

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

Design and Implementation of a Surveillance System to monitor Air and Noise Pollution through IOT and GPS

Dr.T.Menakadevi¹, Ashwini.K², Chaithanya.M³, Chaithra.N⁴, Chandrakala.N⁵

Professor, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India¹

UG Scholar, Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India 2,3,4,5

ABSTRACT: The rapid growth in infrastructure and industrial plants creating environmental issues like climate change, malfunctioning and pollution has greatly influenced for the need of an efficient, cheap, operationally adaptable and smart monitoring systems. In this paper, a solution for monitoring the noise and air pollution levels in industrial environment or particular area of interest using wireless embedded computing system is proposed. The solution includes the technology Internet of Things (IOT) which is outcome of merged field of computer science and electronics. Here the sensing devices are connected to the embedded computing system to monitor the fluctuation of parameters like noise and air pollution levels from their normal levels. This model is adaptable and distributive for any infrastructural environment that needs continuous monitoring, controlling and behaviour analysis. The working performance of the proposed model is evaluated using prototype implementation, consisting of Raspberry pi 3 board, sensor devices, GPS. The implementation is tested for three or four parameters like noise, CO₂, light, humidity, temperature and radiation levels with respect to the normal behaviour levels or given specifications that provide a control over the pollution monitoring to make the environment smart and alert the people living in that locality and it is possible to track the location. In order to run the program in Raspberry Pi MobaXterm software is used.

KEYWORDS: Internet of Things (IOT), GPS, Raspberry Pi 3, MobaXterm, WSN

I. INTRODUCTION

The technologies that are been developing nowadays mainly focus on controlling and monitoring of different activities. These are increasingly emerging to reach the human needs. Most of this technology is focused on efficient monitoring and controlling different activities. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters (e.g., noise, CO and radiation levels). When the objects like environment equipped with sensor devices, microcontroller and various software applications becomes a self-protecting and self-monitoring environment and it is also called as smart environment The human health consequences of air pollution are alarming. The world health organization (WHO) estimates that 800 000 people per year die from the effects of air pollution. In addition to posing a serious public health problem, poor indoor air quality affects worker productivity. Human exposure was defined as the interface between humans and the environment; the impacts of air pollution on an individual's health are related to their exposure concentrations in the different locations in which they spend time. In general, occupational environment is a space which worker exposure can be assessed with difficulty. Two fundamental information are necessary to estimate personal exposure the concentration of pollutant in different environments and individual time activity. Last, recent development in communication and information technology allows occupational exposure monitors to be ubiquitous and part of everyday activities without significantly impact personal daily function. Real time environmental sensing is the integration of different micro environmental detection sensors with data communication device into one system, in which the data acquired, can be used for further processing and visualization. Ubiquitous sensing enabled by Wireless Sensor Network (WSN) technologies offers the ability to measure, infer and understand environmental indicators. A WSN consists of



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

autonomous sensor nodes that sense some physical phenomena in their surroundings and transmit the sensed data to a centralized unit, through single or multi-hop connectivity. WSNs have gained more significance as the foundation infrastructure for a new and interesting technology era: the Internet of Things (IOT). IOT can be represented as a main enabling factor of promising paradigm for integration of several technologies for communication solution. An IOT is "A dynamic global network infrastructure with self- configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network". IOT has emerged to be attractive in many applications such as, health care, target tracking and surveillance. This paper proposes the implementation of an IOT-based real time occupational exposure monitoring system using multi-pollutant sensors nodes to measure air pollutants concentrations in different indoor microenvironments and wearable tags for real time indoor personal tracking.



Figure 1: Industrial air pollution

II. RELATED WORK

An Environmental Air Pollution Monitoring System for monitoring the concentrations of major air pollutant gases has been designed, developed, and tested complying with the wireless standard. This system measures concentrations of gases such as CO, NO₂ and SO₂, and using semiconductor sensors. The hardware unit integrates a single-chip microcontroller, air pollution sensors array, a GSM-Module. The Central-Server is a high-end personal computer application server with internet connectivity. The hardware unit gathers air pollutants levels (CO, NO₂, and SO₂), and packs them in a frame with the GPS physical location, time, and date. The frame is subsequently uploaded to the GSM-Modem and transmitted to the Central-Server via wireless network. In this paper, environmental air pollution has significant influence on the concentration of constituents in the atmosphere leading to effects like global warming and acid rains. To avoid such adverse imbalances in the nature, an air pollution Control Department, is extremely expensive. Wireless Sensor Networks are a new and very challenging research field for embedded system design automation, as their design must enforce stringent constraints in terms of power and cost. This paper attempts to develop an effective solution for pollution measuring using wireless sensor network.



