the above figure was obtained at the north end of the moat.

#### \* Digital critique and research questions:

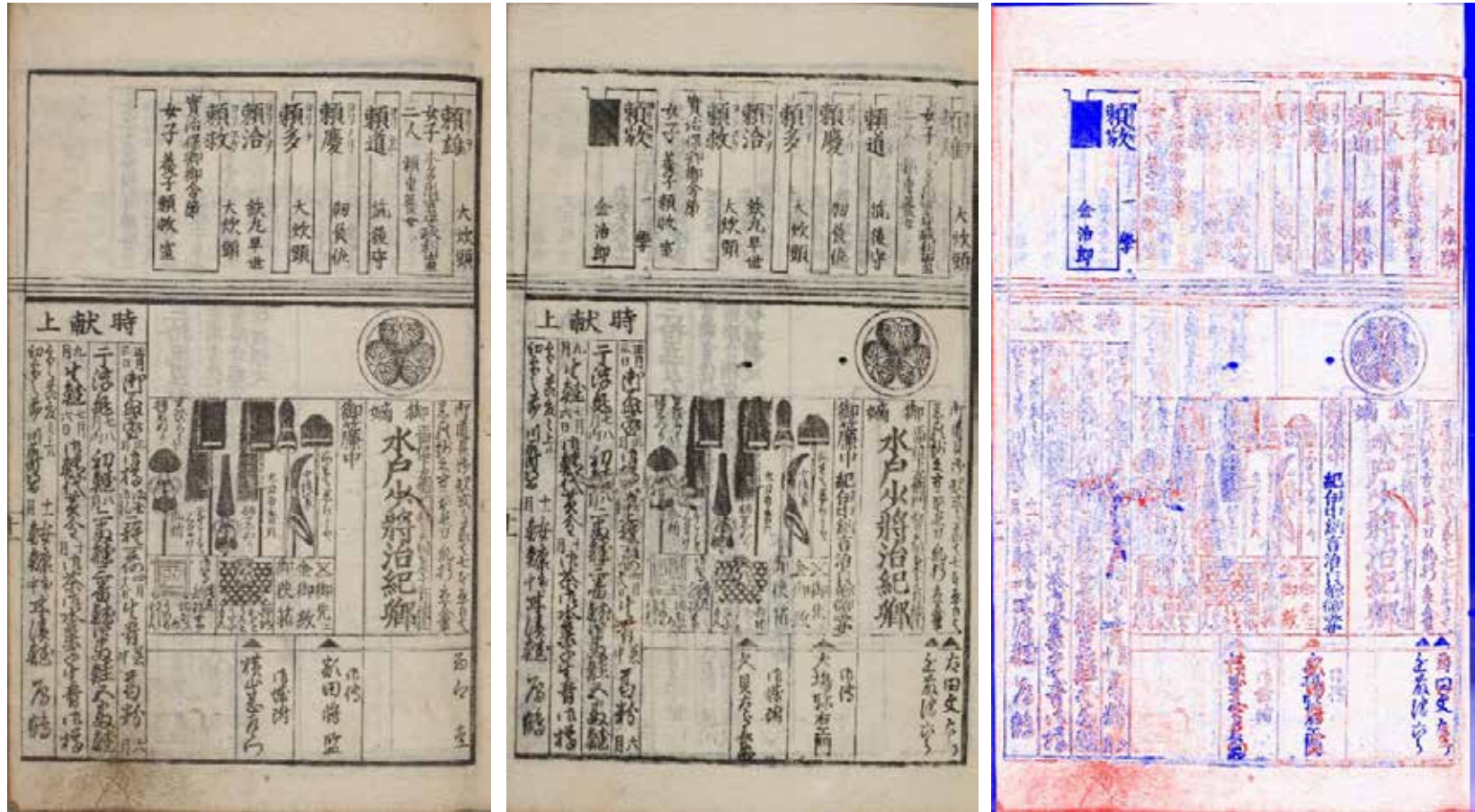
- 1. Variance and invariance:** how to identify features not changed over time, and why is it?
- 2. Integration across sources:** how to integrate historical sources to have a unified understanding?
- 3. Photographer's intention:** why the photograph was taken from the place in this composition? Re-experience the emotion of the photographer!

