- **About YADUSMOG-IA**

Talk for GARDEN THE WATER SKY SYMPOSIUM

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Abstract :

The YADUSMOG-IA project is a pastiche of weather applications for navigators. This artistic & scientific project has been tested in Saint-Malo since March 2019. We have installed a network of air sensors with first activists to measure air pollution and humidity in order to carry out a participatory science study. The training of artificial intelligence modify the representation of the landscape according to the rate of particulate matter captured nearby, based on pictorial representations of "smog" learned by A-I's.

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A – Theoretycal Assumptions

Genesis of the project : a sky observation

I started this project with Victor Boquet, interface designer. We wanted to create a sensitive urban experience, on a city scale. Personally: I see it as a scientific experiment, and a participatory ecological science project. First, hypotheses were formulated and we implemented a methodology to experiment and then interpret the results. Data are collected via fine particles sensors and hygrometers. Everyone can produce data, share them, analyze them, and publicize the event. In addition, it is also an experience in political science. I formulated hypotheses and wanted to put certain concepts to the test of reality. This presentation, will discuss of political science, methodology and then explain the app & the artistic work.

First the name of the Yadusmog application. It is inspired by the YADUSURF application which is widely used by french surfers. We replaced surf by smog. Smog is a contraction of SMOKE and FOG. It results from the condensation in the lower layers of the atmosphere of moisture on suspended dust. A greyish cloud can then form over a city, and a anticyclone can perpetuate the phenomenon. As you can see, the logo is here a cyclone that I scanned and vectorized. A depression more precisely is replaced by fine particles. We also rely on the fact that dust clouds now come from vast air currents and wind-related trajectories, which are international.

Anthropogenic clouds : a tool to observe them ?

We speak of "anthropogenic" clouds: or clouds created by man. We now know that these particles are extremely volatile for some and pollute from hundreds of kilometres away. We can already talk about the circulation of fine particles via air currents and jet currents.

I really wondered about the change in the micro weather caused by the presence of PM for the first time in Southeast Asia, during a huge pollution peak. On the coast, meteorological phenomena are often observable: thermal breezes, heat mist. I was in on the coastline where a strong thermal breeze was expected since 2 months, but instead, a massive opaque veil was still there, and there was no wind. As a simple observer, and not a meteorologist, I cannot analyse these phenomena or draw hasty conclusions. I can only wonder about the impact of these fine particles on the formation or not of clouds, and therefore the absence of a thermal breeze.   More locally on April 24th on the french west coast : we could not distinguish the difference between a usual heat mist on the sea and a cloud of particulate matter.

The difficulty is that we loss sufficient acuity and experience in observation on natural phenomena.   There may be a loss of observational skills, because weather-related uses and practices have changed. Today, meteorological real time applications allow optimal adaptation.

A context of struggle about air quality in Saint-Malo :

YADUSMOG is a cynical name given to this app' specially dedicated to Saint-Malo : city with a corsair maritime past used to promote tourism.   We are addressing the issue of air quality in Saint-Malo because it has been controversial for several decades. A citizens association called Osons-Saint-Malo has been federating a popular education movement and organizes events concerning urban planning issues and common goods: air and water. The association acts as a counterweight to the institutions. She points out the activity of an industry downtown.
The association is actively campaigning to reduce ammonia emissions in the city and the harbor.

A collective protest action is made possible through the exchange and distribution of photographs of microclouds of pollution in Saint-Malo on the internet. It also has set up the network of "noses". It is a network which report each olfactory nuisance by specifying the place & importance of the nuisance. In spring 2018, the association produced a booklet that analyses them comparing the various districts after 3 years of data collection.   Our proposal is to be included in their Repertoire of contention, and modes of protest action.   Our sensor installation is deployed via the NOSEs network,   and thanks to A-I we can take new photographs of anthropogenic clouds.

Political research : the use of health studies and social movement theory

This pastiche of a weather app' comes from various assumptions. I studied the case of asbestos. The advertising by associations allowed this to be put on the political agenda, which leaded to the production of public health studies.   Perhaps we could take advantage of what is called a structure of political opportunity: the problematization of particulate matter in Europe. A sociologist & urban planner Manuel Castells : analyses the changes in the media universe. Internet allows the emergence of social movements by the definition of new media spaces, bringing about social change. So I wanted to test the use of digital technologies in the publicization of an issue. Indeed this media-project involves and calls various communities that monitor innovations, but also refers to local practices and popular culture.