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

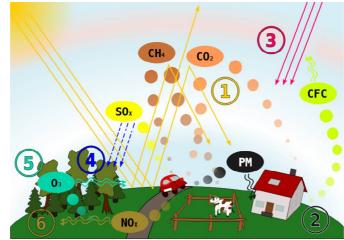


Figure 2: Emission of various gases present in air

III. EXISTING SYSTEM

Existing system model is presented in figure 3 uses Zigbee based wireless sensor networks to monitor physical application in different fields. The sensor nodes directly and environmental conditions with thousands of communicated with the moving nodes deployed on the object of interest which avoided the use of complex routing algorithm but local computations are very minimal. A Wireless Sensor Network consists of many inexpensive wireless sensors, which are capable of collecting, storing, processing environmental information, and communicating with neighboring nodes. In the past, sensors are connected by wire lines. The access method of sensor gateway node is convenient because data can be received from a sensor via the gateway at any time and any place. The gateway acts as the network coordinator in charge of node authentication, message buffering where you can collect, process, analyze, and present your measurement data. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center. End device is responsible for collecting wireless sensor network data, and sending them to parent node, then data are sent to gateway node from parent node directly or by router. After receiving data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. Then through Zigbee module the alert data is sent to all the people whose data values are stored. The services or information in the servers are provided through to the user through Zigbee and alert message can be viewed via smartphone.

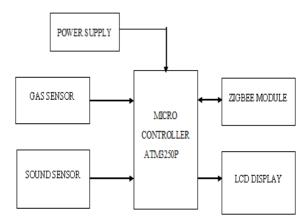


Figure 3: Existing surveillance model



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

IV. PROPOSED SYSTEM

A wireless sensor network (WSN) is an infrastructure comprised of sensing, computing and communication elements that allows the administrator to monitor & control of the specified parameters in the network. Typical application of WSN includes data collection, monitoring, surveillance & medical telemedicine. The embedded computing device system is for monitoring noise and CO_2 levels in the atmosphere to make the environment intelligent or interactive with the objects through wireless communication. Which means it will identify the variations in the sensor data and fix the threshold value depending on the identified level of CO_2 or noise levels. Here the heart of the system is Raspberry Pi controller. The reason for using raspberry Pi 3 is it is more efficient and has perform multiple operation on a single board and cost effective. The raspberry Pi coding are written in Embedded C in UNIX platform. The controller is interfaced with sensor devices such as temperature, humidity, gas, noise and light sensor. The analog data that has been collected from these sensor devices are converted into digital data. Here the conversion is done through ADC interfaced with the I2C pin of the Raspberry Pi. For the collection of data from the area of interest the GPS tracking system is used. Then through LAN connection the network connectivity is given to the controller. To display the collected data to the user who are in need of it a webpage has been created. By browsing the web address one can get the pollution levels in a particular area of interest at one single click. In this sensed data has been processed, stored in the cloud i.e.in to the Google spread sheets and also it shows a trend of the sensed parameters with respect to the specified values. The end users can browse the data using mobile phones, PCs etc. With the help of IOT the alert message is viewed by all the people and safeguard themselves and move away from the polluted area and it is possible to create individual URL address as per the user constrain based on wed based processing.

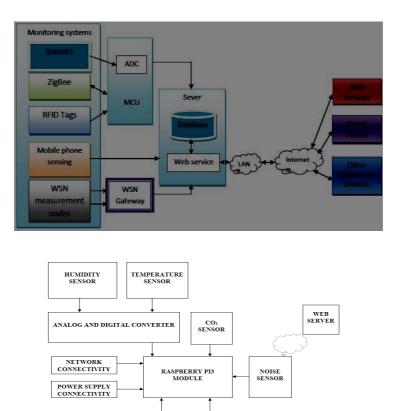


Figure 4: Proposed surveillance model

GPS RECEIVER

LDF



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

A server is an instance of a computer program that accepts and responds to requests made by another program; known as a client. Less formally, any device that runs server software could be considered a server as well. Servers are used to manage network resources. The service or information in the server are provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

V.COMPUTATIONAL ANALYSIS ON ENVIRONMENTAL PARAMETERS

Here we include some basic analytics methods to calculate the pollution parameters, like noise levels and CO levels in the surrounding environment. The common unit of measurement for sound is decibel, dB and its intensity is measured in Sound Pressure Level (SPL). The noise levels are measured in the A-weighted (low-level sensitivity) SPL, abbreviated as dB (A). Sound of frequencies from 800 to 3000Hz is covered by the A-weighted scale. If the SPL, L1 in dB is measured at r1 meters, then SPL, L2 in dB at r2 meters is given by $L2 = L1 - 20 \log 10 (r2/r1)$

Day - Night equivalent noise levels (Ld_n) of a community can be expressed as

 $Ld_n, dB(A) = 10*log_{10}[15/24(10Ld/10) + 9/24(10(Ln+10)/10)]$

Where,

Ld= day- equivalent noise levels (from 7AM – 10PM), dB (A)

Ln=night-equivalent noise levels (from 10PM – 7AM), dB (A)

Based on intensity, the sound intensity I may be expressed in decibels above the standard threshold of hearing I0. The expression is

 $I (dB) = 10 \log_{10} [I/I_0]$ intensity in decibels

Table 1: Standard Noise Values								
Standard for noise	Type of region							
Night (10pm -	Day (7am-10pm)	1 ype of region						
7am) in dB	in dB							
45	55	Residential						
40	60	Residential -						
-		commercial						
		commercial						
55	65	commercial						
60	70	Residential-						
	, 0							
		industry						
65	75	Industry						
		ž						

Table 1: Standard Noise Values

Table 1 shows the standard noise values present during day and night time. Based on the values the type of region can be identified.



