

UnivEnv

Visualization of environmental data collected through a network of stations located on the territory

NIKITA BALDAN, EMANUELE MOTTO, MAURO NORIS

A.Y. 2018/2019

Contents

1	Introduction	3
2	Data	3
3	Proposal	4
3.1	Individual	4
3.1.1	Smartphone	4
3.1.2	Smartwatch	4
3.2	Public	5
3.3	Technical	7
3.4	Type of graphs	9
4	Bibliography	11

1 Introduction

The main topic of this project is to provide a set of visualization tools regarding environmental data collected by a station located in the territory.

The requirement is to design three different information visualization tools, which are the following:

- Individual: app for smartphone/smartwatch
- Public: ambient display
- Technical: application for large tablets or desktop

Each of the representation is linked by a different type of user, for example the desktop application is made for letting back end technical personnel staff to access data at different levels of granularity, instead of the public representation that will provide an approximation of the data collection for letting not technical people understand what they're seeing.

2 Data

The station will collect the following environmental data:

- CO2
- Air Humidity
- Luminosity
- Wind speed and direction
- Location (also height, type of soil, type of surrounding environment)
- Time (hour/season)
- Pressure
- Rain
- Temperature

3 Proposal

The solution provided will present the following representation.

3.1 Individual

3.1.1 Smartphone

The solution provided has to take into consideration that it has to give an easy representation of complex data. The choice for this type of device and user is to represent data by a number linked by an icon that will change respect to the result of the data collection. For example, if we have that the CO₂ indicator is telling us that there is too much CO₂ in the air, the icon linked by that number will be one that tell us that something is not going on so well and the number will be colored in red. This representation will also provide a graph that streams the behaviour of that agent today.

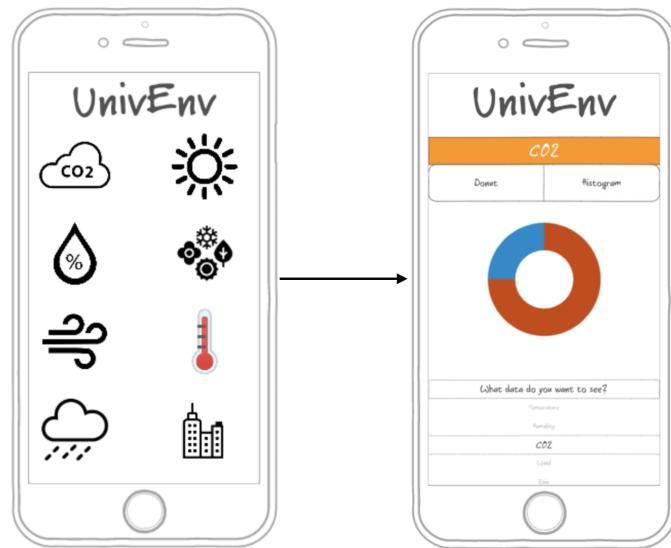


Figure 1: Smartwatch representation

3.1.2 Smartwatch

For this representation, we have to take into consideration the dimension of the screen that will be used.

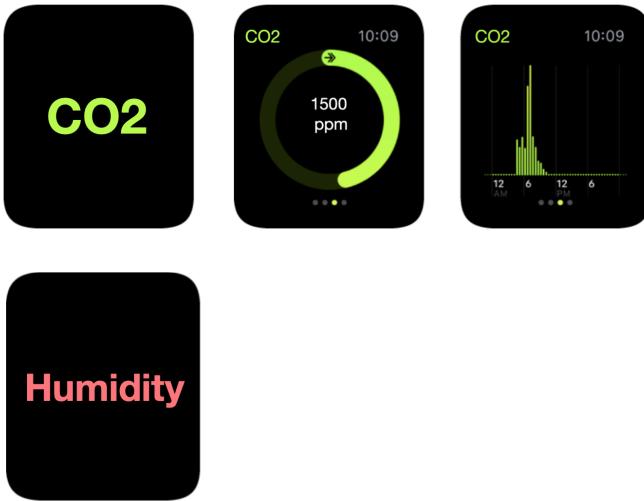


Figure 2: Smartwatch representation

The type of graph that were thought to be used are donut graph and histogram. They were chosen because they're easy understandable in despite of their inaccuracy.

3.2 Public

The public interface has been structured in two parts.

- The first screen (Figure 2), is an image that represent the current state of our environment depending on the variables defined before. If, for example, the level of CO₂ is over the average level, we'll add some smog clouds in our representation. Now we define, for each variable, what we are going to add if the level is over the normal level. The temperature is given by a string in the upper-right part.
 - CO₂: smog clouds.
 - Air Humidity: fog.
 - Luminosity: bigger sun.
 - Wind speed and direction: wind icon and clouds.
 - Location (also height, type of soil, type of surrounding environment): is described by the image.

- Time (hour/season): there is a string indicating what time is it. For the season, it's described by the image.
- Pressure: arrows going down
- Rain: clouds with rain

This representation is thought to be as abstract as possible, in order to be accessible to all people (e.g. kids, adults, etc).

There'll be a sound output that will tell you what you are clicking, for helping blind people.



