LES ORRES 9 JANUARY 2023

Smart Mountain for tomorrow

19th OCOVA FORUM

MEDIA PROJECT

Advanced Digital Multimedia Emotional Museum

Luca Ulrich

AIM AND SCOPE

- Enhancing museum experience through the adoption of technologies enabling digital transition
- MEDIA project:
  - **Multimedia**: different media to vehicle the information
  - **Emotional**: the visitors' emotions and state of mind must be the focus towards which all the employed technologies aim at
  - **DIgital**: all the employed technologies foster the digital transition according to the guidelines dictated by the PNRR
  - **Advanced**: the project aims at being innovative, integrating acquisition systems and visualization technologies. In other words, the innovation process aims at being present in all the steps of the project

CASE STUDY - MAV

The museum

Memory

Matter

Shape

Beauty

LITERATURE REVIEW

How to enhance visitors' experience using digital technologies?

PROFILING/ACQUISITION

- Affective computing techniques can be used to monitor visitors' experience
- Visitors can be grouped according to different classes
- Results can be used to adapt the following visits

MUSEUM EXPERIENCE

- Creating a context within which the objects can be framed
- VR is a powerful tool to increase the immersivity perceived by visitors

PROJECT PIPELINE

EXPERIENCE DIFFERENCES

In loco	VR Desktop	VR Headset
• Physical objects	• Virtual objects acquired with a 3D scanner	• Virtual objects acquired with a 3D scanner
• Physical interactions with the objects	• No interaction with the objects	• Virtual interaction with the objects
• Level of immersivity provided by captions	• Limited level of immersivity	• Maximum level of immersivity
• RGB-D, EEG, questionnaire	• RGB-D, EEG, questionnaire	• EEG, questionnaire

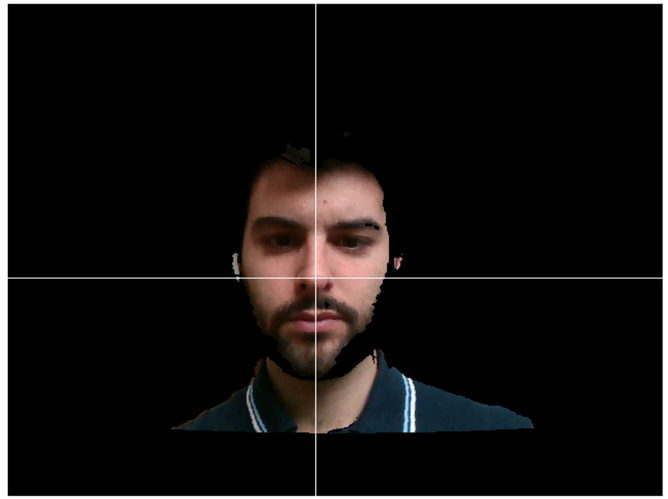
ACQUISITION TOOLS

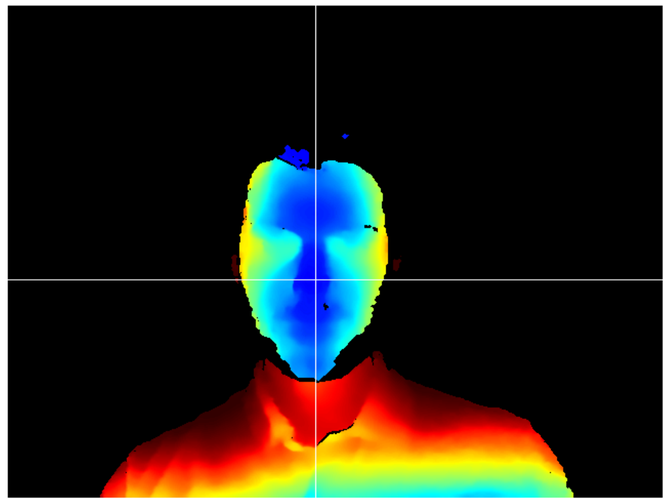
RGB-D camera and Artificial Intelligence