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

		•						
Table 2: Standard Air parameters values								
S.NO	PARAMETERS	Test	NAAQ					
		Results	Norms					
		$(\mu g/m^3)$						
1	Sulphur	9.8	80.0					
	dioxide(SO ₂)							
2	Nitrogen	28.7	80.0					
	dioxide(NO ₂)							
3	Particulate	127.0	100.0					
	matter(PM_{10})							
4	Ozone(O ₃)	16.0	180.0					
5	Lead(Pb)	0.24	1.0					
6	Carbon	0.486	2.0					
	monoxide(CO)							
7	Ammonia(NH ₃)	3.5	400.0					
8	$Benzene(C_6H_6)$	0.26	5.0					
9	Arsenic (As)	1.0	6.0					
10	Nickel (Ni)	1.8	20.0					

Table 2 shows standard air parameter values where these gases are checked in real time. The usual reference method for the measurement of carbon monoxide concentration in air is based on the absorption of infrared radiation by the gas in a non-dispersive photometer.

VI. IMPLEMENTATION

Based on the framework shown in figure 4, we have identified a suitable implementation model that consists of different sensor devices and other modules, their functionalities are shown in figure 5.In this implementation model we used Raspberry pi 3 board with GPS module is as embedded device for sensing and storing the data in cloud. Raspberry pi 3 board consist of analog input pins, digital output pins and it is accessed through GPIO pins, inbuilt ADC and Wi-Fi module connects the embedded device to internet.

Sensors are connected to Raspberry pi 3 board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated.

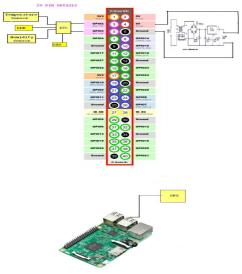


Figure 5: Circuit diagram of proposed surveillance system



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

The LAN connection has to be established to transfer sensors data to end user and also send it to the cloud storage through IOT by creating web page. Before sending the sensed data to cloud, the data will be processed in UNIX platform and visualize data to end user. The data analysis in UNIX platform makes easier to us to set threshold level and to perform necessary controlling actions.

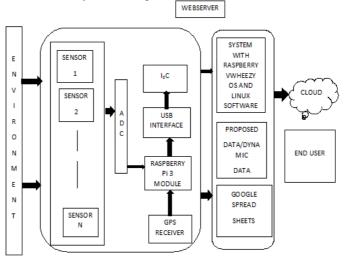


Figure 6: Proposed Raspberry Pi 3 interfaced with webserver

An embedded system designed for environmental monitoring and its components are shown in figure 6.The embedded device is placed in particular area for testing purpose. The sound sensor detects sound intensity levels in that area and Carbon Monoxide (CO) sensor will record the air quality in that region, if the threshold limit is crossed the corresponding controlling action will be taken (like issuing message alarm or buzzer or LED blink). All the sensor devices are connected to internet through Wi-Fi module or LAN connection.



Figure 7: Proposed Air and noise monitoring system

Figure 6 shows the embedded system with its components for reading and to store the pollution parameters in cloud. After successful completion of sensing, the data will be processed and stored in database for future reference. After completing the analysis on data the threshold values will be set for controlling purpose.

VII. RESULT

After sensing the data from different sensor devices, which are placed in particular area of interest. The sensed data will be automatically sent to the web server, when a proper connection is established with sever device. The figure 5 shows the web server page, which will allow us to monitor and control the system. By entering IP address of server, which is placed for monitoring, we will get the corresponding web page. The web page gives



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

the information about the intensity of sound and the CO level variations in that particular region, where the embedded monitoring system is placed.

