



smartmuseum

# SMARTMUSEUM:

## Towards

# Intelligent Cultural Heritage Knowledge Exchange Platforms on Semantic Web

Presented by:

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**IARIA SEMAPRO 2009**

October 2009, Sliema, Malta



# Outline of talk

- Smartmuseum Project
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    - Aims
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    - Beyond state of art
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    - Annotation vocabularies and tool
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  - Intelligence in access: Ubiquity and Mobility
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## Smartmuseum Project Introduction



# SMARTMUSEUM Project: Definition and State of Art

- Overall objective
  - develop a platform for innovative services enhancing on-site personalized access to digital cultural heritage through adaptive and privacy preserving user profiling.
- General goals:
  - Lowering costs of on-site access to digital cultural heritage content,
  - Improving structured, user behavior and preference dependent on-site access to the vast repository of cultural heritage,
  - Improving the individual and shared experiences people receive from cultural and scientific resources,
  - Bringing personalized cultural experience closer to non-expert communities,
  - Making real reuse of personal experiences related to cultural heritage access for a variety of interest groups.

# Smartmuseum: Beyond State of Art

- Goals restated:
  - Lowering costs of on-site access to digital cultural heritage content
    - Approach taken: **Utilizing Widely Available Mobile User Devices**
  - Improving structured, user behavior and preference dependent on-site access to the vast repository of cultural heritage,
  - Improving the individual and shared experiences people receive from cultural and scientific resources
  - Making real reuse of personal experiences related to cultural heritage access for a variety of interest groups.
    - Approach taken: **User modelling and User profiling**
  - Bringing personalized cultural experience closer to non-expert communities,
    - Approach taken: **Adaptation and Personalization through Recommender Systems**

# SMARTMUSEUM Partners



Heritage Malta

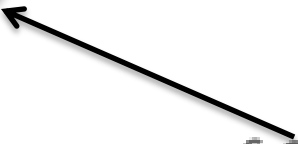
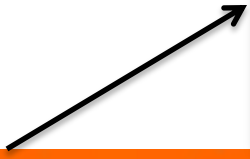
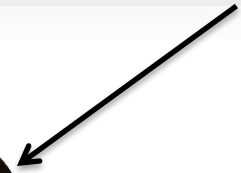
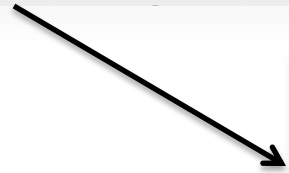
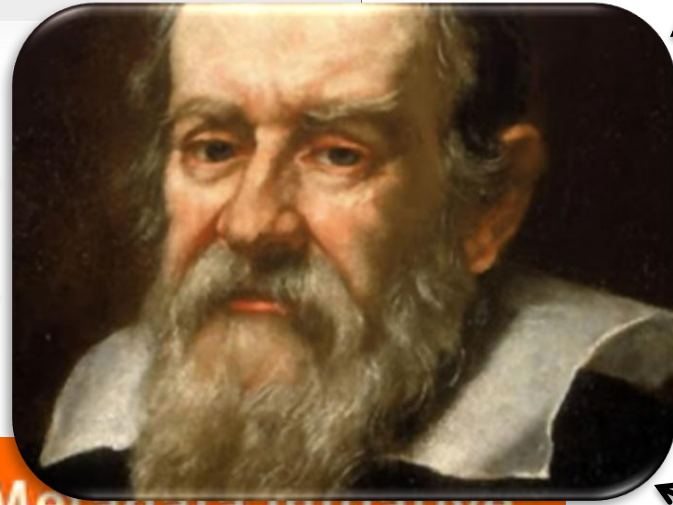




