Knowledge Alliance for Advanced Urbanism

LESSON PLAN

Date: December 2016

TITLE OF THE LESSON: MAPPING UTOPIAS

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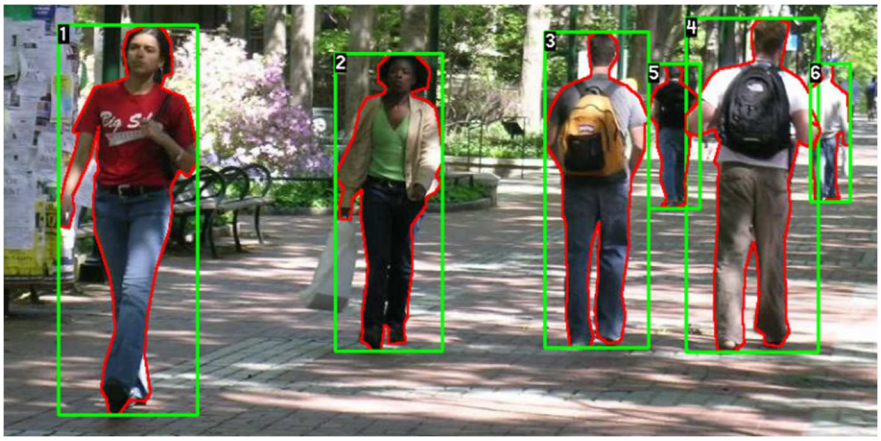
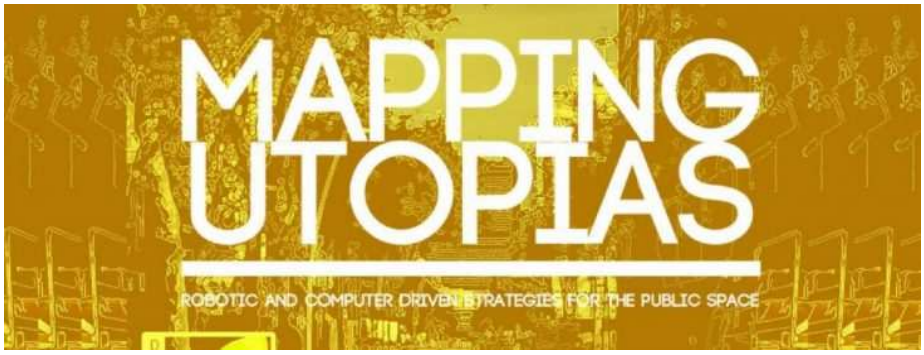


BACKGROUND EXPECTATIONS:

2050 Will mark the ultimate shift towards Cities. More than 70% of the human population will live by then in urban clusters. This unprecedented condition will bring unprecedented challenges for Cities. The increasing growth in terms of population will need to match increasing needs for energy, food production, mobility and much more. The digital revolution is providing every day new instruments, offering urban planning strategies able to match the growing complexity of the urban environment. Technology and data are already producing an important impact, affecting crucial decision in the environmental context, the political scenario and the everyday life of millions of citizens.



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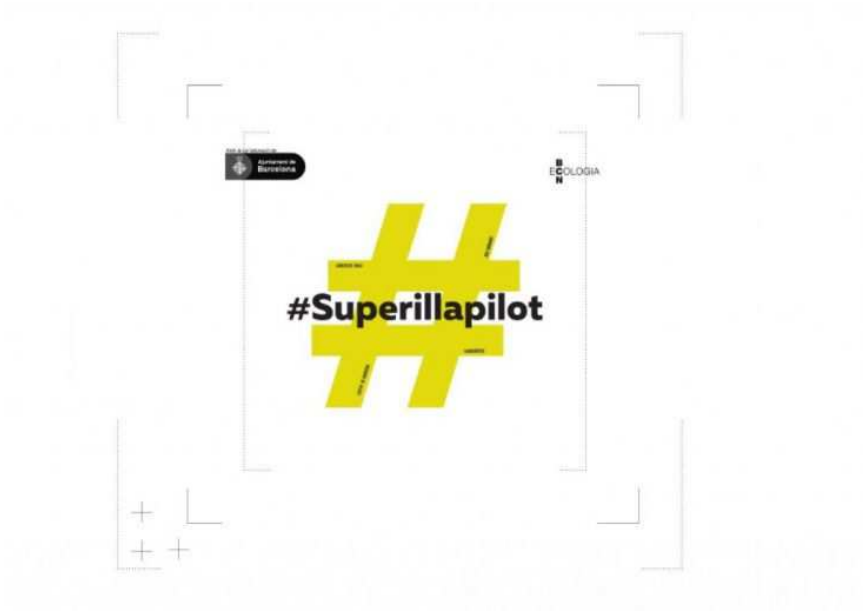
WHAT STUDENTS LEARN?