In addition, Victor and I remained strongly worried on the political content assigned to the role given to augmented reality, and artificial intelligence. we wanted to collect data with the issuer's permission. It seemed appropriate to us to create one or more artificial intelligences whose role is dedicated to serving the societal & ecological cause, and being of a collective tool. Victor was already working on machine learning systems as an artist. I was doing a electronics and works about climate & science. Together we evaluated the feasibility of a device that would allow us to modify our perception of the sky based on the capture of sensor data and smartphone geolocation and webcam.   Victor proposed the technology of style transfer by learning artificial intelligence, while I took care of the electronic part and the creation of the network, and the map.

B – Creating the network and the art

The sensors and network creation : being low-tech

Open access and digital tools now allow sensors to be deployed and data to be easily retrieved for modest amounts of money.   We wanted to stay low tech, we were opposed to the purchase of unnecessary sensors and symbolically to the individualization of ecological issues. With the Osons association we installed sensors in ten private homes. The location of the sensors are the result of a comprise between the association, who wanted to install the sensors where they had perceived the greatest nuisances ;   and myself who recommended the installation of the sensors according on a more extensive grid within the city to better peceive possible variations I chose to set up a sensor program developed by the Stuttgart fablab. Web data are retrieved from

the server in Germany which offers to acquire all data in open source, and graphics. We also wanted to be part of a global and participatory approach throughout Europe. The program also modifies the connection interval of the sensor, which extends its lifetime from 1 to 5 years.

UX Design and creation of the map :

In summary our interface 'map' keeps a clear and simple reading for a wide audience is adapted to French standards, problematize the link between meteorology & fine particle dispersion :
-our reading interval is a scale of color intensity : it is based on the guide and limit values established in France and the alert threshold.
-We recover data from PM 2.5 pm 10,
-we recover hygrometric data: relative humidity & temperature
A second interface has been produced by a member of the association in order to extract and analyze the recording
-We will provide direct access to the graphs soon.
In fact, Relative humidity is measured with an electronic probe : more or less dry weather conditions have an influence on the airborne suspension of particles. Our interface also shows the Wind force and direction – as it acts as a transfer agent. We recover wind data to get the directions and forces and the prevailing winds. We retrieve Open Source data from the OPEN WEATHER MAP site. We have a WIKI interface where we share our observations & tutorials & a GITHUB, which we will soon provide.

Coding with open-access tools :

The app has been coded in P5.JS an open acess program, and the Artificial intelligences in Python. We used the open access application P5.JS. which easily interacts with other HTML5 objects: text, webcam or sound etc. We have chosen neural style transfer technology to "make pollution visible". We take an image of content which is processed by the style reference image and then reinterpreted as p5.js output. The content image here is the landscape filmed by a webcam, and the style reference chosen are my picturial works : 3 paintings. Victor trained 3 artificial intelligences for the reference style to learn separatly my picture work. I previously made them on the theme of eco-toxicology. They are still learning. Then the image output on your device is the landscape of st malo, transformed by the 3 style learnt by the A-I s. We also use Geolocation : Via the smartphone's GPS, It retrieves data of fine particles from the nearest sensor. THEN The rate of

fine particulate triggers one of the visualizations. This device makes it possible to form "meteors" that are disturbing but also aesthetic, like many of them in nature.

The use of A-I : Neural style transfer reaveals anthropogenic clouds

These paintings are "chromatographies" that I made after discovering the pollution of the soil with dioxin & the sky with anthropogenic particles in Asia. This series is inspired by <u>Laboratory Life: The Social Construction of Scientific Facts</u> an epistemological book by science sociologists Bruno Latour and Steve Woolgar published in 1979. These images retrace the stages of scientific research: Question / analysis system / interpretation. I bring these different steps together in a single image. In semiotics : we call this a « congruation » The representation is like a chromatogram that draws a landscape on which possible toxic substances would appear. This chromatography allows a total dissolution of the landscape.   For 4 years Osons has been inviting people to take photographs of anthropogenic cloud phenomena in Saint-Malo and then post them on social networks. We have added a button function on the computer interface which generates a picture that is sent to the person's smartphone or tablet.

Conclusion :

Our application is still under development and it is so far located to st malo, we hope to extend to france. Concerning the more scientific aspect: the association will organize a major conference at the end of the year where statistics will be presented in order to interpret the data, comparing different neighbourhouds and other different cities. Personnally I hope and think that our readings could thus be compared to the predictive analyses for the city of Saint-Malo.
Our application is free and open and allows everyone to visualize the airborne content of particulate matter, not for the purpose of denunciation but rather to learn about climatic issues and sharing information. However, we also hope to give an experience of the city, and to give back to observe the natural elements. Victor and I want to improve the servor, and moreover the machine learning system and style reference images.   I believe that it also makes it possible to see the world as I see it, in a clearly anxious way, with my « interpretation framework » .

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