FACE TO FACE

the paintings have eyes

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***Abstract*—We intend to analyse and record feelings and emotions in visitors in front of various paintings and investigate the way they look at artworks. The aim is to set a specific path, museum design and succession of depictions based on a precise sequence of feelings that the viewer or even the organiser of the exhibition wants to evoke.**

I. State of art

REVERSE your perspective: for once the artwork will look at you like youre a work of art. Create your own path following your emotions, making your experience in the museum unique. *Be the curator of your own emotions!* You should not worry anymore about a default museum path. Do you feel a bit sad and you desire to express this feeling during your visit? We have realized a software to handle your museum stay. For our research we have chosen one particular exhibition (Liu Bolin - Le Theatre des apparences) because his work is not too well known to interfere with the recording of visitors impressions and its at the same time various (in terms of atmosphere of the work curious for most of the visitors and unconventional). We believe that our project could potentially help visitors to be identified himself more with the artist of the exhibition.

II. Introduction

FACE TO FACE is a project realized in context of the master course Experience Design, tutored by the professor Jeffrey Huang and Immanuel Koh. The experiment was conducted on a sample of 10 people. We have tried to find peers people with different backgrounds (see graph 1).

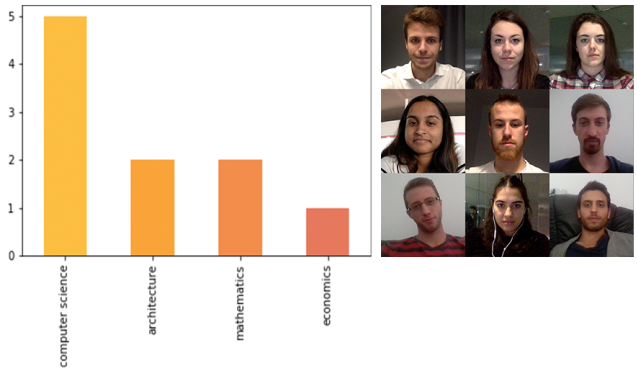

Fig. 1. Sample analyzed. On the right: 9 of the 10 people analyzed.

In Section III we have described the structure of the process to collect our data.

III. Experiment

TO run the experiment we have implemented a Flask web application. The sample did not know the goal of our experiment, we asked him/her to sit in front of the computer and to watch a sequence of artworks for 2/3 minutes. The sequence of painting should resemble a possible museum path, it is generated randomly for each person to avoid the possibility that an artwork could potentially affected the emotion of the following ones. Each artwork is showed for 6 seconds during which the web camera of the computer records 4 pictures (each one every 1.5 seconds) to detect the emotion trend of an artwork (see Fig. 2). Each recorded picture is then

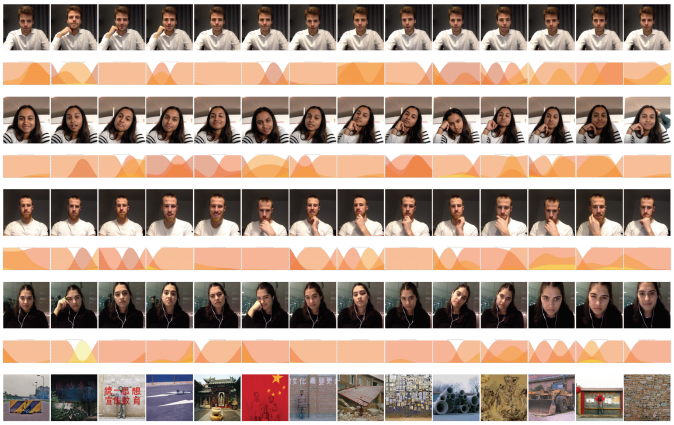

Fig. 2. Evolution of emotions during the experiment.

analyzed by the facial recognition software *Face by Microsoft Azure*. Artworks rating is done collecting data through direct observation in a digital museum. By collecting data it was possible to ”rate” artworks and people in order to put them in different categories based on the emotions range we aim to analyse. These categories were fundamental to generate our path algorithm as described in section IV.