Android App (under active development) is freely available from Google Play.

Asanobu KITAMOTO,  
"MemoryGraph:  
Digital Critique of Old  
Photographs Using a  
Mobile App that  
Enhances the  
Interpretation of  
Landscape", Digital  
Humanities 2017.

# DIFFERENTIAL READING

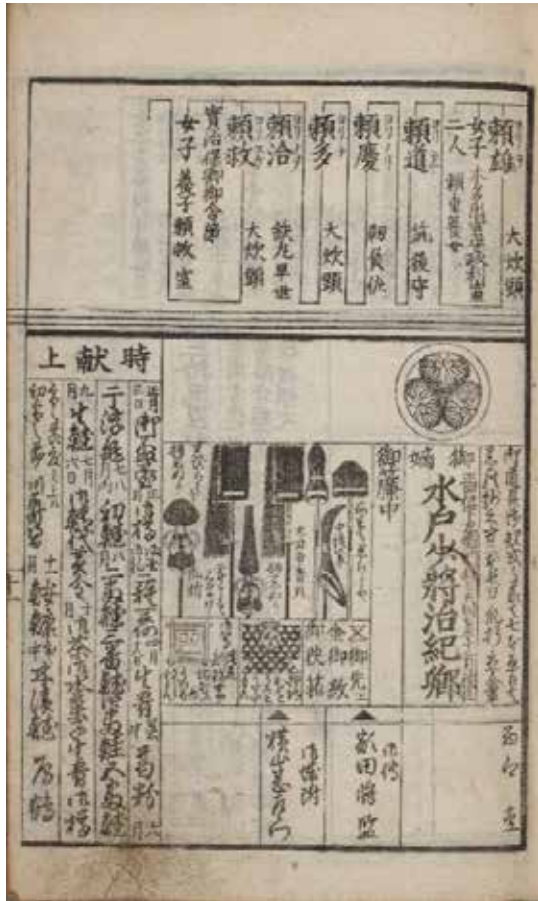
# Differential Reading



Left: "Bukan" in 1789, Middle: "Bukan" in 1791, Right: Comparison of versions.



# Time-Series Historical Sources



- Bukan: directory of state king families and bureaucrats of the central government in the Edo period (1603-1868) .
- Time-series publications for 100 to 200 years with a peak frequency of a few times in a month.
- 381 versions of Bukan will be released as open data.

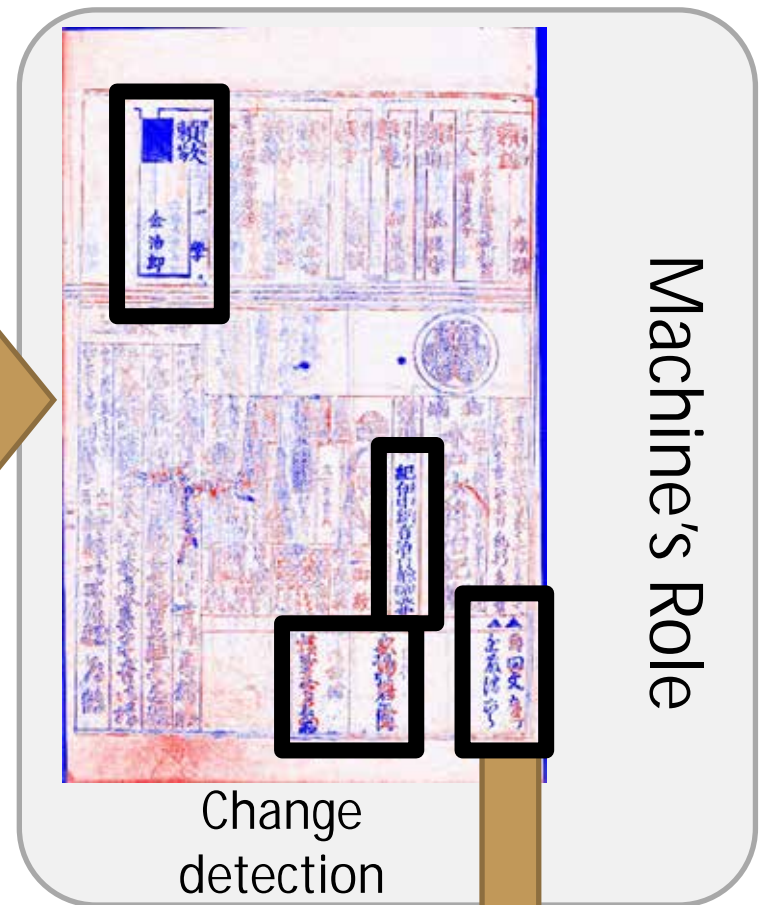
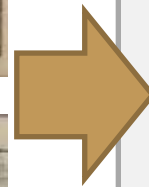
# Human-Machine Specialization