50.54	ensor0 is 1023 ensor1 is 1023 ensor2 is 547 ensor3 is 342																
12 54	nasor4 is \$1 nasor4 is \$1																
																- 10 C - 10	11-22-264
			1 🕑 👖	9 /	🗠 🔛										- 1	11 at 12	11:39 PM
		9 -0															1/13/200
			E:		Q. 1	MA	há	101	****		no	<u>a</u> 0					
			- F 12	2 UI C	0. 1		0.2	5CI									
			ГŖ	guie	8: V	10	n s	SCI	vc		բս	5					
			Гţ	guie	0. 1	ve	U S	SCI	ve		բո	50					
			Гţ	guie	0. 1	ve	U 2	SCI	ve		րո	50					
M	libos - an o si suttido	× 4 MiD -						SCI	ve		րո	50			_	÷ -	a x
	linbes - ang sini guthi@c		+Google Drive X	Sensors Data	-Google Shi X	14.1	15					50				-	
			+Google Drive X	Sensors Data		14.1	15										\$2 ≡
		/docs.google.co	+Google Drive X	Sensors Data	-Google Shi X	14.1	15									10.00	
	→ C	/docs.google.co	+Google Drive X m/spreadsheets	Sensors Data (/d/1v1HAEX2LI/	-Google Shi X	/hHRPEm1	15					50				- yn gyr	
	→ C Https/ Sensors Data File Edit View	/docs.google.co i i III Inset Fornat	+Google Drive at my/spreadsheets Data Tools Ad	V Sensors Data (/d/]:v/HAEX2L/v Id-ons Help Al	- Google Sh X IbAHHQC) PHTK I changes saved in 1	/hHRPEm ¹ Xve	T2ITZbu,	.GhCglyp	oc/edit¥g	gid = 1437	631161				arjoù	10.00	
(-		/docs.google.co	+Google Drive at my/spreadsheets Data Tools Ad	V Sensors Data (/d/]:v/HAEX2L/v Id-ons Help Al	Google Sh x	/hHRPEm ¹ Xve	T2ITZbu,	.GhCglyp	oc/edit¥g	gid = 1437	631161				arjoù	10.00	
	→ C A https:// Sensors Data File Edit Vev ⊕ C ⊂ T 57	docs.google.co জার্ম 🌆 Inset Fornat ৫ % কু.কু.	-Google Drive X m/spreadsheets Data Tools Ad 23 - Anal	Verson Data Ver/1v/HAEXeLM IS-ons Help Al	Google Si X IbAHHQC)PHTK I changes saved in 1 B I 5 <u>A</u> -	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
(-		docs.google.co ه الله الله Inset Fornat ه اله في مي ا	+Google Drive at mi/spreadsheets Data Tools Ad 123 - Anal C	Sensors Data VId/JvHAEXt1Jv IS-ons Help AJ - 10 - D	-Google Sin X IbAHHQC)PHTK I charges saved in 1 8 <i>I</i> 5 <u>A</u> - E	/hHRPEm ¹ Xve	T2ITZbu,	.GhCglyp	oc/edit¥g	gid = 1437	631161		м	ĸ	arjoù	10.00	
€	C C https:/ Sensors Data File Edt View C C C C C C C C C C C C C C C C C C C	dors.google.co ه الله Inset Format ه اله الي الو B Sound Sensor	+Google Drive X m/spreadsheets Data Tools Ad 23 - Arial C Sound Sensor	V Sensors Data- v/d/Jv/HAEX2U/ ISons Help AJ - 10 - D CO Sensor	Google Sin X IbAHHQC)PHTK I changes saved in 1 B I 5 <u>A</u> - E CO Sensor	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
€ ∭ ∫(C Ahttps:/ Sensors Data File Edt View C C T S7 S7 A Time	docs google co B Inset Format S Sound Sensor Original Value	+Google Drive & m/spreadsheets Data Tools Ad 23 - Anal C Sound Sensor Mapped Value	Sensors Data (d/) vrHAEXeLM ISons Help Al - 10 - CO Sensor Original Wale	Google Si X IbAHHQC)PHTK I changes saved in 1 B <i>I</i> <u>5</u> <u>A</u> - E CO Sensor Napped Value	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
€ ∬ 1 2	C Attps://	Idocs.google.co Image: Format S % &	+ Geogle Drive M m/spreadsheets Data Tools Ad 23 - Amal C Sound Sensor Mapped Value 255 255	Benora Data- Jol / UnitHAEX21/J 16 ons Help AJ 18 ons Help AJ 0 O Sensor Original Value 146 151	Ecopie Sin X IbAHHQC) PHTK I changes saved in I B I 5 <u>A</u> . E CO Sensor Mapped Value 36 37	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
€ ∬ 1 2 3 4	C Attps:// Sensors Date File Edit View C T S7 S7 A Time 165152 165152 165153	(docs.google.co	-Google Drive X m/spreadsheets Data Tools Ad 223 - Anal C Sound Sensor Mopped Value 255 255 255	Sensora Data- vid/JVHAAEXeL/V IS-ons Help A/ to - to - CO Sensor L46 151 155	Coople Si X (bAHHQC)PHTK Changes saved in 1 B <i>T</i> <u>5</u> <u>A</u> - E CO Sensor Mapped Value 36 37 37 38	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgən i i i s	धिः ≡ al.con = taxe
€ 1 2 3 4 5	C Attps:// Sensors Data File Edit View C 7 57 A Time 165151 165152 165154	(docs.google.co b Inset Format 5 % & 0 00 5 % & 0 00 5 % & 0 00 102300 102300 102300	- Stople Dive X m/spreadsheets Data Tools Ad 203 - Anal C Sound Sensor Mapped Value 265 265 265 265 265	Sensor: Data- id/UVIHADX2D/ isons Help Al te - te -	Google Sr. X IbAHHQC) PHTK Ichanges saved in 1 B J F & <u>A</u> . E CO Sensor Mapped Value 37 37 38 45	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgən i i i s	धिः ≡ al.con = taxe
