Personalization Services In Art Education Environments: First Survey Results

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Structure of the Talk

- Motivation- Objectives
- Related work
- System design
- Motivating scenarios
- Conclusions/Future work

Need For Enhanced Learning Environments In Art Education

- Higher education institutions try to create the infrastructure needed for their potential users coping with the growing demand for digitalization, preservation, and display of varied inventions.
- The COVID 19 pandemic pushed for developments, especially in education that would allow students and instructors to work remotely, while having a rich teaching and learning experience. Immersive technologies like Extended Reality (XR) has received a lot of attention in this light.
- Art students may benefit from the use of XR technology to encourage creativity and present their work in the form of virtual exhibitions in fresh, simple, and cost-effective ways.
- However, information about virtual exhibition construction is incomplete, and it has various flaws and problems connected to art students' unique needs.

Personalization In XR Learning Environments

- Personalization is the main vehicle in many learning environments for the provision of enhanced services to the end-users.
- Personalization for XR systems would primarily mean personalized perception.
- The coupling of XR and recommender systems is still a largely unexplored field. However, researchers recognize the potential.

Personalization vs. Art Presentation

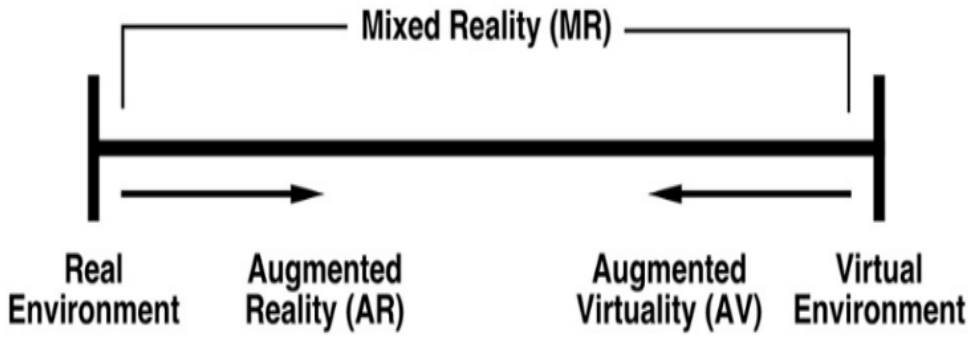
- Can a system, that facilitates art presentation with the use of XR, provide personalized content to its users? What are the techniques that can be used? What are the possibilities?

- According to [Fan and Pool 2006] there are 3 dimensions for information systems personalization:
  - *What*: content (information), user interface (information presentation), functionality (what users can do), channel (the media used for information delivery)
  - *To whom*: individuals or categories of individuals (groups of people based on characteristics)
  - *Who does it*: implicit (automatically by the system) or explicit personalization (the user provides information or guidance)

Objectives

- We are mainly interested in studying personalization services for a system that deals with art education and online exhibitions.
- Specifically, we are interested in assisting art teachers to initiate an art exhibition for their students, art students to create virtual exhibitions and art exhibition visitors to have immersive and interactive experiences.
- We present a literature review concerning eXtended Reality (XR) technologies and personalization for art education purposes.
- We propose personalization services in the context of a framework for enhancing end user experience regarding the creation of virtual exhibitions and their dissemination to the public through XR technologies.
- The presented framework is designed to meet the needs of art students, art teachers, and visitors.

Related Works – XR Technologies



Reality- Virtuality continuum [Milgram et al. 1995]

Related Works
XR Technologies In ART Education

- VR has been used to support Art History teaching and studying [Casu 2015].
- VR in art design teaching provide vivid content, create effective teaching environments, promote professional skills, improve the quality of teaching and assist student integration into the society [Song and Li 2018].
- VR use in higher art education has become a trend due to increased scientific production [González-Zamar and Abad-Segura 2020]. AR use also affects positively motivation [Nincarean et al. 2013].
- In [Pellas et al. 2020; Back et al. 2019] positive findings are shown for MR.