ACQUISITION
- Color frame
- Depth frame

PRE-PROCESSING
- Face detection

CLASSIFICATION
- Convolutional Neural Network (CNN)





ACQUISITION TOOLS

EEG (electroencephalogram)

- Electrical activity of the brain

6 areas

Pre-frontal (FP)
Frontal (F)
Temporal (T)
Parietal (P)
Occipital (O)
Central (C)

5 frequency bands

Delta(δ): 0.5-4 Hz – deep sleep
Theta (θ): 4-8 Hz
Alfa (α): 8-12 Hz
Beta (β): 12-25 Hz
Gamma(γ): 25-45 Hz – high mental activity

ACQUISITION TOOLS

Questionnaire

SECTIONS

1. User Engagement Scale (UES)
2. Perceived emotions
3. Services provided by the museum
4. Demographic

OPEN ISSUES

- Ground truth
- Questionnaire length
- Differences between VR and *in loco* experience
- Some Q&A related to single pieces of work; some others related to the whole experience

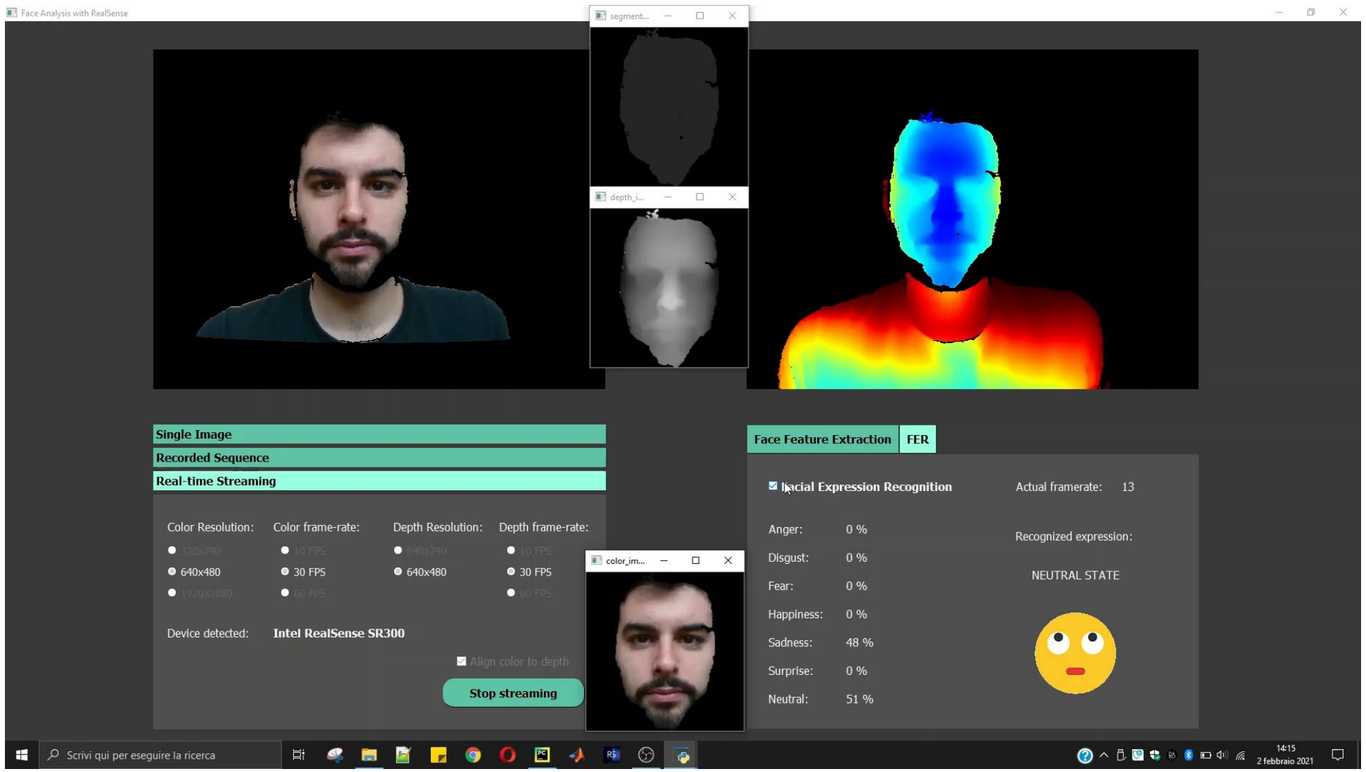
ACQUISITION TARGET

Basic emotions (Paul Ekman)