€ fx 1 2 3 4 5 6	C A https:// Sensors Data File Edt View C	(docs.google.co ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	+Stoogle Drive X m/spread/sheets Data Tools Ad 203 - Amil C Sound Sensor Mopped Value 265 265 265 265 265 265 265	Sensoria Data Sensori	-Google Si X -Google Si X Lchanges saved in 1 B T 5 <u>A</u> . CO Sensor Mapped Value 36 37 30 49 47	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgən i i i s	धिः ≡ al.con = taxe
€ fx 1 2 3 4 5 6 7	C A https:// Sensors Data File Edt View C 7 57 A Time 165151 165153 165154 165154 165154 165155 165155	(docs.google.co Illi Inset Format South Sensor Original Value 1023.00	- Stopje Dive X m/spreadsheets Data Tools Ad 22 - Arial C Sound Sensor Mapped Value 265 265 265 265 265 9 265	Sensor: Data- (d/) VHADX2D/ Sensor: Data- 10 10 10 0 CO Sensor Original Value 151 151 151 166 189 203	Google SF X IsbAHHQC/PHTIK I changes saved in I B J & <u>A</u> . CO Sensor Mapped Value 30 37 38 49 47 50	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgən i i i s	धिः ≡ al.con = taxe
+ 1 2 3 4 5 6 7 8 9	C C Https:/ Sensors Data File Edi View C C T S7 57 57 57 57 57 57 57 57 57 57 57 57 57	(docs.google.co (docs.google.co (neet Format 5 % 4, 02 6 5 5 5 5 6 5 5 5 6 5 5 5 5 5 6 5 5 5 5 5 5 5 5 5 5 5 5 5	-Geosle Drive X m/spreadsheets Data Tools Ad 222 - Arial C Sound Sensor Mopped Value 265 265 265 265 265 265 265 265 265 265	Sensor Dets Id-OrtHAEXCL/ Id-ons Help A 10 CO Sensor Oliginal Value 16 16 16 160 160 161 162 163 163 164	-Google Si X IbaHHQC/PHTK I changes saved in I B <i>T</i> 5 <u>A</u> - CO Sensor Mapped Value 37 39 49 47 47 47 47 53 38	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
€ 1 2 3 4 5 6 7 8 9 10	C C https:// Sensors Date File Edit View C C T File Edit View C C T S7 57 57 57 57 57 57 57 57 57 57 57 57 57	(docs.google.co b b m Inset Format 5 5 6, 60 5 5 5 5 5 6 5 5 5 5 6 5 5 5 5 5 5 5 5 5 5 5 5 5	 Geocle Drive X multiple distributions Data Tools Ad 223 - Anal C Sound Sensor Mapped Value 265 265<td>Sensor Data Sensor Data Sensor Data Sensor Data Sensor Data Sensor O Sensor O Sensor O Sensor O Sensor S</td><td>-Google Si X -Google Si X Ichanges saved in I B <i>T</i> <u>5 A</u>. E CO Seasor Napped Value 37 37 37 37 37 37 37 37 37 37</td><td>/hHRPEm¹ Xve</td><td>T2fTZbu,</td><td>,GhCglyp ≣ • ⊥</td><td>ıc/edit¥g + - +</td><td>gid=1437</td><td>631161</td><td>Σ - अ</td><td></td><td></td><td>orjain Commente</td><td>i yitilgan i i i s</td><td>धिः ≡ al.con = taxe</td>	Sensor Data Sensor Data Sensor Data Sensor Data Sensor Data Sensor O Sensor O Sensor O Sensor O Sensor S	-Google Si X -Google Si X Ichanges saved in I B <i>T</i> <u>5 A</u> . E CO Seasor Napped Value 37 37 37 37 37 37 37 37 37 37	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
€ 1 2 3 4 5 6 7 8 9 10 11	C A https:// Sensors.Data File Edit View C Time 165151 165152 165154 165154 165154 165155 16515 1651 16 1	(docs.google.co inset Fornat \$ % 4_ 49_ B Sound Sensor Creiginal Value 1023.00 1025.00	- Geosle Drive X m/spreadsheets Data Tools Ad 22 - Anal C Sound Sensor Mopped Value 265 265 265 265 265 265 265 265 265 265	Sensori Deta Id/1VHAEXLIJ Idors Help A 10 CO Sensor Original Value 16 151 155 156 156 158 159 150 151 155 156 157 158 159 150 151 152 153 154	-Google SI X bbAHHQC/PHTIK Icharges saved in I B I F & A E CO Sensor Mapped Value 37 37 38 49 47 47 47 45 45 33 30	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
↓ 1 2 3 4 5 6 7 8 9 10 11 12 13	C C https:// Sensors Date File Edit View C C T File Edit View C C T S7 57 57 57 57 57 57 57 57 57 57 57 57 57	(docs.google.co b b m Inset Format 5 5 6, 60 5 5 5 5 6 5 5 6 5 5 6 6 5 5 6 6 6 7 6 7 6 7 8 8 5 8 5 8 5 8 5 8 5 8 5 8 5 8 5 8 10 10 10 10 10 10 10 10 10 10	 Geocle Drive X multiple distributions Data Tools Ad 223 - Anal C Sound Sensor Mapped Value 265 265<td>Sensor Data Sensor Data Sensor Data Sensor Data Sensor Data Sensor O Sensor O Sensor O Sensor O Sensor S</td><td>-Google SI X bbAHHQC/PHTK tchanges saved in 1 B 7 5 A - CO Sensor Mapped Value 37 38 49 47 47 49 45 37 30 30 30 28 40</td><td>/hHRPEm¹ Xve</td><td>T2fTZbu,</td><td>,GhCglyp ≣ • ⊥</td><td>ıc/edit¥g + - +</td><td>gid=1437</td><td>631161</td><td>Σ - अ</td><td></td><td></td><td>orjain Commente</td><td>i yitilgan i i i s</td><td>धिः ≡ al.con = taxe</td>	Sensor Data Sensor Data Sensor Data Sensor Data Sensor Data Sensor O Sensor O Sensor O Sensor O Sensor S	-Google SI X bbAHHQC/PHTK tchanges saved in 1 B 7 5 A - CO Sensor Mapped Value 37 38 49 47 47 49 45 37 30 30 30 28 40	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