Related Works – Personalization

- Personalization systems can be classified based on the data they utilize, the learning paradigm used, the location, and the process of the interaction with the user (Individual-Collaborative, Reactive-Proactive, User or Item information, Memory or Model-based, and Client or Server-side) [Anand and Mobasher 2005].
- The major categories of data used for personalization are demographic data (data about a user like her/his name and email), behavioral data (about the users' actions like links clicked and number of visits), and contextual data (user's unique properties such as device and browser type).

Related Works – Personalization

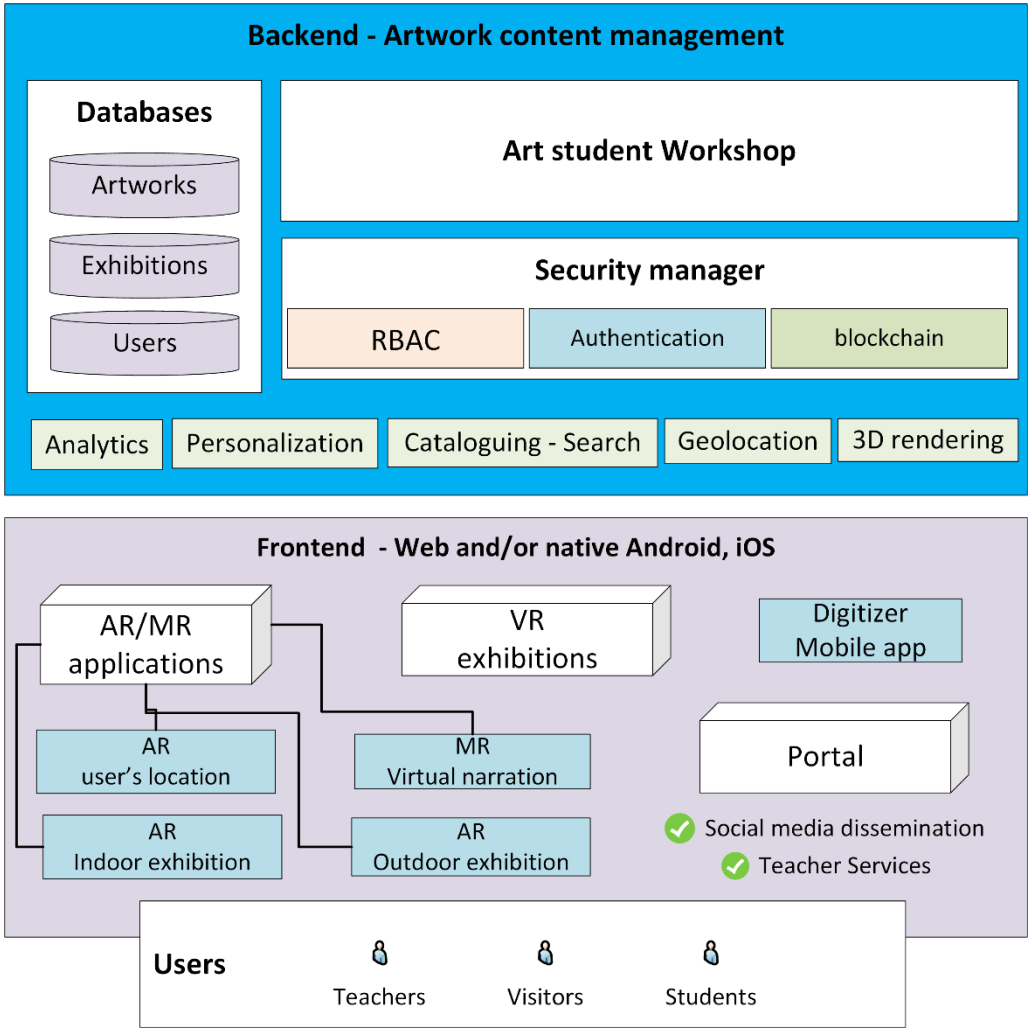
How can we achieve personalization? Personalization techniques can be classified as follows:

