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This is the author's manuscript

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/153332> since

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SensorWebBike

A Participatory Environmental Urban Monitoring

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SUMMARY

Sustainable development and effective environmental policies are key to ensure public safety and health. People feel safer in their cities when national and local government are clearly committed with a better environmental governance, building public trust and transparency. Urban environmental monitoring is a driving force to set up continuous information services able to provide input for spatial decision support systems. SensorWebBike is a real-time Spatial Data Infrastructure (SDI) and web interface that seeks to tackle this challenge: setting up an open sensing and participative approach for urban environmental monitoring.

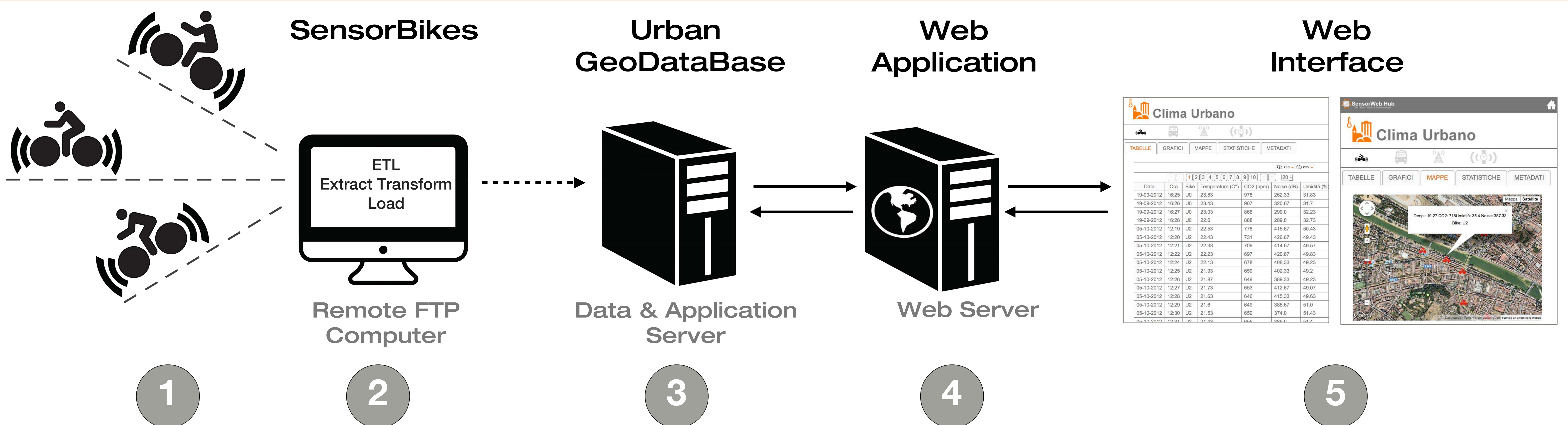
CONTEXT

Data have still a low interoperability, due to a lack of policy coordination and “closed” data infrastructures. But data, may be made available from different sources, as local and national infrastructures could be positively integrated by a participatory involvement of diverse stakeholders, including citizens. Bikers becomes voluntary citizens-sensors able to measure environmental parameters, by using a small sensor’s box - an innovative low-cost mobile device - mounted on their bikes.

OBJECTIVE

The overall aim is to share a participatory monitoring tool for the collective environmental mapping. Through General Packet Radio Service (GPRS) technology, the sensor transmits geolocated data on environment and air quality to the data server connected to the applications and web server, and real time observations will be visualized in a web browser. The whole system will meet the OpenData approach, and will be compliant with geospatial standards throughout the entire process flow: from sensor data acquisition to web visualisation.