Happiness

Sadness

Surprise



Fear

Anger

Disgust

ACQUISITION TARGET

State of mind/mood

- Interest
- Engagement
- Stress
- Excitement
- Focus
- Relaxation

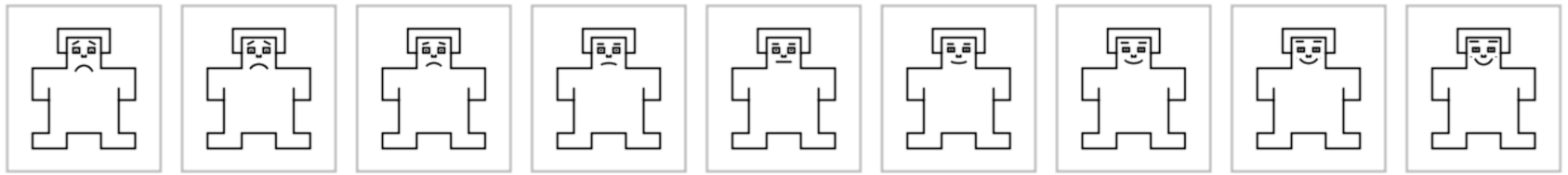
Combination of brain electrical waves

Association ≠ Perfect match!

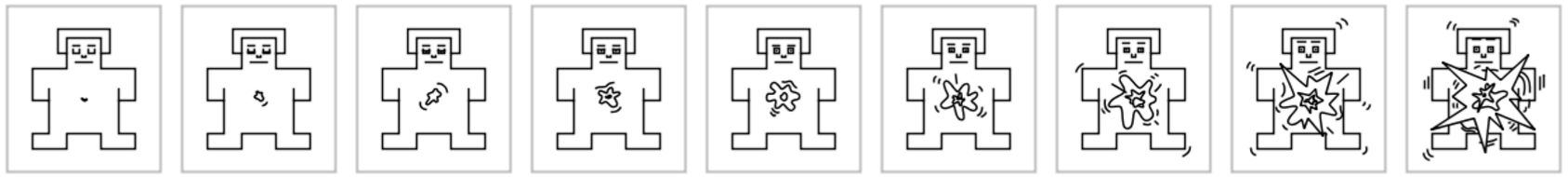
ACQUISITION TARGET

Other indicators

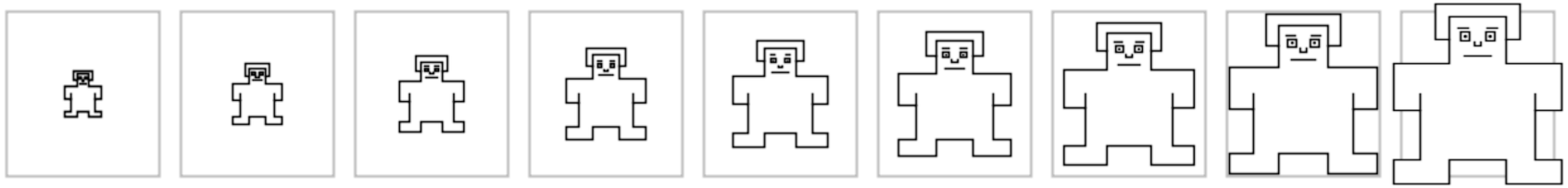
Valence



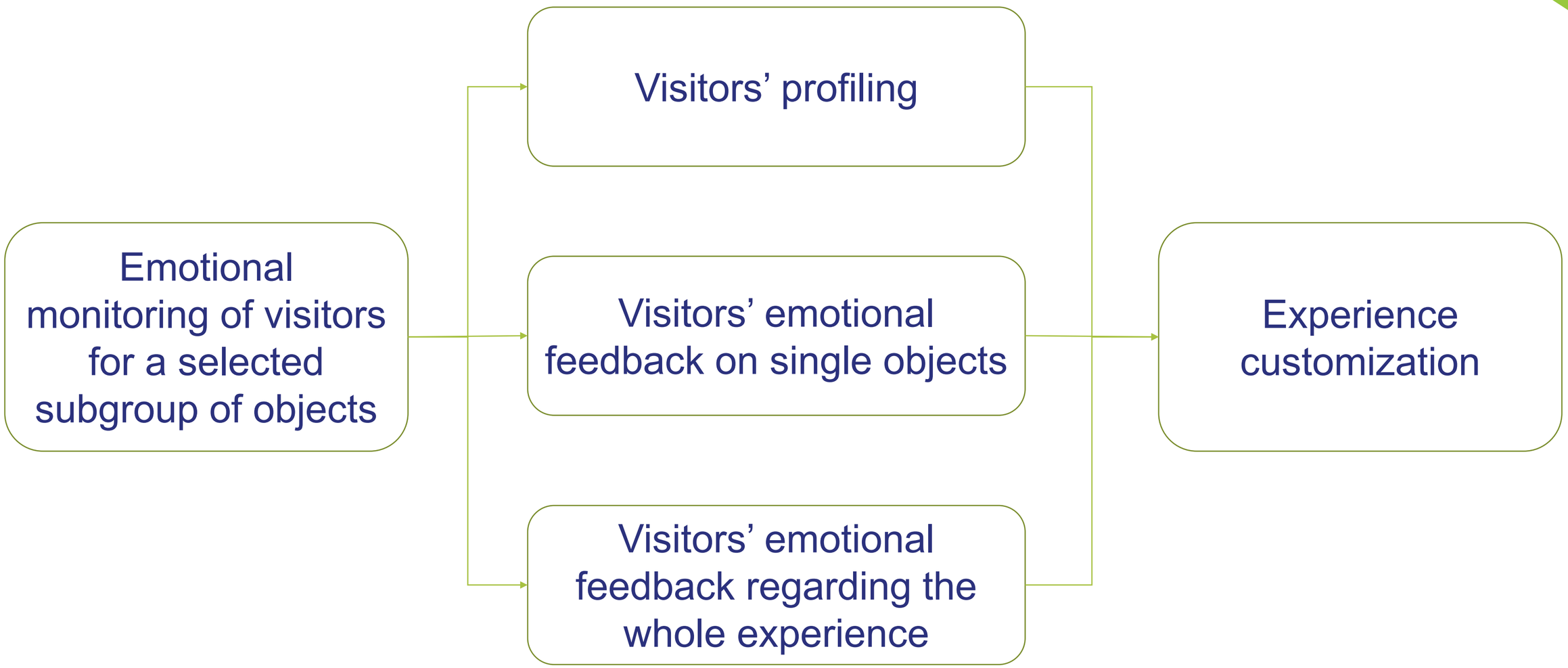
Arousal



Dominance



EXPECTED RESULTS



RESULTS RELEVANCE

Obtained results will be used for:

- Identifying visitors' classes
- Customizing in loco visitors' experience
    - After the completion of this analysis, visitors will be profiled BEFORE the experience in order to provide guidelines and suggestions according to their class belonging
- Redesigning museum itinerary
- VR environment will be expanded and could be used by the museum for remote or *in loco* visits

LES ORRES 9 JANUARY 2023

Smart Mountain for tomorrow

19th OCOVA FORUM

MERCI POUR VOTRE ATTENTION
THANK YOU FOR YOUR ATTENTION

OCOVA ALPMEDNET

3D Lab | POLITECNICO DI TORINO

Luca Ulrich

RÉGION SUD PROVENCE ALPES CÔTE D'AZUR

Hautes-Alpes le département

COMMUNAUTÉ DE COMMUNES SERRE-PONÇON

LES ORRES

CRÉDIT AGRICOLE