- Content based filtering
  [Loeb and Terry 1992; Monaco et al. 2022; Di Noia et al. 2012]
- Traditional collaborative filtering
  [Loeb and Terry 1992; Ko et al. 2022]
- Clustering based approaches
  [Ungar and Foster 1998]
- Association and sequence rule-based approaches
  [Rudin, Letham and Madigan 2013]
- Hybrid techniques
  [Burke 2002]

Related Works
Personalization vs. Culture and Art

- Personalization in cultural heritage has been a research field for decades [Ardissono et al. 2012].
- [Shaik and Yoo 2018] present an interactive VR web application that allows users to create their own custom virtual art galleries. Users can select paintings based on predefined criteria and the system dynamically generates the 3D virtual exhibition. It also allows the customization of exhibition attributes like the floor texture and wall color. Exhibitions can also be shared with others.

System Overview



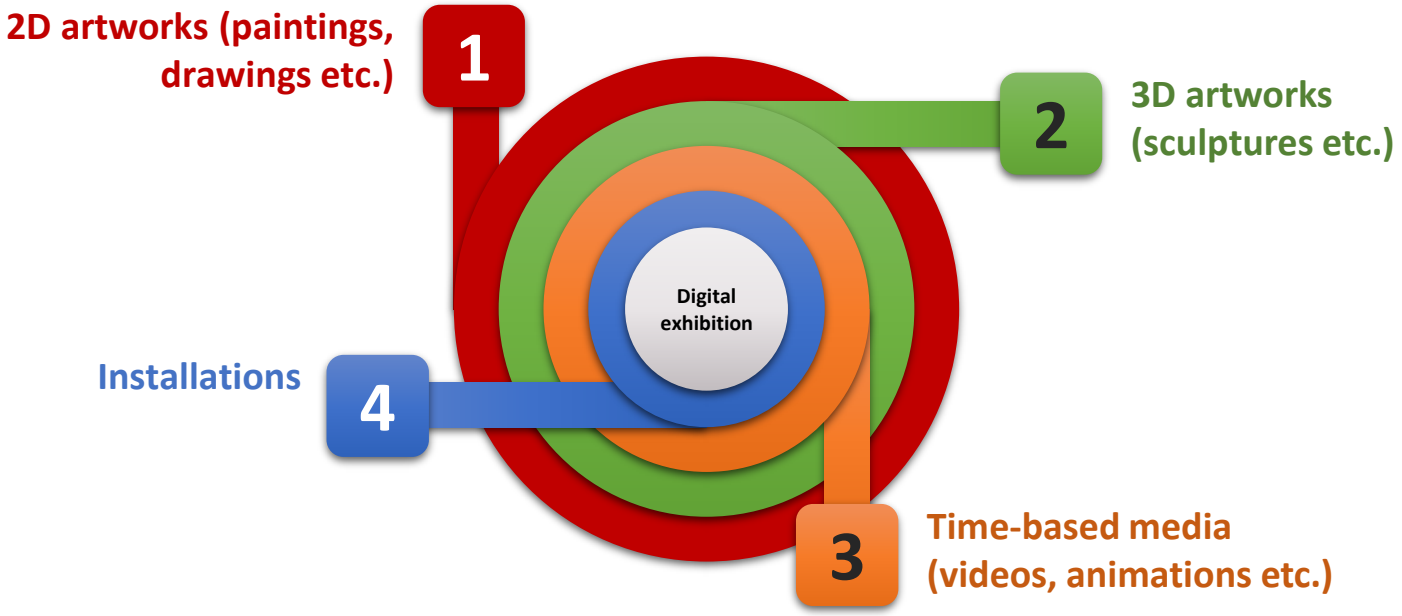
Users

- Art School Teaching Staff
- Art Students
- Visitors

Content – Basic Entities

- *Artwork*: 2D (paintings, drawings etc.), 3D (sculptures etc.), installations and time-based media (videos, animations etc.)