Figure 3: Public interface

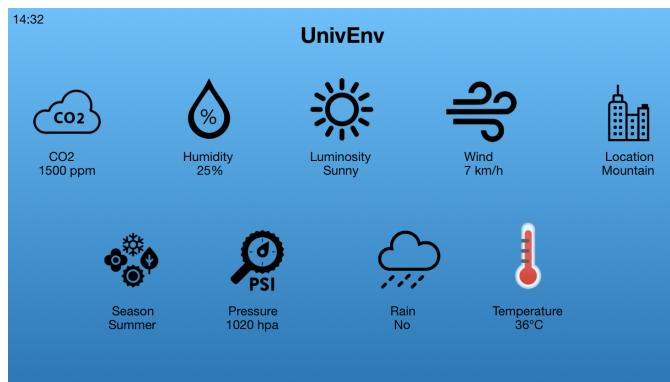


Figure 4: Info of public interface

3.3 Technical

This type of representation is for people that analyze the raw data, so it has been chosen to use representations that maybe are less intuitive to understand but are more accurate.

It has also been introduced the comparison, which allows to select the type of data to compare, and compare it. The system is divided in the following parts:

- Login
- Representation
- Choice of what compare
- Comparison

It has been chosen the following type of representation:

- Scatter chart
- Colored intensity map
- Trend line
- Point representation with mean
- Radar chart

The following mockup represent the system that will be used by technicians.

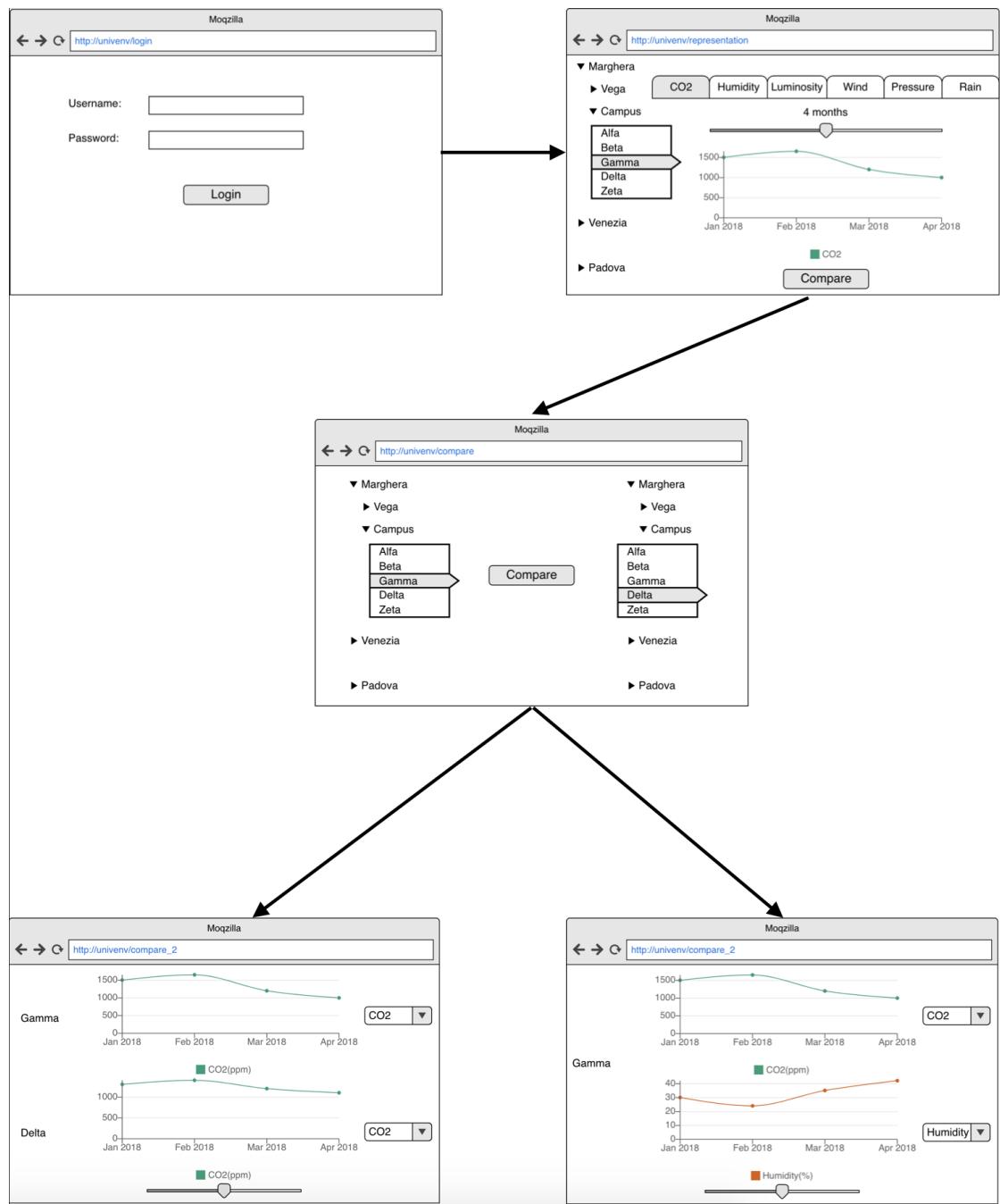


Figure 5: Technical interface

3.4 Type of graphs

It has been chosen those type of representation because they represent accurately the raw data. The exceptions are the radar chart, it has been chosen because it sum up all the variables(the values goes from 0 to 10, which represent the quality of that variable); and the colored intensity map which represent the situation in that moment on the map.