Which forces should be taken into consideration in order to define an urban model? How can we describe a city focusing on greenery, mobility and public spaces? How can we describe the blurry boundary between the digital and physical city? This program wants to rise such questions while familiarizing students with computational and robotics instruments.

The workshop provide students with hands on experience on data manipulation and mapping strategies, offering different levels of learning methods based on the implementation of aerial robotics, virtual reality, computer vision and machine learning. The ultimate goal is to empower students on a multiple set of tools and to critically question the usage and implication of those fascinating instruments, using a real case scenario as a test field: the Superilla in Poblenou.

The Superilla project claims the occupation of the public space by the people, to subvert the leading role that cars have had over the last 50 years. The project is part of the new Plan of Public Space and Mobility of District of Sant Martí, promoted and approved by the City of Barcelona.



OVERVIEW OF ACTIVITIES (Include time to be devoted to each activity):

The course is divided into 5 modules:

1. DATA TRACKING

A tracking system is generally a system capable of rendering virtual space to a human observer while tracking the observer's coordinates. With this module we want to address how to look at mobility in a more informed way. How can we describe the organic infrastructure of mobility of a City? How can data reveal through a behavioural model the different patterns of a city? We focus on how to extract data collected by smart phones and overlap multiple information regarding calories, times, steps, mobility on a georeferenciated map. We will be able to parse

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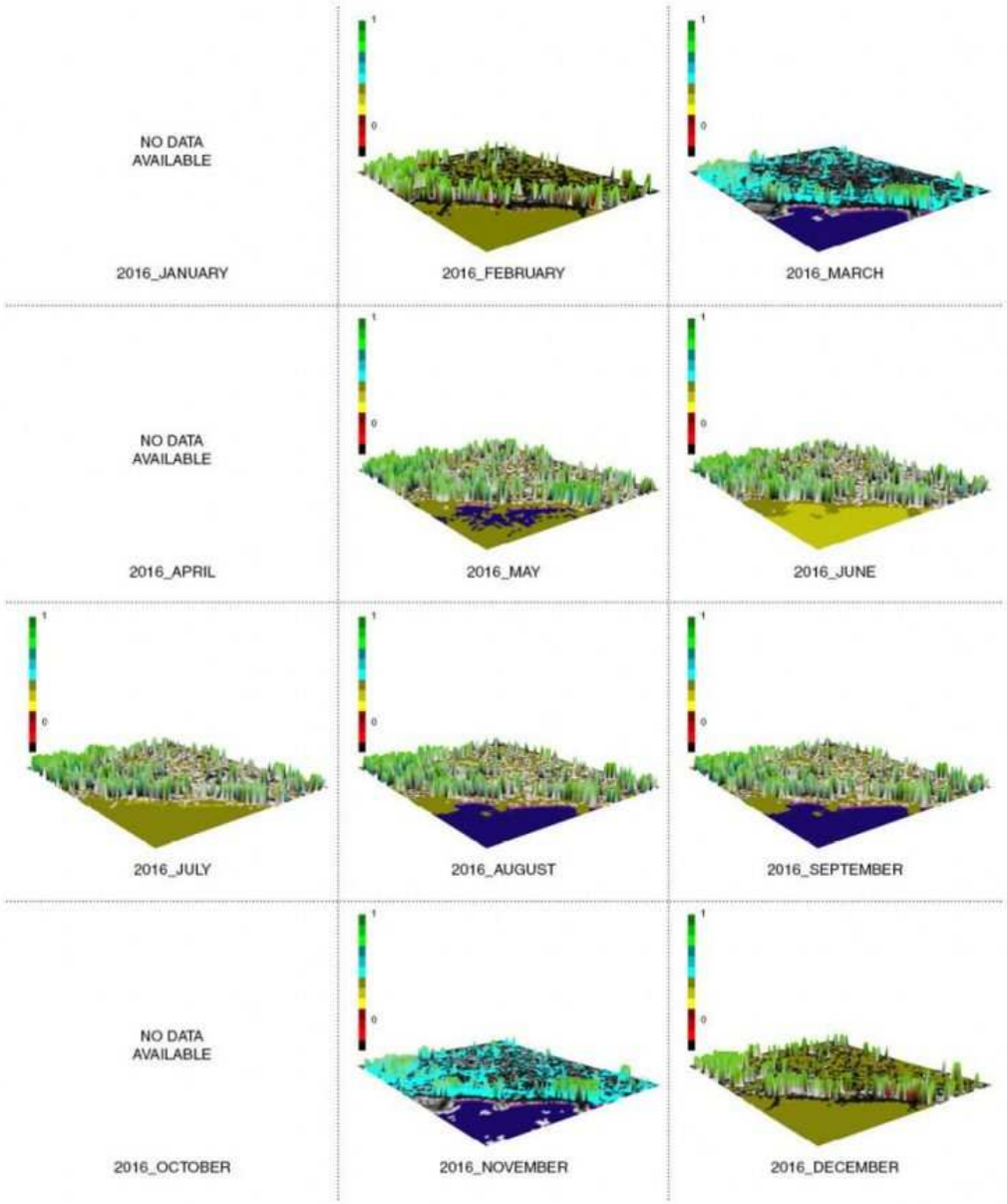
among different means of transportation, creating specific categories associated to machines, pedestrians, bicycle paths and running activities.