Art & Architecture Thesaurus® Onl



Union List of Artist Names® Online




**Dublin Core® Metadata Initiative**  
*Making it easier to find information.*



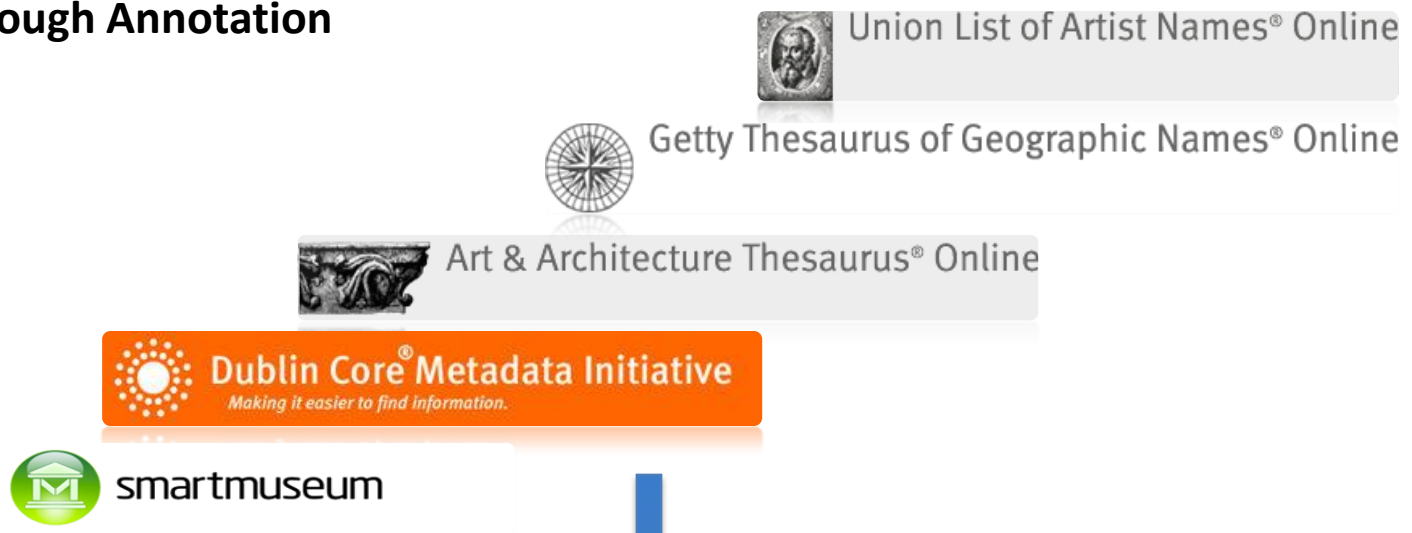
Getty Thesaurus of Geographic Nar

**Smartmuseum**  
**Content Creation and Annotation Architecture**



# Content Creation through Annotation

CH  
Vocabularies



Annotation  
Mechanism  
And tool

### 1. ONKI Concept Search Widget in default state

ontology selector    search field    language selector    open ONKI Browser

yso    fi    Open ONKI Ontology Browser

- yso
- ysa
- paikka
- toima
- maa
- ic
- hpmah
- mesh
- gaera
- audience
- medium
- yso-old
- kiripaikka
- ka-toiminta
- [all]

### 2. Autocompletion search result

yso    ship    en    Open ONKI Ontology Browser

- ship finds
- ship traffic
- ship travel
- shipbuilding
- shipbuilding industry
- shipmasters
- shipping administration

### 3. Concept collector for selected concepts

yso:ship travel [change] [X]    en    Open ONKI Ontology Browser

concept collector




# Sample Annotated Content:

## Saint John the Baptist




<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/coverage> "c. 17th century"@en .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/creator> "Neapolitan School"@en  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/creator>  
<urn:heritagemalta:biography:97> .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/description> **"Saint John the Baptist is depicted as a young man in spiritual communion with the divine.**  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "Bible"@en .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "Crosses (visual Works)"@en .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "Saints"@en .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "aat:300150555" .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "aat:300235443" .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/subject> "aat:300264513" .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/title> **"Saint John the Baptist"**@en .  
<urn:heritagemalta:64> <http://purl.org/dc/elements/1.1/type> "aat:300033618" .  
<urn:heritagemalta:64> <http://smartmuseum.eu/ns/schema.rdf#dateOfCreation>  
<http://smartmuseum.eu/ns/time.rdf#time\_c. 17th century\_c. 17th century> .  
<urn:heritagemalta:64> <http://smartmuseum.eu/ns/schema.rdf#dimensions> "61 cm (diameter without frame)81 cm (diameter with frame)"@en .  
<urn:heritagemalta:64> <http://smartmuseum.eu/ns/schema.rdf#dimensions> "81 cm (diameter with frame)"@en .

