DYNamic Acoustic MAPping
DYNAMAP

DYNAMAP: A SYSTEM WITH LOW-COST HARDWARE AND ARTIFICIAL INTELLIGENCE TO COMPUTE REAL TIME NOISE MAPS.

Luca Nencini, Francesc Alías, Xavier Sevillano

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PROJECT SUMMARY

Aims:
The project aims at developing a **dynamic noise mapping** system able to detect and represent in **real time** the acoustic impact due to road infrastructures.

Project budget:
2.2 M€

Duration:
2014-2019

INVOLVED PARTNERS

Project coordinator	Autonomous National Agency for Roads	**IT**	
	Milan municipality	**IT**	
	Mobility Environment Agency for Territory	**IT**	
	Bicocca University – Milan	**IT**	
	BlueWave Acoustics	**IT**	
	Accon Environmental Consultants	**DE**	
	La Salle University - Barcellona	**ES**	

MAIN GOALS OF DYNAMAP

- 1. automate noise mapping process using the information retrieved from a low cost monitoring network;

- 2. develop low cost sensors and communication devices to collect the information needed to update noise maps in real time;

- 3. implement and test the system in two sites with different characteristics: an agglomeration and a major road.

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HOW IT WORKS

Data collecting on a server. Data sent from the sensor are archived on a server

Wireless noise sensors development

Data analysis for calculation of Leq values of specific sources:
1 - Identification and removal of spurious events
2 - Calculation of sound level on a defined time basis

Pre-calculated spatial noise map of Source 1

Sound level of source 1

Pre-calculated spatial noise map of Source n

Sound level of source n

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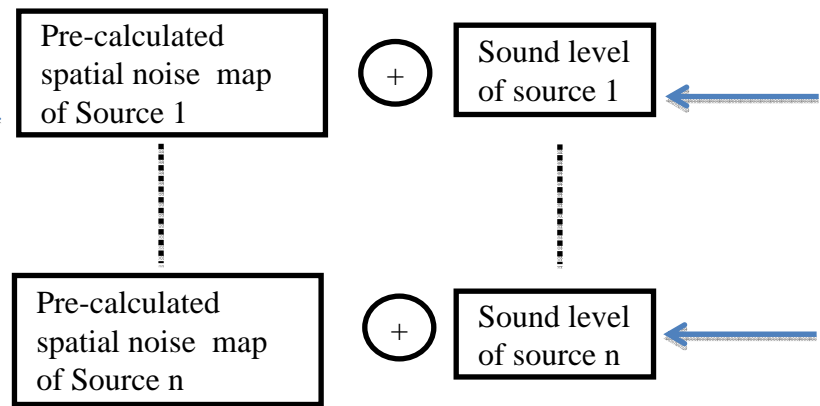
WHERE

Site #1: Milano urban area

Site #2: Rome sub-urban

TECHNICAL BAGROUND

The wireless sensor network concept will be an evolution of the Noisemote system
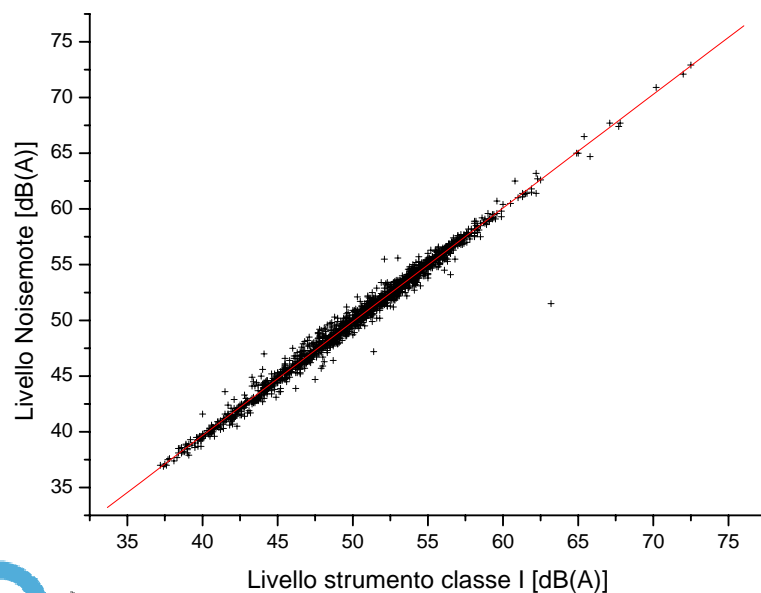
Noisemote is a system well suitable for pervasive monitoring in smart cities that can be connected to wifi urban networks and gprs-gsm networks

www.noisemote.com

TECHNICAL BAGROUND

Meets class II specifications for frequency response and dynamic measurement range

www.noisemote.com

TECHNICAL BAGROUND

It is interfaced with an online web application to analyze and download data

It can be programmed to post data to user's preferred storage system, as for example the "Sentilo" platform