TOOLS: RHINO / GRASSHOPPER 3D MOVE APP PHONE TRACKING



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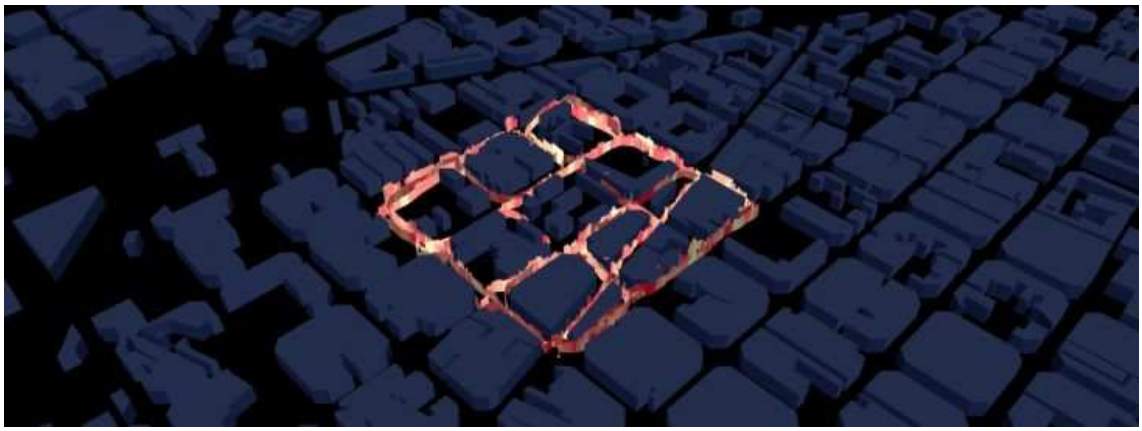
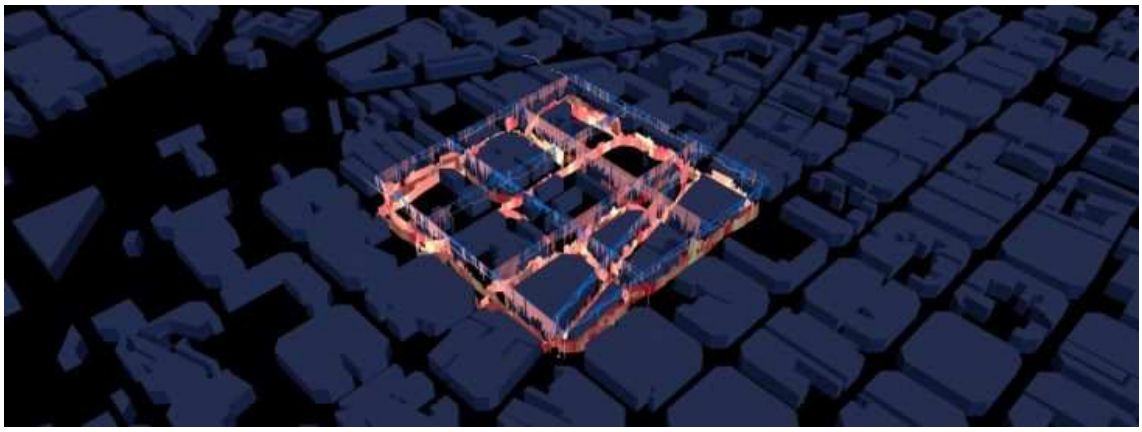
2. NDVI DATA / REMOTE SENSING