 Art & Architecture Thesaurus® Online

# Sample Annotated Content:

## Thermoscope



<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/creator> "Galileo Galilei"@en .  
<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/creator>  
<urn:imss:biography:300251> .  
<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/description>  
"Copy of the instrument to measure heat and cold invented by Galileo during his stay in Padua."  
<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/identifier>  
<urn:imss:instrument:404007> .  
<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/subject> "Academies and Institutions"@en .  
<urn:imss:instrument:404007> <http://purl.org/dc/elements/1.1/subject> "Galileo"@en .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#ageGroup>> <<http://e-culture.multimedien.nl/ns/getty/aat#300154397>> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#dateOfCreation>>  
<[http://smartmuseum.eu/ns/time.rdf#time\\_1801\\_1900](http://smartmuseum.eu/ns/time.rdf#time_1801_1900)> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#dimensions>> "Height 460 mm"@en .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#material>> <<http://e-culture.multimedien.nl/ns/getty/aat#300010797>> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#objectType>>  "Thermoscope"@en .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#objectType>> <<http://e-culture.multimedien.nl/ns/getty/aat#300204873>>  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#placeOfConservation>>  
<urn:imss:place:700117>  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#purposeOfVisit>>  
<<http://smartmuseum.eu/ns/types.rdf#PurposeEducational>> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#targetGroup>>  
<<http://smartmuseum.eu/ns/types.rdf#CompanionsAlone>> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#visitorType>>  
<<http://smartmuseum.eu/ns/types.rdf#VisitorTypeGreedy>> .  
<urn:imss:instrument:404007> <<http://smartmuseum.eu/ns/schema.rdf#visitorType>>  
<<http://smartmuseum.eu/ns/types.rdf#visitorTypeSelective>> .



**Intelligence in access:  
adaptation and personalization**



# Personalization through User Profiling and Modeling

- User profile contains:
  - Personal information about the user (Basic)
    - Age, gender, and etc.
  - Interests and preferences (Advanced)
    - Interests and/or preferences (cognitive patterns)
      - Expressed through ranks(scores) assigned
    - Trust / Privacy
      - Confidence of experience
      - How much personal details to be disclosed outside
  - History and evidence of the experience of user to exhibits (smartmuseums).
    - Items (artifacts) visited
- Semantic profiling
  - Profiles are described using RDF triplets

## Sample Profile Slices

<urn:imss:instrument:401073>  
 <http://purl.org/dc/elements/1.1/subject> "Scientific collections"@en . 0.000850746268656717  
 <urn:imss:instrument:401090>  
 <http://smartmuseum.eu/ns/schema.rdf#objectType>  
 <http://e-culture.multimediant.nl/ns/getty/aat#300122283> . 0.000850746268656717

History of Item visit

<urn:imss:instrument:402071>  
 <http://smartmuseum.eu/ns/schema.rdf#material>  
 <http://e-culture.multimediant.nl/ns/getty/aat#300010946> . 0.001  
 <urn:imss:instrument:401088> <http://smartmuseum.eu/ns/schema.rdf#dateOfCreation>  
 <http://smartmuseum.eu/ns/time.rdf#time\_1501\_1600> . 0.000850746268656717

Interest Weight

<urn:imss:instrument:403049>  
 <http://smartmuseum.eu/ns/schema.rdf#objectType> "Quadrant"@en . **0.000850746268656717**

<urn:imss:place:700060>  
 <http://purl.org/dc/elements/1.1/relation> <urn:imss:biography:300150> . 0.001