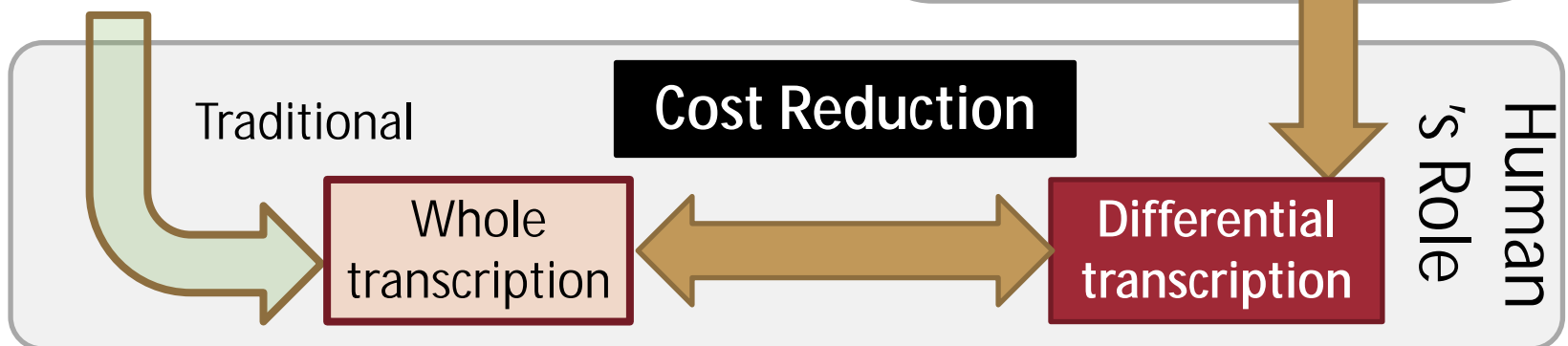
Many versions of "Bukan"