SensorWebBike - FRAMEWORK COMPONENTS



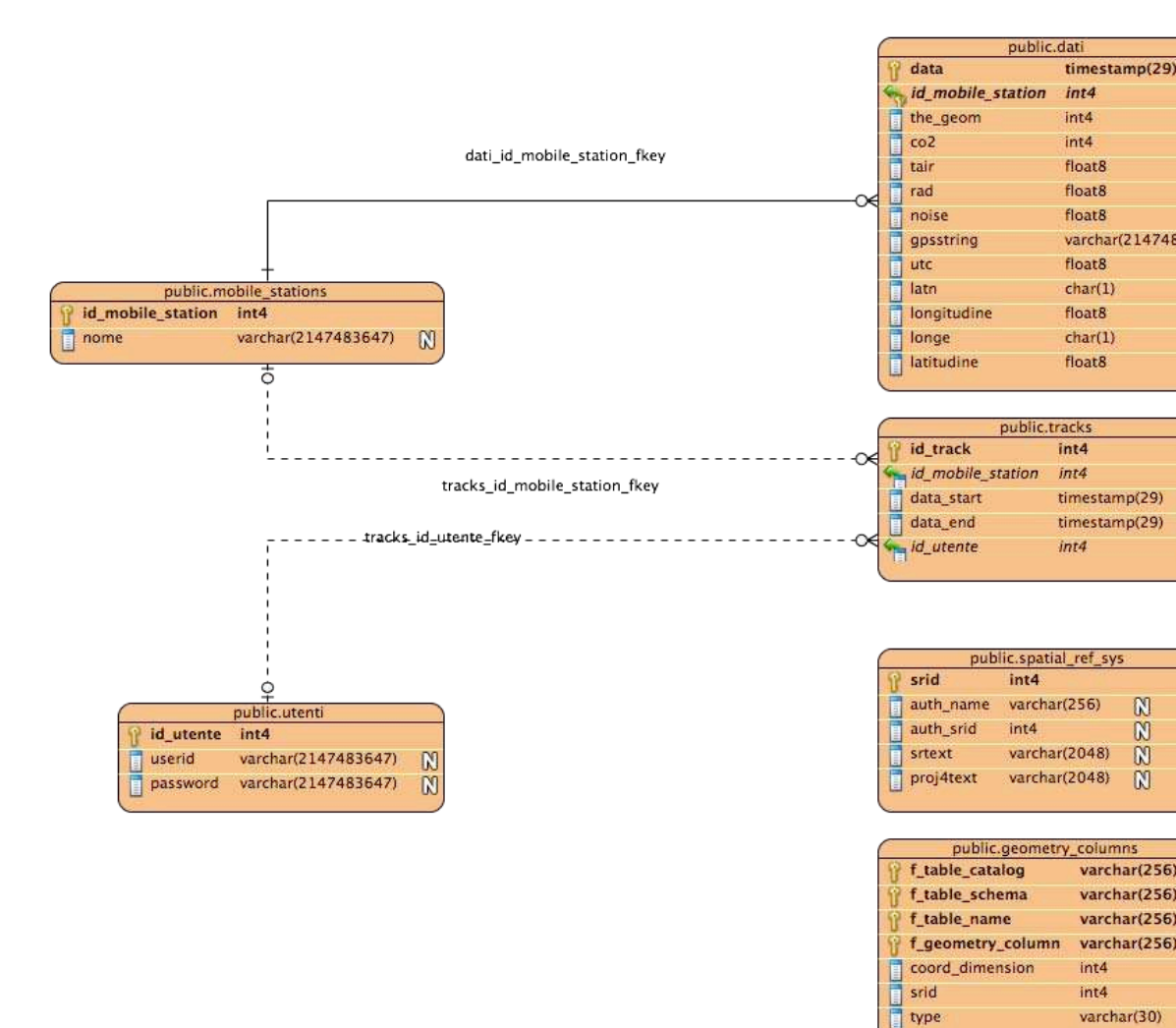
1. The SensorBikes, equipped with Arduino electronics platform and low-cost sensors, are able to collect environmental data (CO₂, Noise, Humidity and Temperature). Parameters are sent to the receiver PC through GPRS connection.
2. All collected data are stored in ASCII CSV files with GPS data following NMEA RMC standard. A specific ETL (Extract Transform Load) procedure has been developed using Java programming language. It is launched every 5 min and it reads all collected data, perform a data quality check on files and store them into Urban GeoDB.
3. Using PostGIS functions, the geographic information are transformed from NMEA RMC standard into point elements for PostgreSQL. Conceptual design of the GeoDB was based on the entity-relation model.

4. The Web Application “Clima Urbano” is able to view and analyse all data stored in Urban GeoDB. “Clima Urbano” has been developed using J2EE technology with Java Server Faces and PrimeFaces library for GUI customization.
5. Through common Internet browsers, including smartphone browsers, it is possible to view all collected data in table or chart format or view all registered spot on Google Map. Interface functions allow to export data and visualize metadata. Advanced and user-friendly analysis data tools are under development.

SensorBike



The Data Model of Urban GeoDB



- Data** - Table containing all collected data (CO₂, Noise, Humidity and Temperature) by SensorBikes.
- Mobile sensor** - Table containing all ID bikes with sensor.
- Tracks** - Table containing all bikes tracks information.

RESULTS

The SensoWebBike prototype has been tested in the city of Florence, and is online at <http://149.139.16.20:8080/bikeclimate/> where the geolocated measures, bike tracks and user-generated meta-data are visualized on a GIS mashup and shared automatically, contributing to build a comprehensive and constantly updated spatial representation of air quality pattern of the whole urban area. SensorWebBike opens environmental monitoring systems and data to the public, “augmenting” urban social interactions so to increase citizens’ awareness on air quality issues, creating the “intelligence data spots” of cities.