PERSONAL PROFILE		ABILITIES	
Username	ksuulic	Ability to hear	<input checked="" type="checkbox"/>
Email	kalar@va.tl	Ability to see	<input checked="" type="checkbox"/>
Real name		Ability to talk	<input checked="" type="checkbox"/>
Country		Ability to touch	<input checked="" type="checkbox"/>
Age	38	Ability to use stairs	<input type="checkbox"/>
First language	Estonia	Ability to walk	<input checked="" type="checkbox"/>
Gender	male	Reading skills	<input checked="" type="checkbox"/>
Highest education level		Typing skills	<input checked="" type="checkbox"/>
Preferred language			
You have to enter your passy change it!			
Old password		<b>PERSONAL PREFERENCES</b>	
New password		Transportation preference	train
New password		Personal link	no

<urn:imss:instrument:401073>  
 <http://purl.org/dc/terms/educationLevel>  
 <http://e-culture.multimediant.nl/ns/getty/aat#300054368 > . 0.000850746268656717

History of Place visit

<urn:imss:instrument:401090>  
 <http://purl.org/dc/elements/1.1/subject> "Measuring space"@en . 0.000850746268656717  
 <urn:imss:instrument:401088>  
 <http://purl.org/dc/terms/isPartOf> "Medici collections"@en . 0.000850746268656717

<urn:imss:instrument:402071>  
 <http://purl.org/dc/terms/educationLevel>  
 <http://e-culture.multimediant.nl/ns/getty/aat#300254154> . 0.001

<urn:imss:instrument:401031>  
 <http://smartmuseum.eu/ns/schema.rdf#processesAndTechniques>  
 <http://e-culture.multimediant.nl/ns/getty/aat#300053789> . 0.001

Interest towards a certain concept (process and technique)

<urn:imss:instrument:403002>  
 <http://smartmuseum.eu/ns/schema.rdf#targetGroup>  
 <http://smartmuseum.eu/ns/types.rdf#CompanionsAlone> . 0.000850746268656717

# Personalization through Recommendation

- SMARTMUSEUM recommendation technologies:
  - **Static Recommendation**
    - (Item-based) family of recommenders
      - In this case Slope one Item-recommender is considered and implemented.
  - **Semantic Recommendation**
    - (User based) RDF-triplets of user profile (interest/preferences/context) are processed:
      - Semantic distance between concepts on CH ontologies are used for calculating similarity between users.
  - **Trust-Based Collaborative Filtering**
    - Interest similarity taken as the basis of generation of trust values over semantic social network of users.
      - (i.e. , if I share the same taste with you, I might trust you more).



**Profile Creation:**  
Profile can be created manually through manual interface

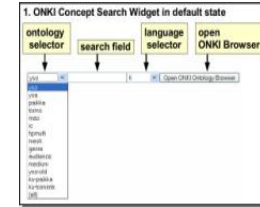
PERSONAL PROFILE	ABILITY
Username: <input type="text" value="kullar@va.s"/>	Ability to name: <input checked="" type="checkbox"/>
Email: <input type="text" value="kullar@va.s"/>	Ability to see: <input checked="" type="checkbox"/>
Country: <input type="text" value=""/>	Ability to add: <input checked="" type="checkbox"/>
Age: <input type="text" value="30"/>	Ability to search: <input checked="" type="checkbox"/>
First language: <input type="text" value="Estonian"/>	Ability to use state: <input checked="" type="checkbox"/>
Gender: <input type="text" value="male"/>	Ability to use state: <input checked="" type="checkbox"/>
Highest education level: <input type="text" value=""/>	Ability to make: <input checked="" type="checkbox"/>
Preferred language: <input type="text" value=""/>	Fluency skills: <input checked="" type="checkbox"/>
You have to enter your password twice to change it:	Typing skills: <input checked="" type="checkbox"/>
Old password: <input type="text" value=""/>	
New password: <input type="text" value=""/>	
Confirm password: <input type="text" value=""/>	
PERSONAL PROFILE	
<input type="button" value="Cancel"/> <input type="button" value="Save"/>	

