nextmedia

Environment supervisory system

**Brief description &
Applications**

Description

AirNet' has been developed for online remote environment supervision, for air polluting factors. Supervising sites are spread into an area and connected together to a supervising center through mobile data links.

Two different communication channels are implemented: the main channel and the backup channel, each channel using a different mobile services provider.

Each site works independently, and the built-in auto-diagnostic system ensures a correct functionality in every conditions, thus eliminating false alarms triggering.

The network operations are: all data are retrieved from environment sensors, from where the sites are installed, then transmitted to the supervising center through mobile phone operators, using a data link. At the center, all data are analyzed and processed, then displayed as colored graphics or maps, over the entire area where sites are installed. More colors to a map means more pollution in corresponding perimeter. When normal levels for a certain environment parameter are exceeded, an alarm is triggered. Then, following this alarm, the environment inspectors can deploy a mobile unit, to perform more accurate measurements. Any environment factor variation above the normal levels is acknowledged at the supervising center in a matter of seconds.

Public recorded data can be made available from a dedicated website.

System advantages

Studies concerning interaction between pollution and adjacent domains (environment protection, how noxious factors affect ozone layer, urban impact, agricultural impact).
Extra-features (biological, nuclear and chemical attacks detection and side-effects)
Predictive evolutions analysis for polluting parameters, based on cyclonic maps recorded by meteo supervising satellites. (contamination flow direction, noxious substances spreading model in an area, estimated concentration in specific a point after a given time).
Automatic sampling procedure – a contaminated air sample is locked into a recipient for further analysis.
Time-efficient detection and prevention of ecological accidents.
Real time environment analysis procedures.
PH monitoring in industrial waters nearby industrial areas (extension).
Natural disaster monitoring (extension)

Warning methods, environmental reports

Reports generated by this system are divided in two big interest area:

public
governmental.

For example, public area include reports accessed by whoever is interested in information regarding carbon dioxide concentration, temperature and pressure evolution in a turistic area, ozone concentration and deforestation impact over the environment parameters, etc.

Governmental area includes information like: environment parameters evolution in a calamitated area, environment parameters evolution if a radioactive/biological accident occurs, site security alarms in case of unauthorized access, etc.

Combined SMS/data history reports ensure a perfect correlation to all efforts of European Union countries related to environment preservation, and statistical analysis lead to important decisions related to forest areas conservation and agricultural zone optimization for a long term basis.

Economical considerations, global tendencies

Implementing such an environment area supervising system significantly reduces intervention and maintenance related costs, taking into consideration the following reasons:

Environment disturbances are announced online an the moment when events are produced.
Specialized teams intervention is rapid and efficient.
Maintenance costs are minimal since each site performs self-diagnostics programs.
Unauthorized site access is announced to the supervising center and local authorities.
Lower costs compared with mobile environment laboratories (a medium cost for one site is around 2500-3000 EUR, depending on the installed sensors)

The development of such a system comes in front of European Union's efforts related to environment preservation. Rapid variation of atmospheric factors due to pollution, as well as recent EU investments in a 2 billion EUR European meteosat, confirms once more necessity of the implementation of this system.

Site Features

Remote sensors can be connected to a site, alongside standard sensors. Sensors installed on a site are for air pollution factors supervising only. Inputs from remote sensors allow connection with residual waters supervising sensors, for example. A site will accept two external sensors networks: radio linked and wire linked, depending of the location and possibilities.

A universal power supply system will allow powering from a wide variety of power grids, mono phase or three phases, from 65 to 400 Volts each, AC, or DC. Any power source can be used, from solar panels to standard power wires.

A backup power unit, running on accumulators will keep alive all system for maximum 7 days, in case of main power supply failure.

Sensors for system integrity will ensure the site security. The security sensors are sensible to physical movements, door forcing, etc.

All events concerning critical levels for supervised parameters, malfunctions, security problems, will be passed as e-mail or SMS to a programmable list of addresses/telephone numbers.

The system can be remote configured and programmed.

All acquired data's are collecting then send-it trough GPRS/CDMA channel and can be online viewed in a graphical or text format using only a web browser and accessing the log server.

There are two modes of accessing data: public (view only public data) or private (accessing a secure webpage).