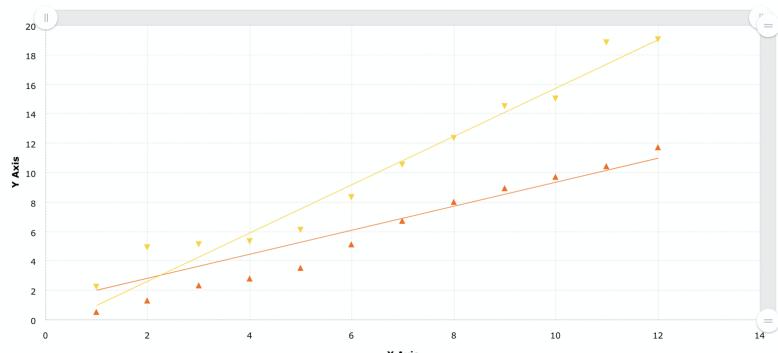


Figure 6: Scatter chart

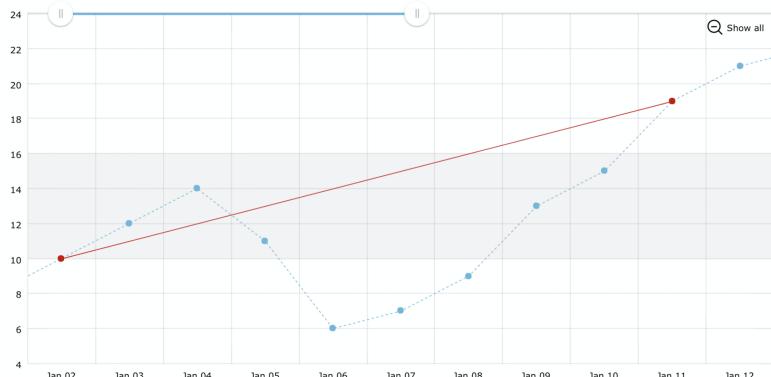


Figure 7: Trend line

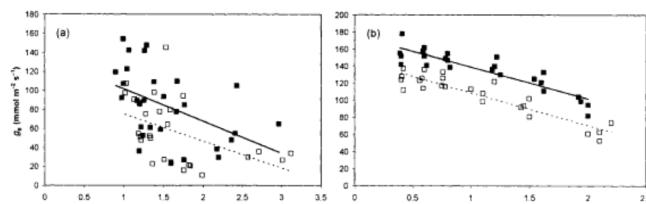


Figure 8: Scatter Point representation with mean line

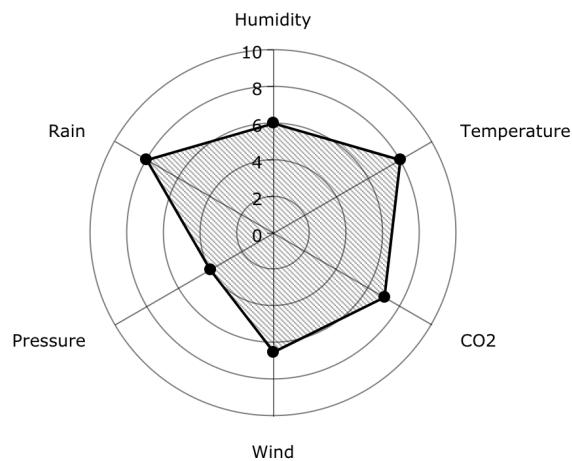


Figure 9: Radar graph

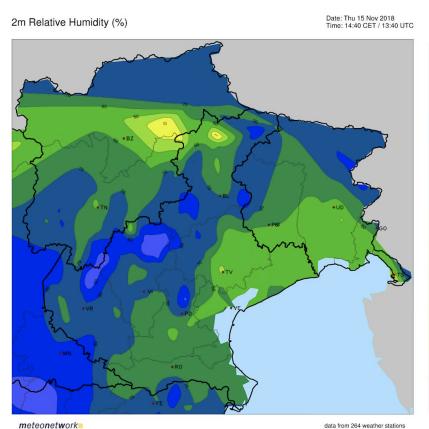


Figure 10: Colored intensity map

4 Bibliography

References

- [1] . E. Medlyn, C. V. M. Barton, M. S. J. Broadmeadow, R. Ceulemansart Stomatal Conductance of Forest Species after Long-Term Exposure to Elevated CO₂ Concentration: A Synthesis; *The New Phytologist*, vol. 149, n. 2, Feb. 2001., pp. 247-264.
- [2] Apple,
Human Interface Guidelines, Gestures;
<https://developer.apple.com/design/human-interface-guidelines/watchos/user-interaction/gestures/>