Comparison with the base version



Change detection



Traditional

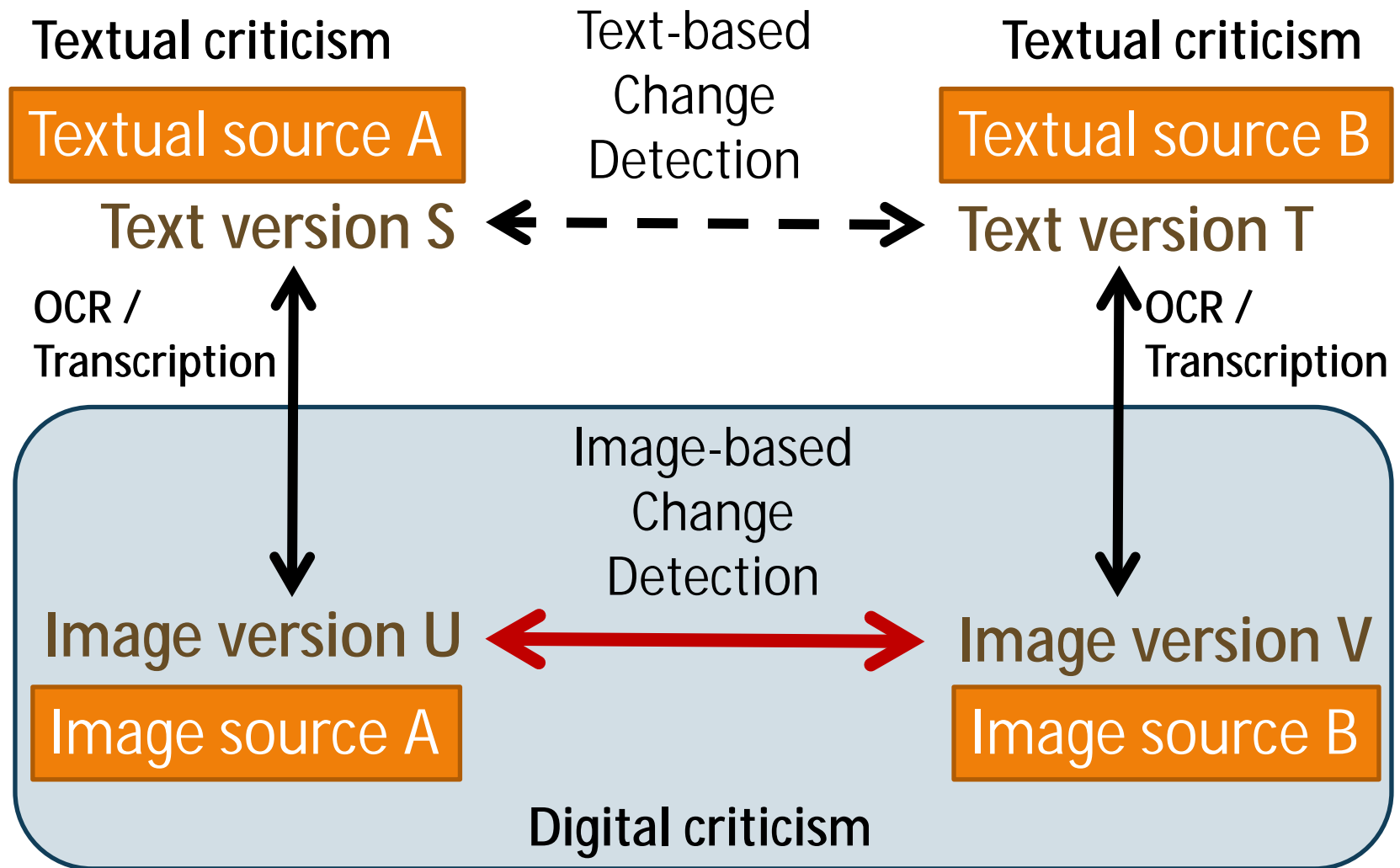
Cost Reduction

Whole transcription

Differential transcription

Human's Role

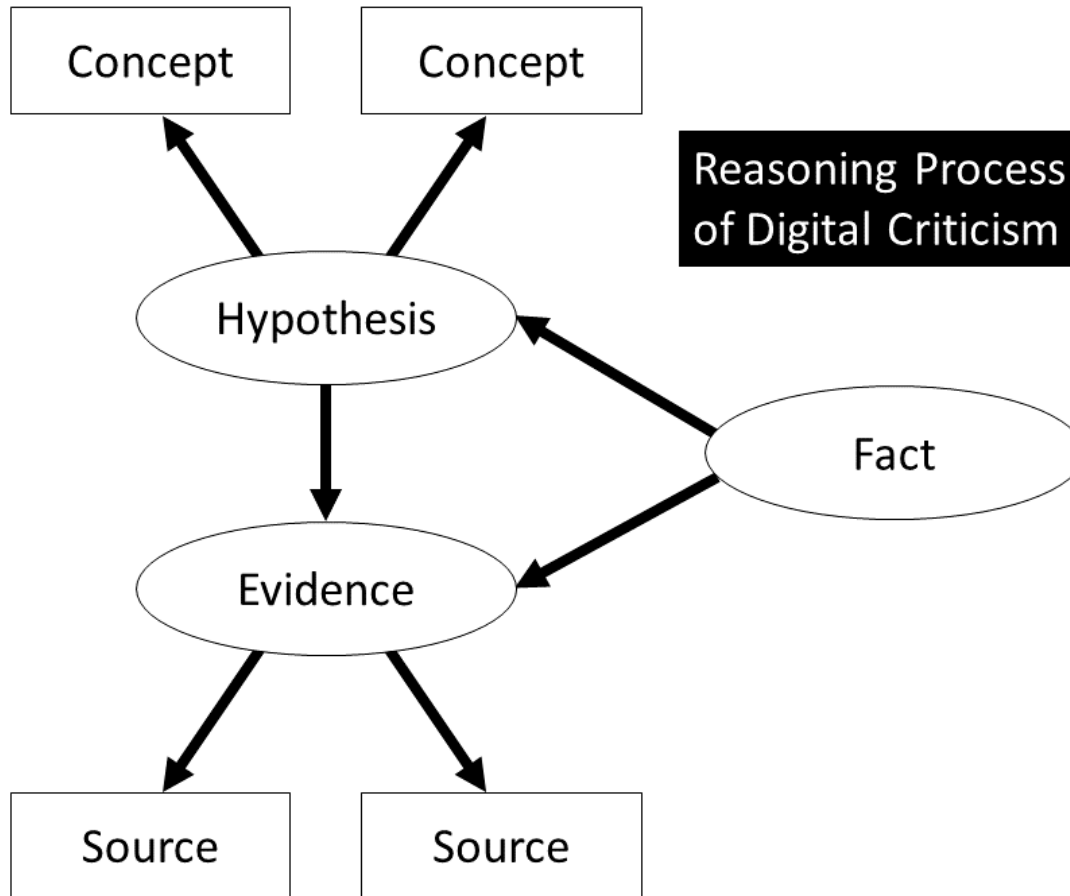
# Image-based Change Detection



# EVIDENCE NETWORK

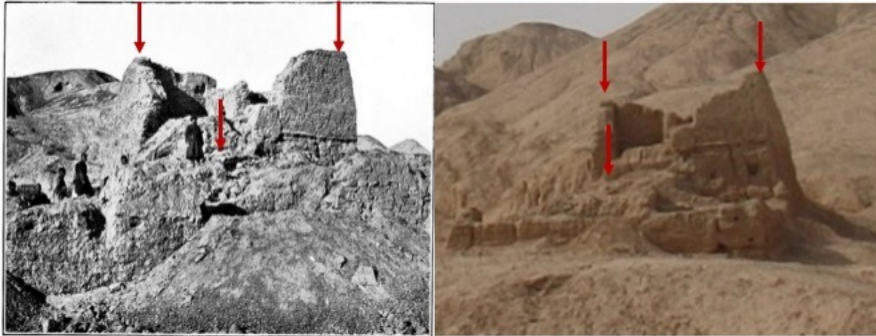


# Evidence Network (EN)

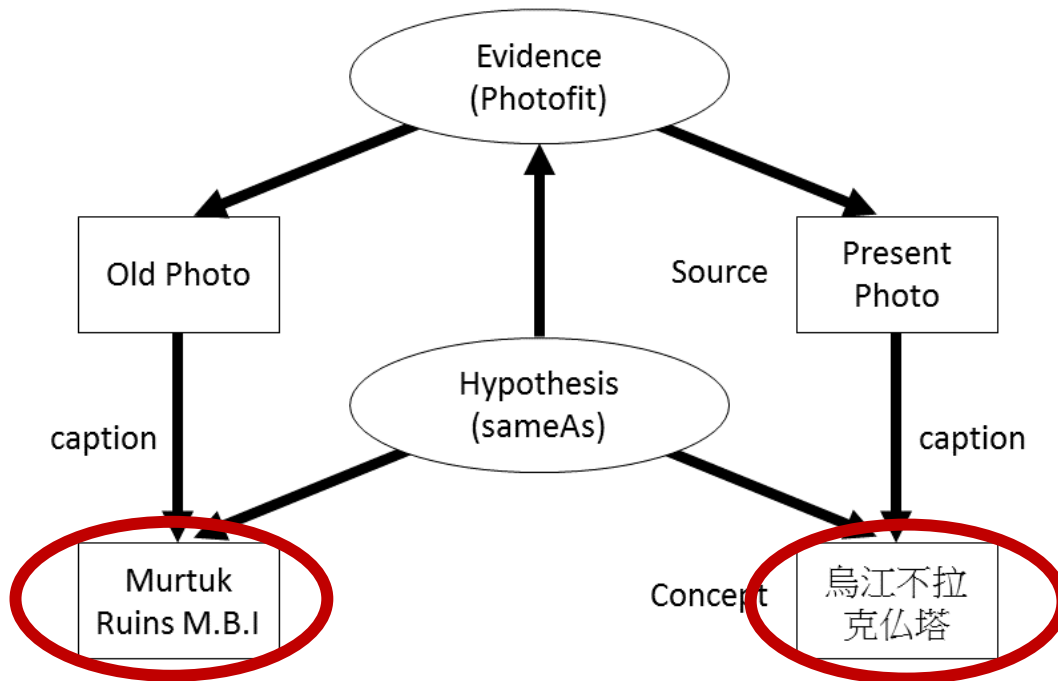


1. Evidence
2. Hypothesis
3. Fact
4. Reliability attribute
5. Concept
6. Source

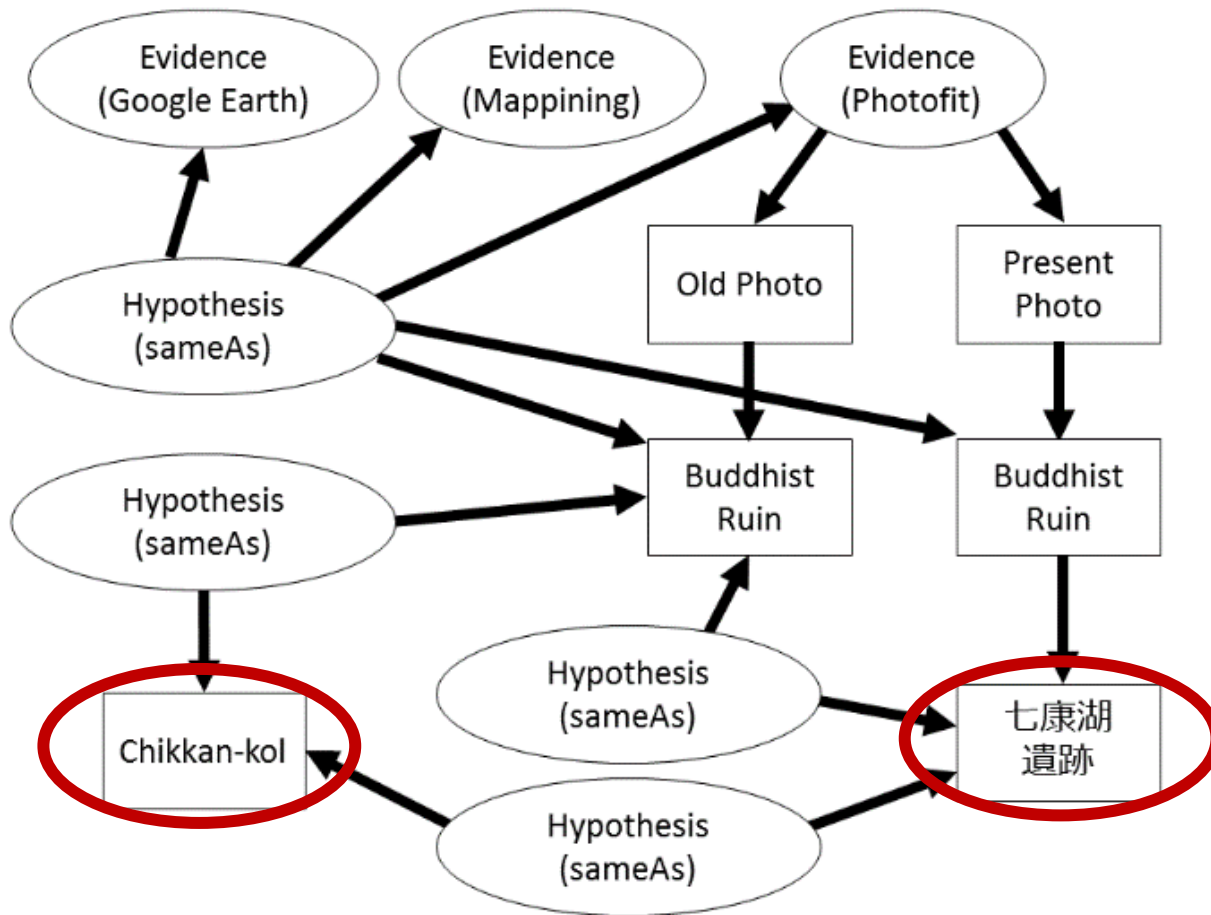