The possibility to connect remote network sensors will ensure to this system 'open architecture' characteristics. This is a welcomed feature when more parameters need to be supervised, other than standard installed.

Alarm types

Any overflow for a supervised parameter will be announced to the supervising center. For each sensor groups, custom trigger levels can be programmed. The interest is to trigger an alarm when a parameter overflows the critical level. Its absolute value is not relevant at a moment of time, and it is not transmitted to the supervising center. Nevertheless, these parameters can become of interest if long time analysis are required, and they can be logged by site or transmitted to supervising center, if required. For example, on a map, we can perform an online analysis the evolution for O_3 or CO_2 concentration. When a parameter overflows its triggering level, the site will send a SMS or e-mail with a message like: **"SITE2154: – CO > 300ppm date: 12:06, time: 10:20AM"**.

Alarms can be grouped in four categories:

1. **Environment alarms**: a certain parameter exceeds its maximum level, or the variation speed for a parameter exceeds the programmed limit.

2. **Functioning errors**: power supply absence, malfunction of a communication channel, malfunction of the remote sensors, warnings concerning chemical sensors time life (chemical sensors have a limited operating period), high temperature inside, high humidity inside, etc.

3. **Security alarms**: (which will alert the police around the location of the site): access door forcing, communication antennas breakdown, clogging of aeration holes, site movement, etc.

4. **Special alarms**: this kind of alarms will report the contamination risk in case of imminent war (chemical, biological or nuclear missiles attacks) or natural disasters (fire, earthquakes, water flood, wind high speed)

Substance categories that can be detected and watched

Site sensors (permanently installed) (2 temperature, 1 humidity, 1 pressure)

Site default sensor	Range	Warranty
Temperature	-40° C - +70° C	24 month
Pressure	20KPa – 105KPa	24 month
Humidity	5% - 95%	12 month

Gas sensors (installed by manufacturer, according to each site's necessities)

Substances class detected	Sensitivity	Warranty
H_2S	0-100 ppm	36 month
CO	0-1000 ppm	36 month
H_2	0-2000 ppm	24 month
CL_2	0-50 ppm	24 month
$PH_3/AsH_3/B_2H_6$	0-0.5 ppm	18 month
Hydrides: $PH_3/AsH_3/SiH_4$	0-1 ppm	12 month
SiH_4/ GeH_4	0-50 ppm	12 month
HCl/HBr	0-30 ppm	12 month
HF	0-10 ppm	12 month
F_2	0-1 ppm	12 month
HCN	0-30 ppm	18 month
$COCl_2$	0-1 ppm	12 month
NH_3	0-100 ppm	12 month
NO	0-100 ppm	24 month
N_2H_4	0-1 ppm	9 month
O_3	0-1 ppm	12 month
NO_2	0-50 ppm	24 month
Mercaptane		12 month
Tetrahydrothiophene (THT)	0-100 ppm	18 month
ClO_2	0-100 ppm	24 month

Security sensors (installed by manufacturer, according to each location particularities)

Site sensor	Type	Warranty
Door Sensor (default)	magnetic	36 month
Movement	infrared	36 month
Vibration	3D accelerometer	24 month

Special sensors for biological/nuclear/chemical activity detection (installed by manufacturer, according to locations)

Site sensor	Type	Warranty
Nuclear	Geiger-Muller	N/A
Chemical (Organic)	confidential	N/A
Biologic	confidential	N/A

Special sensors for natural disaster detection (installed by manufacturer, according to necessities)

Site sensor	Type	Warranty
Fire	Bolometric 3D scanner	N/A
Earthquake	Infrasonic	N/A
Water flood	Hygrometer	N/A
High speed wind	Anemometer	N/A

Ending, implementation opportunities

Environment protection, every year, becomes more and more important in everyone's life. Statistic data shows frightfully   data. Development   of chemical industry   and transport infrastructure, as well as increased demands for synthesis and compound products, the medium life duration has degraded. Obviously, it is futile to expect human body adaptation to these factors in such a short period of time (nevertheless, humans has evolved in a period far bigger than couple of tens of years). Thus, we must see the use of unconventional energies, replacement of polluting sources with non-polluting ones, investments in cleaning and reuse of chemical debris as a necessity instead of a whim.

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Notes