IV. Feeling Path

THE idea of the Feeling Path is that one user can get a different way of progressing through the exhibition by balancing the weights of a set of emotions and a time allowed to the visit. The time is in minutes and the emotion vector is just 7 values between 0 and 1 defining the importance of each emotion (disgust, fear, surprise, contempt, anger, sadness and happiness) 0 being the lowest importance and 1 the highest.

In this section we will detail the process of the generation of the Feeling Path and its computation.

A. Path drawing

We first take a low-resolution image which represents the floor map and define pixels which are reachable and which are not. We can then define an adjacency matrix that will be used to create a graph to be able simulate the navigation in the room.

At this point, to go from a point to another, we now only need to compute the shortest path using our graph, this will give us the set of pixels crossed in the way. We can then do this for a set of points that we consider to be our path and use the result as control points to draw curves which will illustrate the path. We are using bézier curves to make them smooth and produce a human-like movement. We get the final route by concatenating all the different curves into a single one. Once we have our path, we can copy it to the fancy illustrated floor plan by re-sizing our curve accordingly.

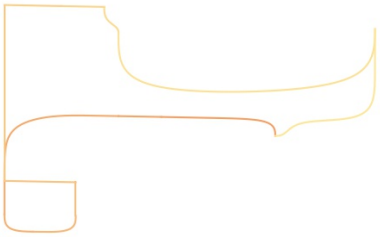

Fig. 3. Example of the drawn path.

B. Path computation

Here we will look into the process which allows to find which pieces of art will be on the path and in which order.

First of all, we need to compute the distance between every pair of artworks and also to include the entry point to this computation. We use the graph representing the floor map created previously to this end. These distances will be used as weights to find the next hop on our path.

We then get the inputs: the emotions vector and the time available from the user. The time will be a threshold to the number of artworks which will be seen by the user, giving us the number of hops.

After that, we begin to construct the path by doing the scalar product of the input vector and the emotion vector of every piece of art to get a similarity score. We then weight these scores by the distance between our actual position and the position of the art piece. The bigger the distance, the lower we are likely to visit it next. Once we decide on our next step, we add the node to the set of visited node so we don't visit it again and set it as our current position. We iterate this way until we reach the wanted number of hops and get back to the exit/entrance point.

This will return our final set of points to visit in order for us to draw the Feeling Path.

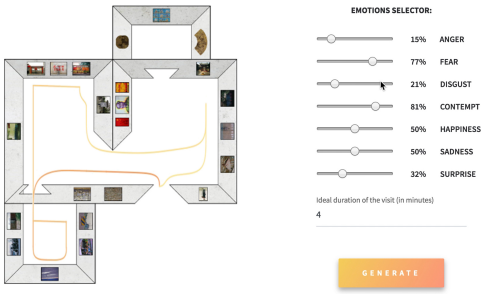

Fig. 4. Example of generated Feeling Path.

V. Principle Component Analysis: PCA

ONCE the experiment was done and we decided we had gathered enough data from it, we wanted to compare people to the pieces of art such that each person can be face to face with artwork that emotionally resembles them.
To this end we used PCA to do dimensionality reduction and being able to represent pictures and people on a 2D plane, having the distance between two points as a metric to the emotional likelihood. As an input to the reduction we use all the emotional vectors from the art pieces and the mean of all persons' reactions during the entire reaction to define them.
Finally, we use the PCA functions from scikit-learn Python library to perform our comparison and plot them as below to get visual results.

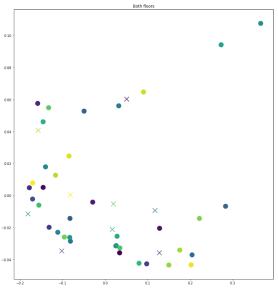

Fig. 5. PCA with both floors and people: Circles are the artworks and crosses the different persons.

As an addition to this, we also found interesting to create two different plots to compare people and pictures from each floor separately. This is because we had two set of people, one who saw the images from both floors and one group who saw the images of the first floor. It hence gives a different vision to the experiment, as we can now show people new artworks directly from their reactions to other exhibits and possibly other museums.