Shaping the invisible layers of an urban space requires precise methodologies based on the implementation of cutting edge technologies. Satellitles are offering a very specific point of observation, through multispectral pictures. Using the different bands integrated in the filters of satellites cameras, we can actually detect crucial factors of a City organism ,such as the greenery infrustructure. Ndvi data, (Normalized Vegetation Index), is a graphical indicator that can be used to analyze remote sensing measurements ,simply and quickly identify vegetated areas and detect live green plants. We will use a workflow connecting qGis and Rhino/Gh extracting NDVI data from multispectral pictures.

TOOLS: RHINO / GRASSHOPPER 3D NERO GH LIBRARY QGIS





3. AERIAL ROBOTICS

Robots are no longer merely passive onlookers capturing information about an environment. They are now engaging with it in a meaningful way through an increasing understanding of their surrounding conditions. Hacking robots, understanding their mechanisms, allows designers to reshape their functionalities and assign new capabilities. In this module we will cover drones technology, learning how drones are made, from hardwares to electronics. We

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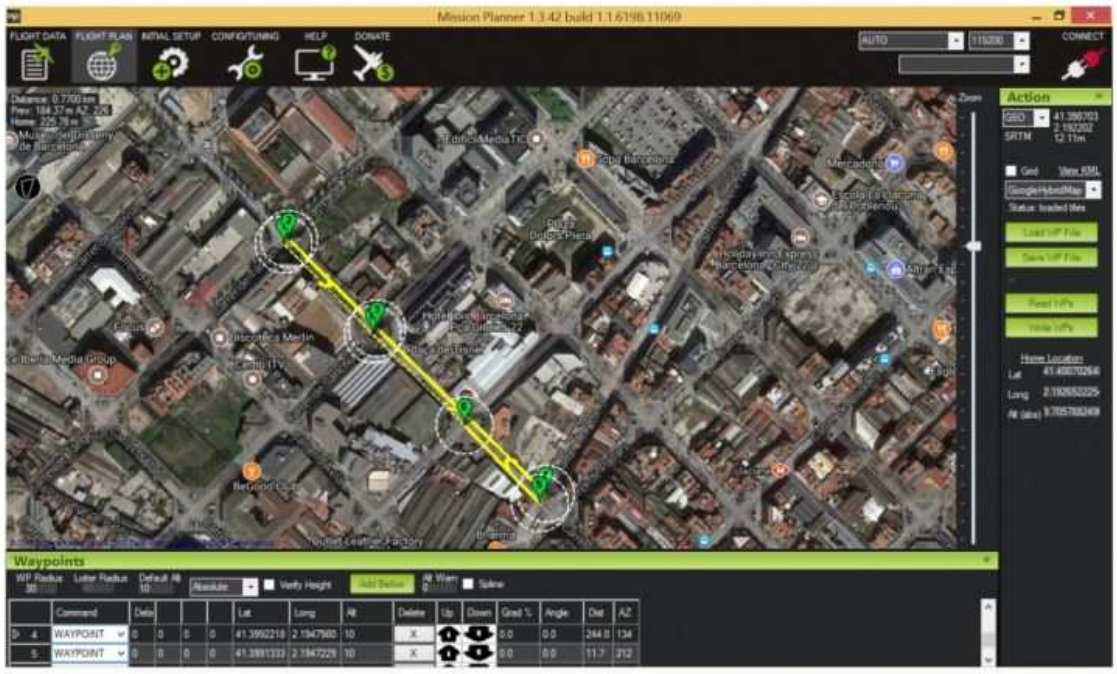
will finally focus on how to program drones for autonomous flights for specific mission of data capturing. We will propose an open source workflow religning on non commercial drones and free softwares.