↓ 1 2 3 4 5 6 7 8 9 10 11 12 13 14		(docs.google.co	- Gooste Drive X m/spreadSheets Data Tools Ad 23 - Anal C Sound Sensor Mapped Value 255 255 255 255 255 255 255 255 255 25	Democe Data 1000000000000000000000000000000000000	Google 5' X bbAHHQC)PHTK Lchanges saved in 1 B 7 5 ▲ . C C S S S S S S S S S S S S S	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
↓ 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	C https://www.sensors.Data File Eat View For a 7 57 A Time 165151 165152 165154 16515	(docs.google.co	Glocy Ic Drive X mr/spread/sheets Data Tools Add C Areal C Soung Sensor Soung Sensor 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 27 28 265 265	Sensot Data Id J VHA DXLM Id O VHA DXLM Id O VHA DXLM Id O Sensor O Sensor Objinal Value 16 16 16 16 16 165 186 189 203 162 163 164 171 183 184 183 184 183 184 183 184 189 203 182 183 184 191 191	-Google S1 X bbAHHQC/PHTK t changes saved in 1 B 7 5 A - CO Sensor Mapped Value 30 31 32 47 47 45 33 33 30 45 45 45 45 45 45 45 47 47 47 47 47 47 47 47 47 47	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
↓ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16		(docs.google.co	- Google Drive 18 ma/spread/sheets Data Tools Ad 23 - Anal C C C C C C C C C C C C C C C C C C C	Sensor Data (d/) vrHAExtLN (d/) vrHAEx	Google 5' X Echanges saved in I B <i>T S</i> <u>A</u> . C0 Seasor Mapped Value 37 37 38 49 47 47 47 47 50 53 33 30 30 49 47 47 47 53 53	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
★ 1 2 3 4 5 8 7 8 9 10 11 12 13 14 15 16 17 18	→ C → ttps:// Sensors Data File Est: View • • • • • • • • • • • • • • • • •	(docs.google.co format Inset Format S % 4_ 49, 49, B Sound Sensor Original Value 102300	- Google Drive 34 ma/spread/sheets Data Tools Ad 23 - Anal C C C C C C C C C C C C C C C C C C C	Sensor Data Vid/J vrHAEXtLM Sensor Data Vid/J vrHAEXtLM 10 10 CO Sensor Original Naive 16 151 151 151 153 15	Google SI x tobach H ₂ C) PHTK tobach H ₂ C) PHTK tobach H ₂ C) PHTK B I f ≤ <u>A</u> - E CO Sensore 30 30 30 40 45 45 45 45 45 45 45 45 45 45	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 8 7 8 9 10 11 12 13 14 15 16 17 18 19	→ C → ttps:// Sensors Data File Edit View O ∩ 7 7 //	B B S 4 B S 4 4 B Sound Sensor Chigan Hole Chigan Hole B Sound Sensor Chigan Hole Chigan Hole Chigan Hole 102100 102100 102100 102200 26500 2600 2600 2600 2600 102300	- Stopic Dive X m/spread/sheets Data Tools Ad 23 - Anat C Sound Sensor Mapped Value 255 255 255 255 255 255 255 255 255 25	Benori Dete Adr/JvHAEXcLM Adr/JvHAEXcLM Adr/JvHAEXcLM CO Sensor Coginal Sensor Coginal Sensor Coginal Sensor Coginal Sensor Se	Google 51 × Loanges saved in 1 B <i>I S</i> <u>A</u> . E CO Second Mapped Value 30 31 30 40 41 42 43 44 44 41 51 51 51 51 51 51 51 51 51 5	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥g + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 8 7 8 9 10 11 12 13 14 15 16 17 18 19 20	→ C → ttps:// Sensors Data File Est: View • • • • • • • • • • • • • • • • •	(docs.google.co	Stoople Drive X nru/spread/sheets X Data Tools Ad C Sound Sensor X Mapped Value 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265	Genool Data Genool Data Genool Data Genool Ge	Google SI x changes saved in I B I S A . CO Second Si Si Si Si Si Si Si Si Si Si	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 8 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21		B B Inset Format Inset Format <tr< td=""><td>100001c Dive X 10000 mr /spreadsheets 222 - Anal C Sound Sensor Mogpee Value 2655 2655 2655 2655 2655 2655 2655 265</td><td>Benaci Data Id/1_VH-ADXLU Id/1_VH-ADXLU <!