VI. Web application

FOR the web application we have decided to use the framework Flask[1] for the back-end since it is really light and easily expandable. We have factored the application into a

[1]Flask: http://flask.pocoo.org/

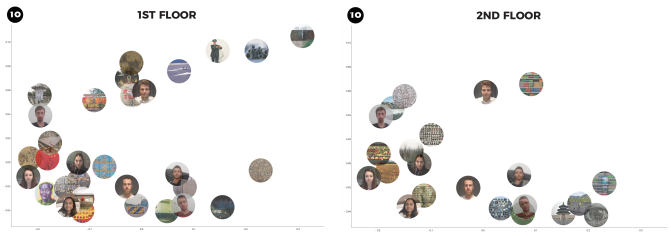

Fig. 6. We have used the first floor to train and the second floor to test.

set of blueprints [2] that allows the instantiation of an application object. To capture the picture during the experiment with the web camera we have used the library *OpenCV*, the experiment starts when the user press the corresponding button on the homepage, every time that a new artwork is showed an *ajax* request is made (see Fig.7). The back-end then records 4 pictures for the painting and sends a *GET request* to Microsoft Azure to get the corresponding emotions recorded. As database

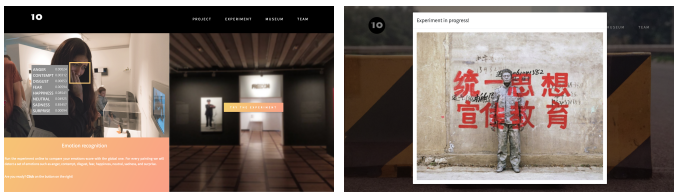

Fig. 7. Experiment UI

we have chosen to use *SQLite3*. At the end of the experiment we insert all the new data into the database. At the end of the experiment a modal containing the results recorded is showed (see Fig.8). The user can also look to average data recorded just clicking on the interested painting in the carousel (in the homepage), every time we ask to the back-end to query the corresponding value in order to show an updated chart.

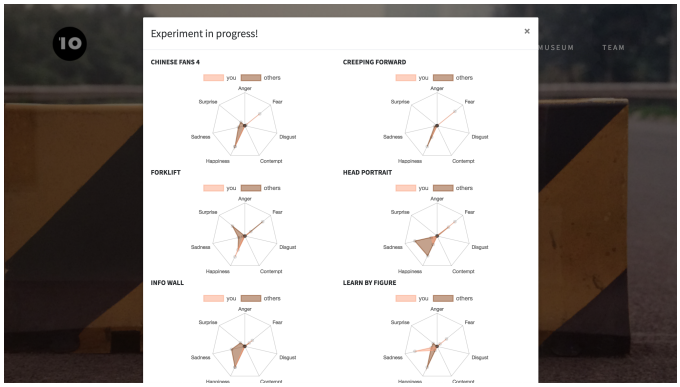

Fig. 8. Results obtained after having run the experiment.

For the front-end we have used mainly the library *Bootstrap Material Design*[3]. As Javascript library we have used *jQuery*.

[2]Blueprint: record operations to execute when registered on an application. Flask associates view functions with blueprints when dispatching requests and generating URLs from one endpoint to another (http://flask.pocoo.org/docs/1.0/blueprints/).

[3]BootstrapMD: https://mdbootstrap.com/

To design our web application we have followed the set of rules, guidelines and components proposed by material design.

VII. Conclusion

WHAT we aim to do is emphasising this feeling centred attention and let the visitors embrace the essence of the exhibition. This project allowed us to put ourselves in another prospective. We were able to consider artworks not just as a piece of art but to give them somethings that go beyond being material, something that is more abstract: a feeling, an emotion that is intrinsically part of it. As showed in Fig. (6) we can notice that some people almost full overlay with certain artworks, that means that are emotionally similar. The website grants people interested in the project to look at results that we have collected during the experiment (see Fig. 9).

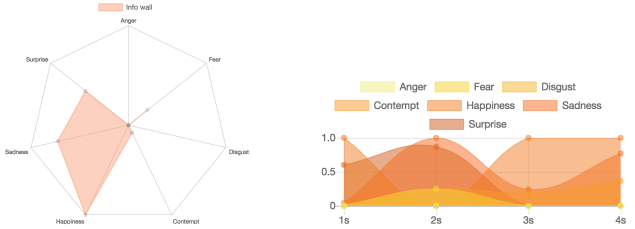

Fig. 9. Result of the emotion obtained for the artwork *Info wall*. On the left: emotions average distribution, on the right: evolution of the emotions during 6 seconds.