TECHNICAL BAGROUND

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- the development of an **Anomalous Noise Event Detection** (ANED) **algorithm** to identify the anomalous sound events that could distort the noise levels measured by the sensors

- two **variants** of the ANED algorithm depending on the type of sensor
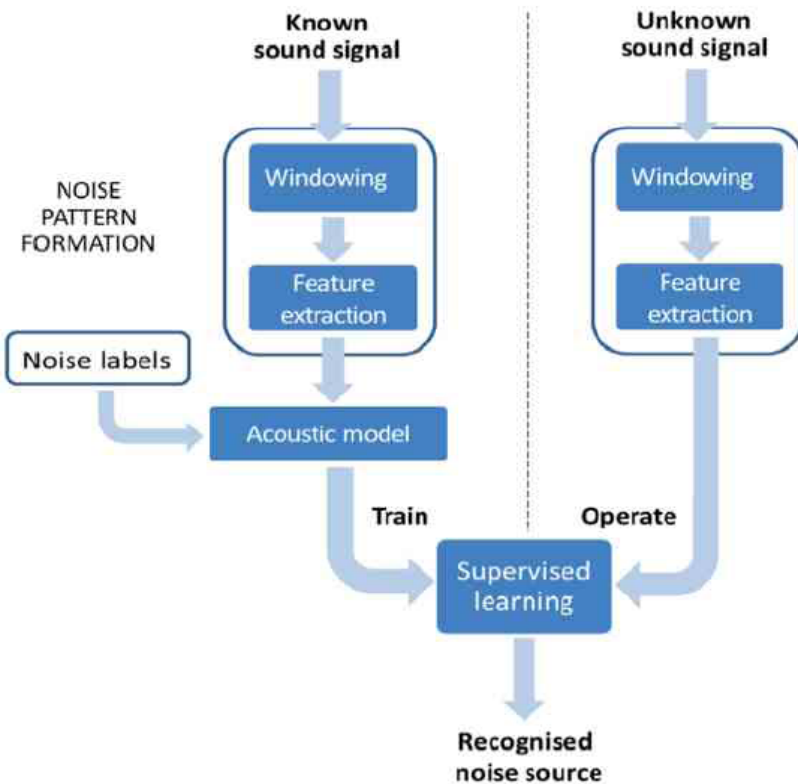
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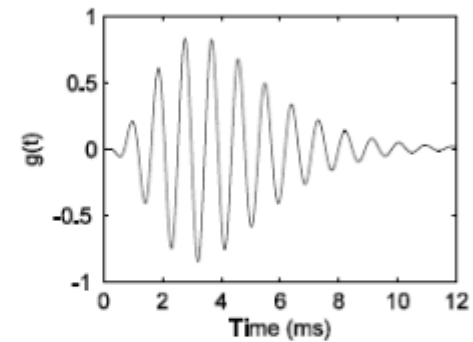
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TECHNICAL BAGROUND

- – ANED for low computational capacity sensors
  - Sensors only provide Leq values
  - ANED based on time evolution of Leq
- – ANED for high computational capacity sensors
  - Sensors provide spectral signal analysis
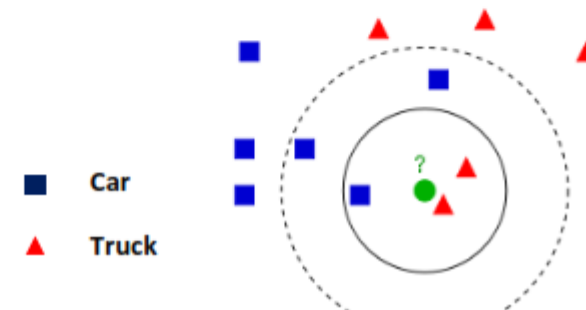 - ANED based on pattern recognition approach