--</td--><td>Google 51 × Loanges saved in 1 E J 5 ▲. E CO Second Mapped Value 5 3 3 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5</td><td>/hHRPEm¹ Xve</td><td>T2fTZbu,</td><td>,GhCglyp ≣ • ⊥</td><td>ıc/edit¥q + - +</td><td>gid=1437</td><td>631161</td><td>Σ - अ</td><td></td><td></td><td>orjain Commente</td><td>i yitilgan i i i s</td><td>धिः ≡ al.con = taxe</td></td></tr<>	100001c Dive X 10000 mr /spreadsheets 222 - Anal C Sound Sensor Mogpee Value 2655 2655 2655 2655 2655 2655 2655 265	Benaci Data Id/1_VH-ADXLU Id/1_VH-ADXLU </td <td>Google 51 × Loanges saved in 1 E J 5 ▲. E CO Second Mapped Value 5 3 3 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5</td> <td>/hHRPEm¹ Xve</td> <td>T2fTZbu,</td> <td>,GhCglyp ≣ • ⊥</td> <td>ıc/edit¥q + - +</td> <td>gid=1437</td> <td>631161</td> <td>Σ - अ</td> <td></td> <td></td> <td>orjain Commente</td> <td>i yitilgan i i i s</td> <td>धिः ≡ al.con = taxe</td>	Google 51 × Loanges saved in 1 E J 5 ▲. E CO Second Mapped Value 5 3 3 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 8 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	→ C → ttps:// Sensors Data File Est: View • • • • • • • • • • • • • • • • •	(docs.google.co	Stoople Drive X nru/spread/sheets X Data Tools Ad C Sound Sensor X Mapped Value 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265 265	Genool Data Genool Data Genool Data Genool Ge	Google SI x changes saved in I B I S A . CO Second Si Si Si Si Si Si Si Si Si Si	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 24	→ C Inter+ Sensors Data File Edit Vee File Edit Vee T ST ST Inter+ Inter+ ST ST Inter+ Inter+ Inter+ Inter+ Inter+ Inter+ Inter+	B B Inset Format Inset Format <tr< td=""><td>Status Status Status Data Tools Add Data Tools Add Data Tools Add C Status Status Status Status</td><td>Semon Data Semon Data S</td><td>-Google Si X IbAHHQC / PHTK IbAHHQC / PHTK Ib J J S ▲ . C0 Second Si J S ▲ . Si J S ▲ . C0 Second Si J S ▲ . Si J S & . Si</td><td>/hHRPEm¹ Xve</td><td>T2fTZbu,</td><td>,GhCglyp ≣ • ⊥</td><td>ıc/edit¥q + - +</td><td>gid=1437</td><td>631161</td><td>Σ - अ</td><td></td><td></td><td>orjain Commente</td><td>i yitilgan i i i s</td><td>धिः ≡ al.con = taxe</td></tr<>	Status Status Status Data Tools Add Data Tools Add Data Tools Add C Status Status Status Status	Semon Data S	-Google Si X IbAHHQC / PHTK IbAHHQC / PHTK Ib J J S ▲ . C0 Second Si J S ▲ . Si J S ▲ . C0 Second Si J S ▲ . Si J S & . Si	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
+ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25		Konstructure Konstructure 8 6 B 8 8 6 B 5 9 6 Constructure 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1023.00 1	- Geocie Diver X (X) m/spread/sheets Data Tools Ad C (X) - Anal C (X	Discont Data Vicit VHHADX2DV Id ons Help A 10 0 0 CO Sensor Original Nation 151 155 156 151 157 153 158 151 159 152 153 154 151 155 158 151 159 152 151 155 159 154 151 155 159 159 159 159 150 159 150 159 150 159 150 159 150 159 150 159 150 159 150 159 150 159 150 159 150 150 150 150 150 150 150	- Google Si X - Google Si X - Google Si X - Co Seconomic -	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 17 18 19 20 21 22 24	→ C Inter+ Sensors Data File Edit Vee File Edit Vee T ST ST Inter+ Inter+ ST ST Inter+ Inter+ Inter+ Inter+ Inter+ Inter+ Inter+	B B Inset Format Inset Format <tr< td=""><td>Status Status Data Tools Ad Data Tools Ad Data Tools Ad Data Tools Ad C Status Status Status Status Status C Status Status Status Status Status</td><td>Semon Data Semon Data S</td><td>-Google Si X IbAHHQC / PHTK IbAHHQC / PHTK Ib J J S ▲ . C0 Second Si J S ▲ . Si J S & .</td><td>/hHRPEm¹ Xve</td><td>T2fTZbu,</td><td>,GhCglyp ≣ • ⊥</td><td>ıc/edit¥q + - +</td><td>gid=1437</td><td>631161</td><td>Σ - अ</td><td></td><td></td><td>orjain Commente</td><td>i yitilgan i i i s</td><td>धिः ≡ al.con = taxe</td></tr<>	Status Status Data Tools Ad Data Tools Ad Data Tools Ad Data Tools Ad C Status Status Status Status Status C Status Status Status Status Status	Semon Data S	-Google Si X IbAHHQC / PHTK IbAHHQC / PHTK Ib J J S ▲ . C0 Second Si J S ▲ . Si J S & .	/hHRPEm ¹ Xve	T2fTZbu,	,GhCglyp ≣ • ⊥	ıc/edit¥q + - +	gid=1437	631161	Σ - अ			orjain Commente	i yitilgan i i i s	धिः ≡ al.con = taxe