- *Exhibition*: can be indoor (VR) or outdoor (AR, MR)



Content Attributes

Content-Based Attributes:

- Texts, videos (time-based media, Installations), images (paintings, drawings), 3D objects (sculptures), geolocation data.

Context-Based Attributes:

- Video or audio describing exhibit or exhibition (narrations), texts that refer to the context of the exhibit or exhibition (widgets).

Model-Based Attributes:

- These attributes derive from the model itself. In this case, model-based attributes are related to personalization and publishing on social media permission.

SERVICES

Module	Services
Art Workshop	Initiation and assessment of online AR/MR/VR exhibitions for Art Teachers. Creation and management of online AR/MR/VR exhibitions for Students.
Security manager	Users can log into the system to obtain a specific role.
Analytics	Usage and interactions analytics are stored for all registered users.
Personalization	Visitors can access personalization information related to artworks and exhibitions. Students may have personalization suggestions during the creation procedure. Teachers may have personalization suggestions during the assessment.
Cataloguing / search	Visitors can view and search published exhibitions or artworks. Students can view and search also their unpublished content. Teachers can view and search all published work as well as their assignments.
Geolocation	Students can put their artworks in specific locations presented to visitors.
3D rendering	Students can create a 3D object with the help of Digitizer Mobile App.
AR/MR applications	Any user can use the AR/MR apps and access their content depending on their role. The AR indoor exhibition app displays additional artworks in an existing exhibition. AR user's location app displays artworks on the users' walls. AR Outdoor exhibition app provides outdoor exhibitions to the users and MR Virtual Narration app lets the user interact with the projected artwork.
VR exhibitions	VR exhibitions are provided through the portal. All users access exhibitions (Desktop VR) while Students can access their unpublished exhibitions.

User Requirements For Personalization and Recommendation

Module	Services
Art Workshop	How do I choose the objects that are most appropriate to the narrative I want to present and the story of the exhibition? How can I adjust the group of artworks and the narrative to the space in terms of scale, size and rhythm/flow? Could we have more than one room for the exhibition? Could we change the color of the walls in the exhibition rooms? Could we have various options for the students concerning the shape of the rooms? (e.g., long room, spiral room, round room, square room or well-known online museums).
Exhibition assessment	Could we assess the exhibition based on previous assessments of similar exhibitions?
Exhibition Viewing	Will we use avatars? If not, could we have a range of options? Could we provide alternative artwork exhibition viewing based on user behavior in previous system visits?

- The findings of the literature review were triangulated with the help of a group of experts-art teachers

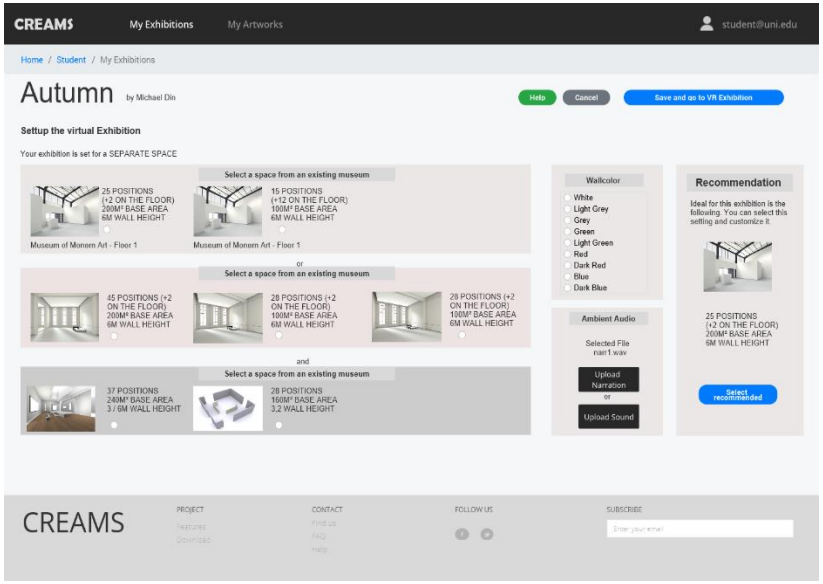
Requirements For Personalization Services