TECHNICAL BAGROUND

Gammatone Cepstral Coefficients

$$g(t) = Kt^{(n-1)}e^{-2\pi f_b t}\cos(2\pi f_c t + \varphi) \qquad t > 0$$

K-Nearest Neighbour algorithm

■ Car

▲ Truck

PREVIOUS TESTS ON THE FIELD

Crowdsourcing
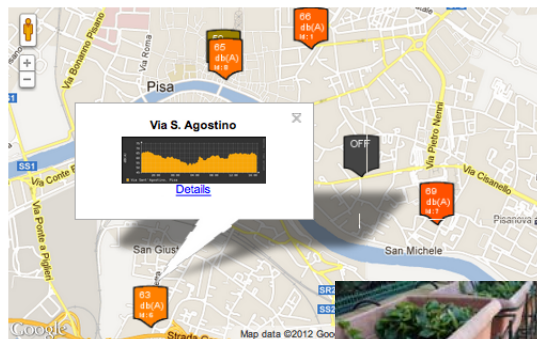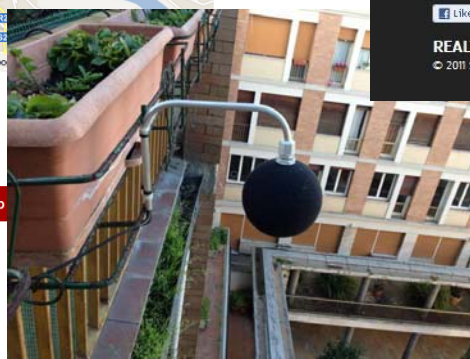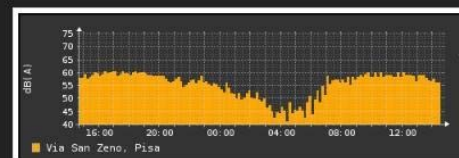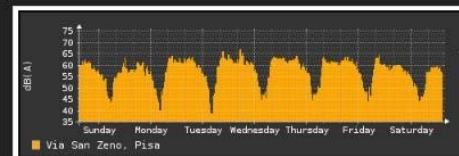
PREVIOUS TESTS ON THE FIELD
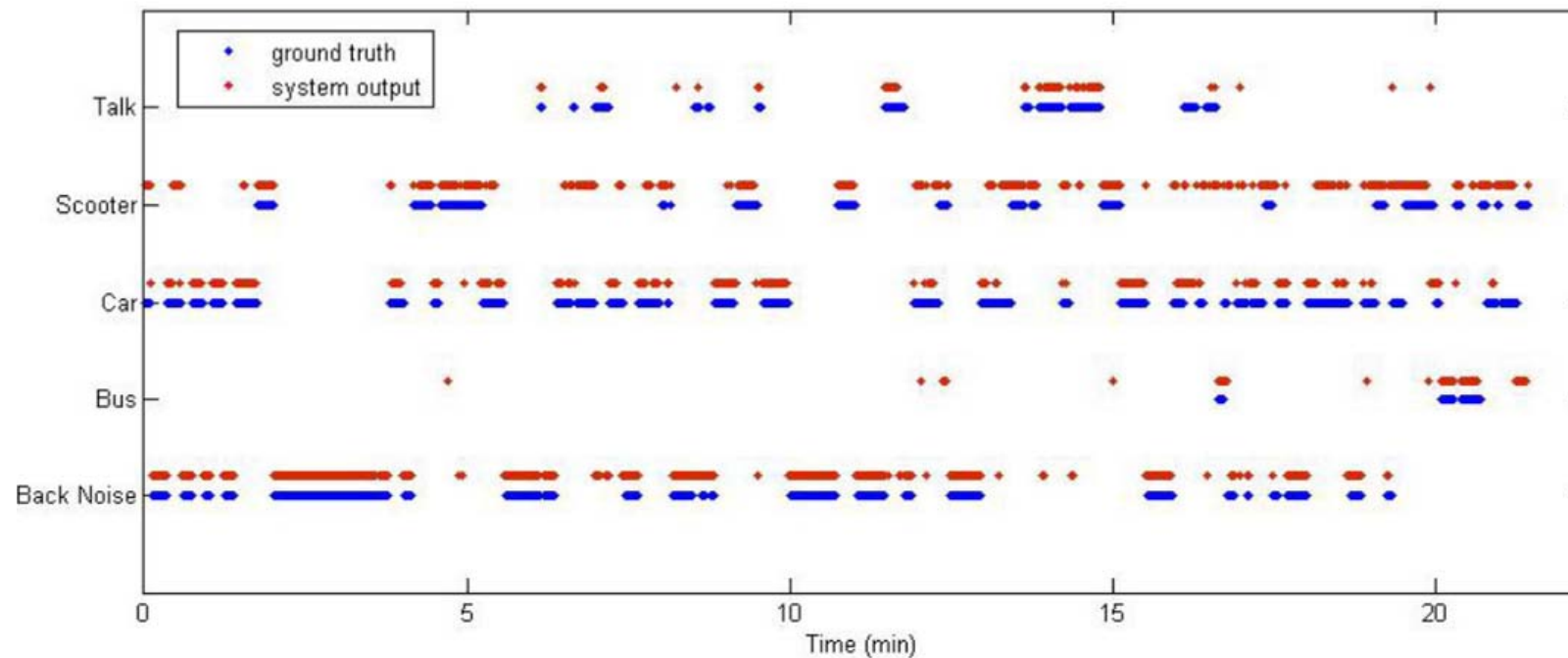
CONCLUSION

1. demonstrate that the automation process will lead to a significant reduction of the resources needed to update noise maps (time, costs and dedicated personnel)

2. improve and ease public information through different access levels of the system to provide user friendly information.

3. check the possibility of improving the system with additional information to dynamically reportmultiple environmental data (air quality, meteorological conditions, etc.)

4. Implement new ways to make cities smarter and smarter by mean of an acoustic artificial intelligence

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QUESTIONS

Thanks for your attention

Luca Nencini
l.nencini@blue-wave.com

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