Figure 9: Cloud storage (Google spreadsheets) for sensors data.

The sensed data will be stored in cloud (Google Spread Sheets). The data stored in cloud can be used for the analysis of the parameter and continuous monitoring purpose. The figure 9 shows the noise intensity levels and CO levels in air at regular time intervals

enviro	nmental.loca	altunne 🔿	MORE			
Sensor Report Hosur						
Sensor	P1(Bus Stand)	P2(KCC Nagar)	P3(ACE)			
NOISE	Very high	Low	Low			
TEMPERATURE	70	43	45			
HUMIDITY	84	57	42			
CO ₂	43	23	48			
LATITUDE	0.00.T.112M	0.00.T.118M	0.00.T.120M			
LONGITUDE	T.186.0.00	T.146.0.00	T.154.0.00			

Figure 10: Web page output



International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

5th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '17)

13th-14th March 2017

Organized by

Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India.

The above figure 10 shows about various noise and air parameter present in air and its value is measured in real time. The heart surveillance system is Raspberry pi3, where the program are made in c language and made to run in Unix platform using MobaXterm software processing in this software is very easy and modification can be done in fraction of seconds. The temperature is read in degree Celsius and CO_2 is read in $\mu p/m^3$ unit. GPS is used to track the location and area can be identified based on latitude and longitude value. Based on the water content present in atmosphere, humidity values goes on changing. By the help of these contents user can safeguard themselves from harmful situation and travel to safer places and alert message can be viewed via smart phones or PC's and move themselves to safer location.

VII1. CONCLUSION

By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi or LAN.

The smart way to monitor environment and an efficient, low cost embedded system is presented with different models in this paper. In the proposed architecture functions of different modules were discussed. The noise and air pollution monitoring system with Internet of Things (IOT) concept experimentally tested for monitoring two parameters. It also sent the sensor parameters to the cloud (Google Spread Sheets).

This data will be helpful for future analysis and it can be easily shared to other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

REFERENCES

[1] WHO the World Health Report - Reducing Risks, Promoting Healthy Life, 2000.

[2] S. J. Oh and W. Y. Chung, "Room environment monitoring system from PDA terminal". International Symposium on Intelligent Signal Processing and Communication Systems, Seoul, Korea 2004, pp. 497–501.

[3] A. AL-Ali and I. A. Zualkernan, "mobile GPRS-sensors array for air pollution monitoring". IEEE Sens. J. 2010, pp. 1666–1671.

[4] O. Vermesan, et al., "Internet of Things Strategic Research Agenda", Chapter 2 in O. Vermesan and P. Friess (Eds.)

Internet of Things—Global Technological and Societal Trends, River Publishers, Aalborg, Denmark, 2011, ISBN 978-87-92329-67-7.

[5] S. Kim, E. Paulos and M. D. Gross, "WearAir: Expressive t-shirts for air quality sensing". In TEI'10, Cambridge, USA, 2010, pp. 295-

296.[6] Negi I, et al., "Novel monitor paradigm for real-time exposure assessment" Journal of Exposure Science and Environmental Epidemiology, 2011, pp. 419-426.

[7] K. Brown, et al., "Reading Chemical Exposure Assessment Method with Real Time Location System", DREAM-RTLS, Cincinnati, ISES 2014

[8] C., P. Adams, Riggs and J. Volckens, "Development of a method for personal, spatiotemporal exposure assessment." Journal of Environmental Monitoring 2009, pp. 1331-39.

[9] P. Rudman, S. North and M. Chalmers, "Mobile pollution mapping in the city." UK-UbiNet workshop on eScience and ubicomp, Edinburg, UK, 2005.

[10] R. Honicky, E. A. Brewer, E. Paulos and R. White, "N-smarts: networked suite of mobile atmospheric real-time sensors." the second ACM SIGCOMM workshop on Networked systems for developing region, Seattle, WA, USA, 2008, pp. 25–30.