Role (whom)	Recommendation	
	What	When
Teacher	Co-advisors with experience in exhibition assessment	Exhibition assignment
	Similar exhibition assessments to the exhibition to be assessed.	Exhibition Assessment
Student	Related narrations	Exhibition Creation
	Related artwork descriptions	Artwork management
	Similar exhibitions with high ranking or with the best assessment	Before the creation of an exhibition
	Artworks that are highly related to the exhibition	Exhibition Creation
Visitor	Artworks or Exhibitions depending on their behavior, personal info and preferences	Viewing

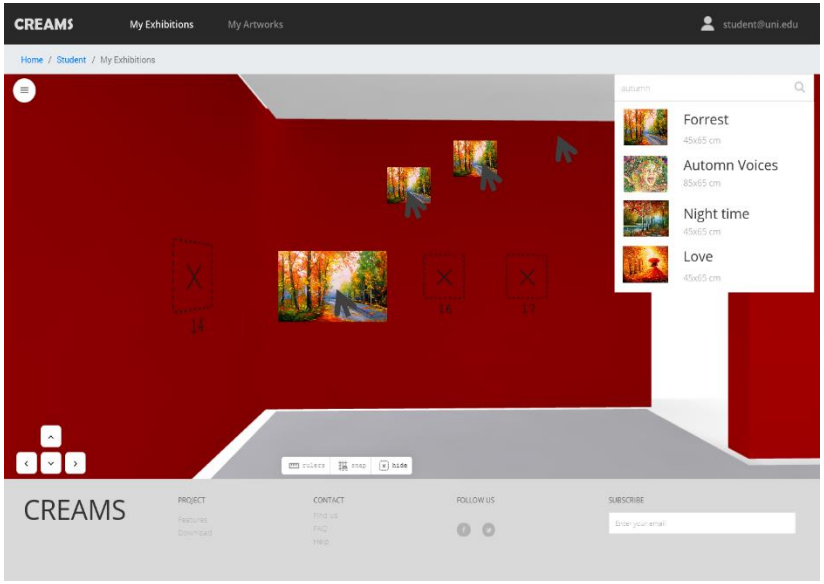
- For further filtering of the list of recommendations that would facilitate personalization, we performed an interview with students at Art Schools who are nearing the conclusion of their studies (4th-year students).

MOTIVATING SCENARIOS

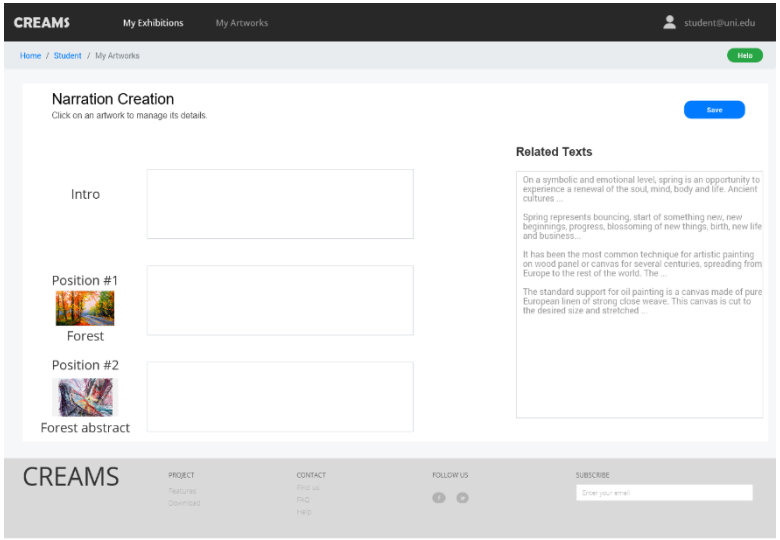
A. *The student creates an exhibition using the art student workshop*



Student exhibition creation using predefined spaces.