**Madonna and Child**

Style of Sandro Botticelli, date ?  
tempera on panel, 71.5 x 55 cm  
*Museum of Fine Arts, Valletta*



**Recommendation Retrieval:**  
Retrieving recommendation according to user's profile



**Content Creation:**  
Annotation is created and indexed



- Rec. List:**  
-----
1. A Saint in Ecstasy
  2. Madonna and Child and Saint John

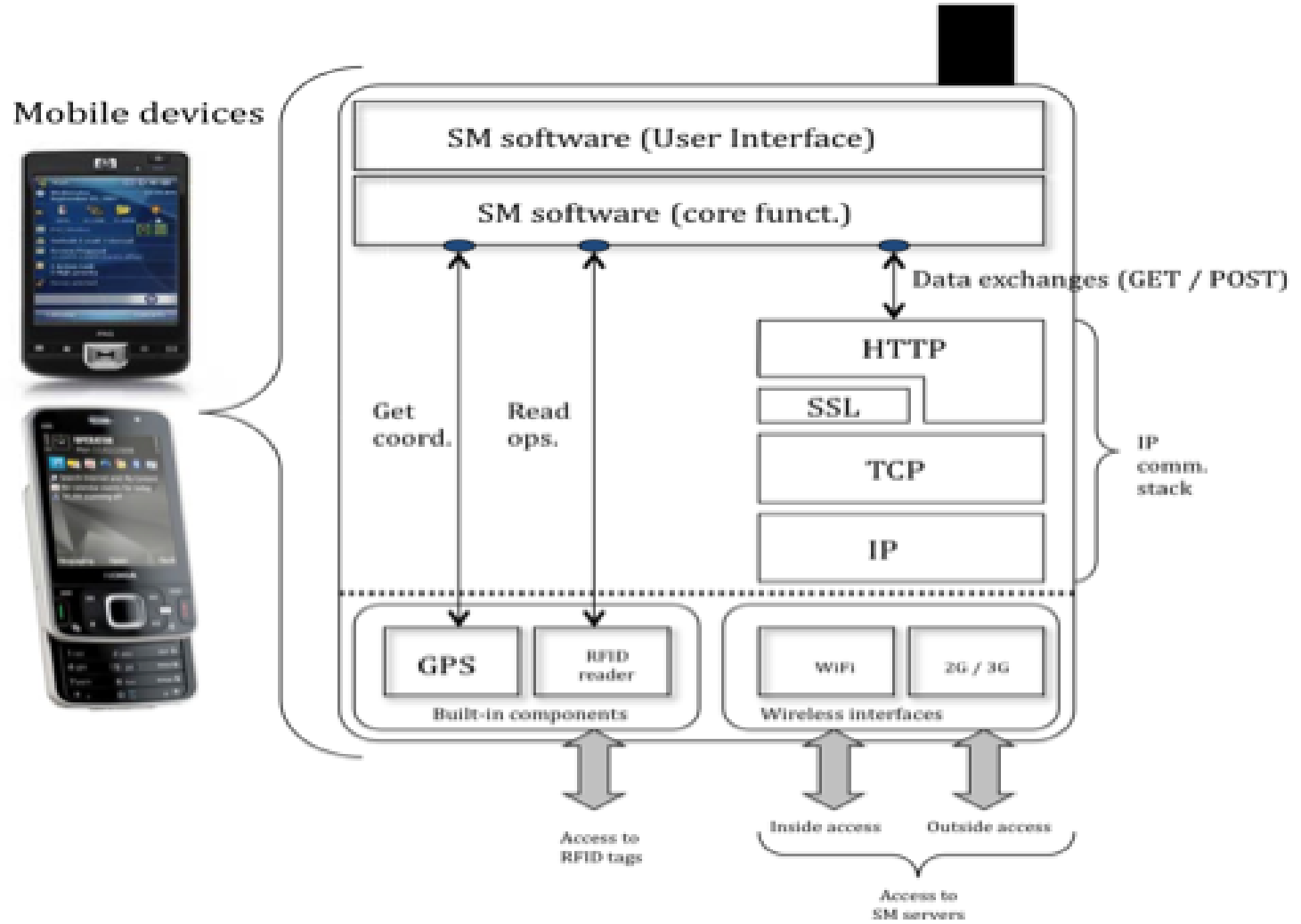


**Intelligence in access:  
Ubiquity and mobility**

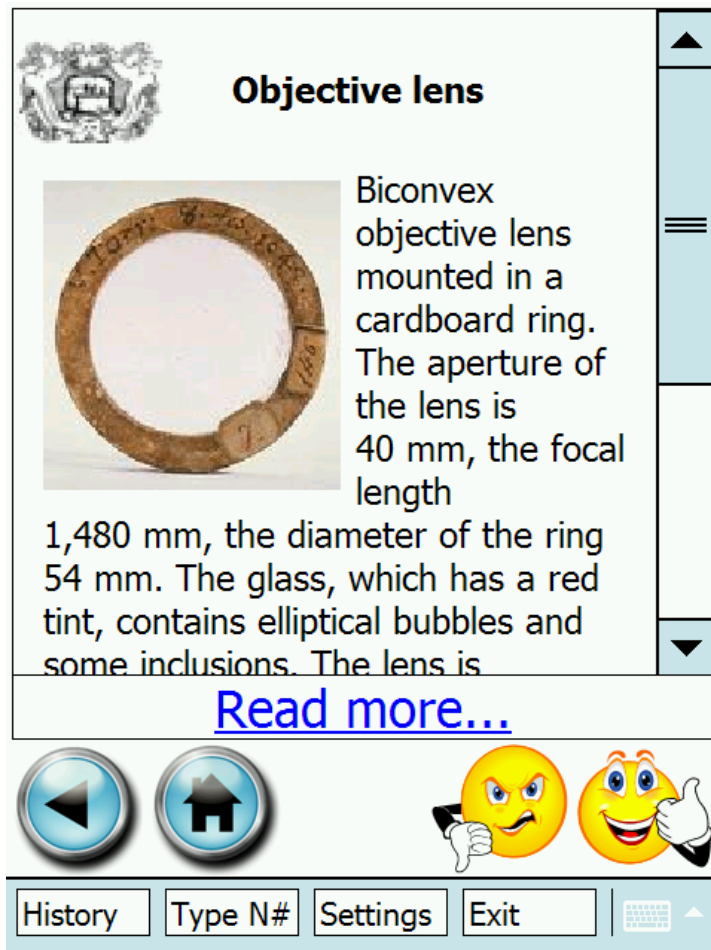






# Architecture of SmartMuseum mobile device



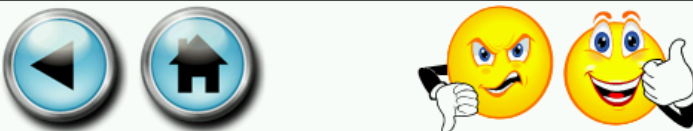
# Main User Interface of Windows Mobile Devices




