Sensors talk and humans sense

Part III

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SEN2SOC experiment

inform
suggest
alert
engage
SEN2SOC
bridging SENsor measurements and SOCial networks
interactions via natural language generation for supporting
smart city services

interaction: sensor networks and humans
engagement of the Santander community
combination of sensor and social data into meaningful services
environmental sensor data processing/presentation in a simple way
alerts about extreme environmental conditions
social media content analysis
detection of trending topics
“users as sensors”: SEN2SOC app users can express how they sense the environment
sharing of environmental alerts in real-time on social networks

sensor-to-social interaction
objectives

refine and integrate sensor and social data

enhance sensor data analysis and monitoring

implement efficient data mining techniques on heterogeneous data (sensor measurements and social networking interactions)

activate Santander citizens, visitors, and city authorities

offer route and place recommendations to Santander citizens/visitors (based on sensor measurements and social media information)

provide environmental monitoring tool to city authorities (real-time or past sensor data, statistical analysis results, alerts, etc.)

initiate a vibrant social network community of interest around SmartSantander sensor network

SEN2SOC architecture
sensor data monitoring

data retrieval
data cleansing
times series
virtual nodes
alerts

virtual nodes

Santander shapefile
(Instituto Nacional de Estadística - INE)
social data observer

geolocated data collection
user-generated content mining
Santander areas popularity based on user trails in social media
content summarization (trend detection, clustering)
identification of popular spots (recommendation)

web application
& statistical analysis

sensor data (graphs)
virtual nodes (graphs)
real-time / historic data
alerts
nearest sensors
prediction (sensor / area)
mobile application

environmental conditions (real-time)
humans as sensors
route recommendations
social media content analysis
(place recommendations, trends, etc.)

interface

SEN2SOC data communication
... the conductor
control flow diagram

web app: list of areas and sensors
Santander geographic areas and SmartSantander sensor nodes
web app: sensor node values
graph for sensor measurements regarding the user-specified environmental parameter and time window

web app: prediction
prediction for the specified environmental parameter and desired time window (forecasted values in blue line)
web app: K-nearest neighbors (KNN)
select some sensor node (in blue) on the map and find its adjacent nodes (in red)

web app: K-nearest neighbors (KNN)
comparison charts
web app: virtual sensor values
aggregated values corresponding to geographic areas of Santander

web app: alerts
alerts triggered by user-configurable parameters (areas filled up with red on the map)
mobile app: authentication
users may register with the SEN2SOC platform or sign in with their Facebook or Twitter account

mobile app: services
main screen
mobile app: environmental conditions
real-time, aggregated sensor data (temperature, particles, NO2, relative humidity, noise, ozone, CO, and heat index)

mobile app: route planner
route recommendations based on (favorable) environmental conditions
mobile app: city areas social activity

popularity of Santander areas based on social media: number of photographs (Flickr/Twitter) or number of tweets (Twitter).

mobile app: user subscription to areas

subscribe to Santander areas in order to receive alerts about extreme environmental conditions.
mobile app: alerts
alerts appear in real-time on the mobile screen; users are able to share alerts (Facebook/Twitter)

open data (1st method): sharing of alerts

SEN2SOC experiment data access method:
provides data regarding mobile users' sharing of alerts about extreme environmental conditions on social networks (Facebook/Twitter)

data is returned in JSON file format and can be accessed through the following URL:

http://sen2soc.afrodit.hellasgrid.gr/data/sharing/{start_date}/{end_date}
open data: sharing of alerts (JSON: 1 of 2)

```json
{
    "sharing": {
        "measurement_info": {
            "measurement_date": "2013-07-16 15:31:01",
            "area_id": 103,
            "parameter_type": "heat_index",
            "parameter_value": 42.5758,
            "parameter_unit": "Celsius",
            "accurate_measurement": true
        }
    }
}
```

open data: sharing of alerts (JSON: 2 of 2)

```json
"alert_sharing_info": [
    {
        "alert_sharing_id": 708,
        "alert_sharing_date": "2013-07-16 15:34:51",
        "social_media": "Twitter",
        "alert_message": "Extreme condition at area 103 for heat index: 42.5758 Celsius."
    }
]
```
**mobile app: users as sensors**

users can express their perception on the environmental conditions (user input based on qualitative scales of measurement)

![Mobile app screenshot](image)

**open data (2nd method): users as sensors**

SEN2SOC experiment data access method:

provides data regarding mobile users’ feedback on how they “sense” the environment (users’ perception on the present environmental conditions)

Data is returned in JSON file format and can be accessed through the following URL:

http://sen2soc.afroditi.hellasgrid.gr/data/feedback/{start_date}/{end_date}
open data: users as sensors (JSON: 1 of 2)

{
    "feedback": [],
    "measurement_info": [1
        {
            "measurement_date": "2013-07-16 15:10:01",
            "area_id": 23,
            "parameter_type": "noise",
            "parameter_value": 53.4306,
            "parameter_unit": "dB",
            "extreme_value": false,
            "accurate_measurement": true
        }
    ],
}

open data: users as sensors (JSON: 2 of 2)

"user_rating_info": [1
    {
        "user_rating_id": 238,
        "user_rating_date": "2013-07-16 15:12:33",
        "user_rating": 1
    }
],
}
demonstration videos

- social data observer
- web application
- mobile application

thank you!