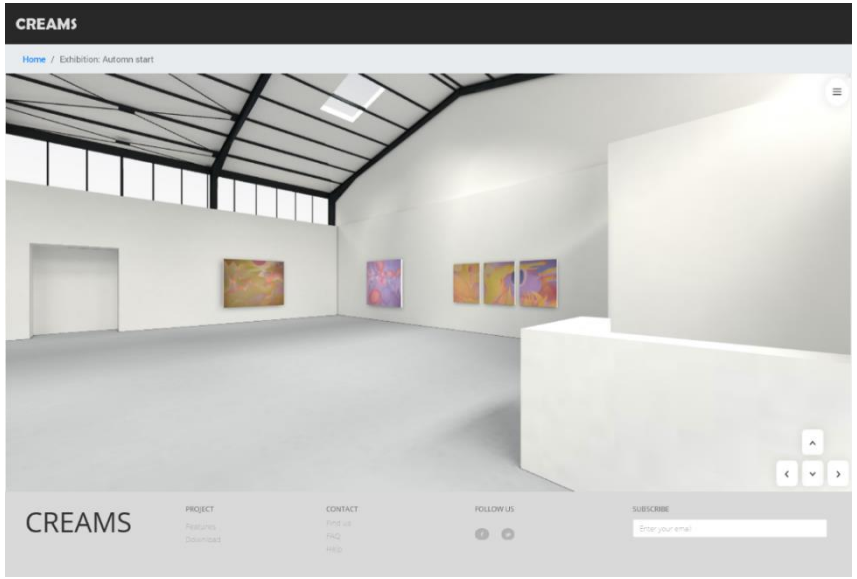
Recommended artworks placement in an exhibition by student.



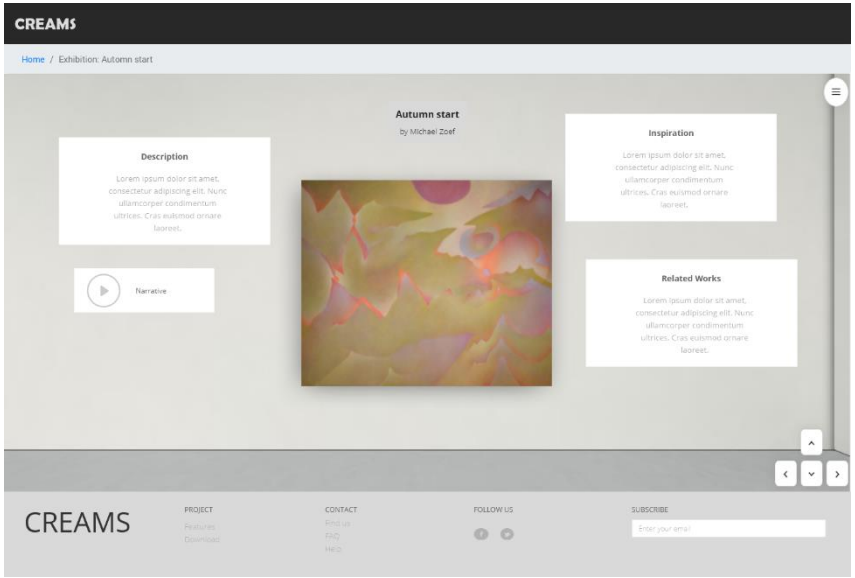
Student creates a narration for the exhibition.

MOTIVATING SCENARIOS

B. The visitor explores a Virtual Exhibition



Unregistered visitor visits a virtual exhibition.



Registered visitor views an exhibit.

Motivating Scenarios

C. A visitor uses the MR app to display an exhibition

Visitor visits an exhibition using an avatar.

Visitor selects Information.

Conclusions-Future Work

- Discussion of personalization issues in an art education environment.
  - Literature review concerning systems, technology and best practices
  - Presentation of a framework offering personalization services to all the actors of art education procedure
  - The proposed framework considers the opinions of experts themselves
- *Future work*: fully implement all the described services and evaluate them in real situations.

Thank you!

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