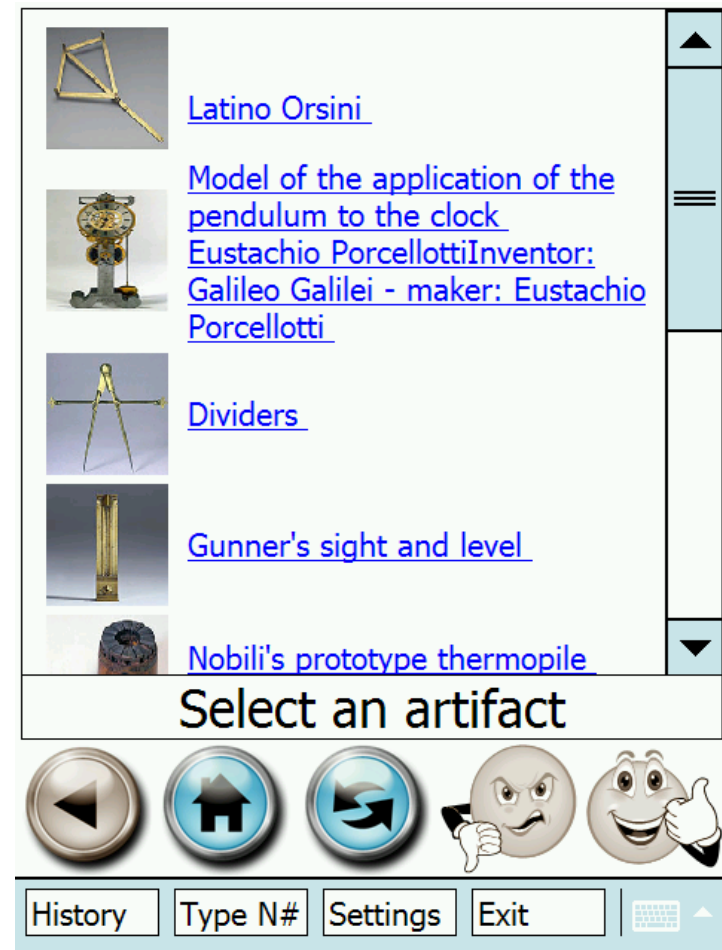
 **Objective lens**


 Biconvex objective lens mounted in a cardboard ring. The aperture of the lens is 40 mm, the focal length 1,480 mm, the diameter of the ring 54 mm. The glass, which has a red tint, contains elliptical bubbles and some inclusions. The lens is


[Read more...](#)





History | Type N# | Settings | Exit | 




 [Latino Orsini](#)


 [Model of the application of the pendulum to the clock](#)  
[Eustachio Porcellotti](#)  
Inventor: [Galileo Galilei](#) - maker: [Eustachio Porcellotti](#)


 [Dividers](#)

 [Gunner's sight and level](#)

 [Nobili's prototype thermopile](#)

Select an artifact



History | Type N# | Settings | Exit | 

# Rating of an SmartMuseum object


## List of recommended objects

- URI **Score=-0.01**
- URI **Score=-0.01**
- URI **Score=-0.01**
- URI **Score=-0.01**

Manual selection of object = +0.3

Object page information

**Objective lens**



Biconvex objective lens mounted in a cardboard ring. The aperture of the lens is 40 mm, the focal length 1,480 mm, the diameter of the ring 54 mm. The glass, which has a red tint, contains elliptical bubbles and some inclusions. The lens is

[Read more...](#)

History Type N# Settings Exit

**Score=+0.29**

Manual selection of object additional content = +0.4



Manual selection of object



"strong dislike" button



Manual selection of object "strong like" button

**Score=+0.69**

**Score=-1**

**Score=-1**


## Non recommended object

URI **Score=0**



Read of object tag = +0.3

Apparatus showing the composition of forces



This instrument, which demonstrates the composition of forces and the principle of the parallelogram of forces, is nearly identical to the one illustrated by Willem Jacob 's

[Read more...](#)

History Type N# Settings Exit

**Score=+0.3**

Manual selection of object additional content = +0.4



Manual selection of object



"strong dislike" button



Manual selection of object "strong like" button

**Score= +1**

**Score=+0.7**

**Score=-1**

**Score=-1**

**Score= +1**

# Smartmuseum.eu

- More info :
  - access to platform
  - on project
  - list of disseminations / publications



# Thank you for your patience

- **Time to experience the platform !**
- Nima Dokooohaki, [nimad@kth.se](mailto:nimad@kth.se)
- Special thanks to:
  - Brian Restall @HM, PIM
  - Alar Kuusik @ELIKO
  - Sylvain Roche @INRIA
  - Anthony Stoyanov @ WebGate
    - For arranging this Demo
- Thanks to:
  - Prof. Dr. Petre Dini
    - For hosting presentation and demo