TOOLS: DRONE NERO DRONE SATCHA KIT PIXHAWK MISSION PLANNER AGISOFT



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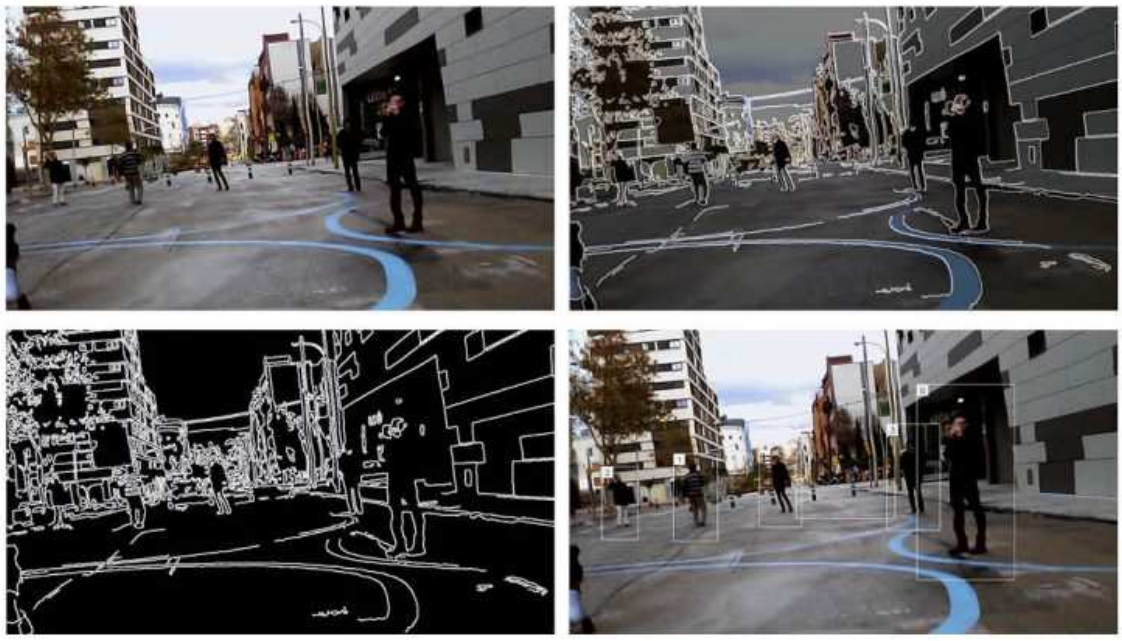
4. PEDESTRIAN DETECTION

We can use computer vision to extract features to quantify the human body. These features can be passed on to machine learning models that when trained can be used to detect and track humans in images and video streams. This is especially useful for the task of pedestrian detection. With such a technology is indeed possible to count the amount of people in public spaces, detect their trajectories and reveal their behaviours. In order to achieve those results, we will need to introduce computational methods based on the integration of machine learning libraries and computer vision strategies. OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision

TOOLS: PYTHON OPENCV MACHINE LEARNING SCIKIT LEARN



5. VR-EDGE / VIRTUAL REALITY DATA VIZ

Virtual Reality became a mainstream system able to generate parallel realities, where users can phisically interact in a digitally created environment. We proposed to use this tool as a Data Visualization instrument, embeding information in a digital version of the case study

TOOLS: VR-EDGE GRASSHOPPER3D INTERNET

RATIONALE FOR SEQUENCING AND PACING ACTIVITIES:

This seminar is an intense experience, which allow students to get familiar with many topics, around the common idea of developing a critical approach towards a data driven design process. An important attention is given to familiarize students with the necessary instruments

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needed to convert data into information, using computation as a common ground. Such a heterogenic program is an ambitious task, which could not be possible without the appropriate involvement of the students participating to the course. The hands-on approach is fundamental to transmit all the course concepts. The students received a series of class tutorials associated to each of the modules presented in the course.

ASSESSMENT

All students made a unique presentation covering all topics discussed over the course. Different groups were organized according to the 5 sections of the seminar. The aim of the presentation was to approach each data visualization process in a critical manner, offering a synthetic conclusion from the reading of it

MATERIALS/RESOURCES:

SOFTWARE TOOLS: RHINO / GRASSHOPPER 3D, MOVE APP, PHONE TRACKING, NERO GH LIBRARY, QGIS, DRONE NERO, DRONE SATCHA KIT, PIXHAWK, MISSION PLANNER, AGISOFT, PYTHON, OPENCV, MACHINE LEARNING, SCIKIT LEARN, VR-EDGE, INTERNET

OTHER CONSIDERATIONS:

It would have been probably better to extend the seminar, distributing the classes in a timeframe of one month, giving to the students more time to digest the information received. As a final recommendation for a possible new iteration on this methodology would be not on reducing the amount of topics presented, but on proportioning a more balanced timeframe among lectures and tutoring classes.

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