# Murtuk Ruins and 烏江不拉克仏塔



**Finding:** A ruin described as “Murtuk Ruins” in an old book, and a ruin described as 「烏江不拉克仏塔」 in a modern book is the same.



# Chikkan-köl and 七康湖遺跡



**Finding:** A Buddhist ruin in one source, and another Buddhist ruin in another source is the same.

# SPARQL Endpoint

```
PREFIX dcterms: <http://purl.org/dc/terms/>
PREFIX dcp: <http://dsr.nii.ac.jp/dcp#>
SELECT ?instance_a ?Relation ?instance_b ?CF
WHERE {
  ?Hypothesis
  dcp:certaintyFactor ?CF ;
  dcp:subjectUri ?a ;
  dcp:objectUri ?b ;
  dcp:relation ?Relation .
  ?a dcterms:title ?instance_a .
  ?b dcterms:title ?instance_b .
  FILTER (?CF > 80)
}
```

- SPARQL query is used to filter evidences having higher reliability.
- A subgraph is more convenient for studying a new hypothesis.

instance_a	Relation	instance_b	CF
"仏教寺院遺跡 (Qhotscho)"	<http://schema.org/sameAs>	"Chikkan-kol"	85
"仏教寺院遺構 (Qhotscho)"	<http://schema.org/sameAs>	"仏教寺院遺構 (現代現地調査)"	90
"Chikkan-kol"	<http://schema.org/sameAs>	"七康湖遺跡"	90

# Summary

1. Digital criticism is non-textual “close reading” through the comparison of sources.
2. Quantitative reading may lead to new discoveries (e.g. maps and photos).
3. Digital tools and infrastructure should be designed for a new research question.
4. Digital historical sources expands the potential of reading powered by computational processes.

# More Information

- **Digital Silk Road**
  - <http://dsr.nii.ac.jp/>
- **Silk Road Maps**
  - <http://dsr.nii.ac.jp/geography/>
- **Memorygraph**
  - <https://mp.ex.nii.ac.jp/mg/>
- **Center for Open Data in the Humanities**
  - <http://codh.rois.ac.jp/>
- **Bukan Complete Collection**
  - <http://codh.rois.ac.jp/bukan/>