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SURVEY ON SENSING AND ALERTING OVERFLOW OF TRASH-USING IOT

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***Abstract*—The Internet of Things (IOT) is constantly evolving and is giving unique solutions to the everyday problems faced by man. "Smart City" is one such implementation aimed at improving the lifestyle of human beings. We deploy the concept of integrating different case situations in this project. Nowadays the waste materials are gradually increasing. But the methods to clear these wastes are not matching the standards. In most of the places we see flooded dustbins waiting for the garbage man to clear the dustbin. So we propose this paper which enables an active mechanism of clearing the dustbin based on priority. We also enable a mechanism for tracking the entire process of the wasted disposal is carried out by the garbage department.**

I. INTRODUCTION (*HEADING 1*)

In the existing system only the visible problems are resolved. The existing system just indicates the wastes inside the dustbin to the department. But it fails to monitor the proper disposal of wastes by the department. In this system daily routine is followed. This in some cases fails to service the necessary area. In the proposed system we enable the tracking of full process involved in a solid waste management from the indication of waste to the disposal of wastes by the department. The ultrasonic sensor in the dustbin counts the number of wastes in the garbage. If the garbage reaches the threshold value given by the user, then a message is sent to the garbage monitoring section through IOT. So the garbage man sets the path and arrives to the dustbin based on priority level. The monitoring of waste disposal is done with the help of an RFID reader fitted with the Dustbin and the RFID tag carried by the garbage man. When the person nears the dustbin then the reader reads the RFID tag and transmits the status to the monitoring section through IOT indicating the clearance of garbage in that particular area.

II. RELATED WORK

A. *Smart Threat Alert System using IoT*

In recent years, IOT has been a focus of research. The security systems have been implemented efficiently with the help of IOT. IOT keeps the security devices connected and provide stable interconnection between them. Our proposed system combines the features of an Alert System and IOT to provide a less expensive and smarter alert system in Emergency situations. It uses the Radio Frequency(RF)detectors to detect the unique combination of RF signals emitted by easily available RF transmitters. Processing of signals and generation of alerts is done with the help of Raspberry Pi. This will be a less expensive and easy to implement system.

B. *Road Vehicle Alert System Using IOT*

The consequence of road accidents that involves a motorcycle is far more fatal for the rider than the other drivers. Yet, there has not been an effective vehicle alert system that can eliminate these avoidable motorcycle accidents caused by other drivers where they fail to notice the motorcycles. One of the major flaws with the existing vehicle alert systems is that it should not treat motorcycles as same as other vehicles as they take much longer time to brake than a cars do. Therefore, this project aimed to find an effective method to identify motorcycles and alert the other drivers when motorcyclists are around them in 20-meter radius. After extensive literature review, the best method to solve the problem is to use road side infrastructure based Internet of Things (IOT) that divides the network into a set of clusters. In this method to identify a vehicle, it is identifying the driver and the rider from their

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smartphone application that beacons custom, unique Media Access Control (MAC) addresses via Bluetooth or Wi-Fi to the IOT probes.

C. *Low-cost Security of IoT Sensor Nodes With Rakeness-Based Compressed Sensing*

Compressed Sensing has been proposed to both yield low-cost compression and low-cost encryption. This can be very useful in the design of sensor nodes with a limited resource budget whose acquisition must be kept as private as possible. We here analyze the susceptibility of Compressed Sensing stages that are optimized to maximize compression performance by rakeness-based design to cipher text-only and known-plaintext attacks. A trade-off between compression and security is highlighted. Notwithstanding such a trade-off, rakeness-based Compressed Sensing exhibits a noteworthy robustness to classical attacks.

D. *Design and experimentation of a low-power IoT embedded system for wireless underwater sensing*

This paper aims at presenting an experimented low power Internet of Things architecture, that could be integrated to underwater monitoring systems like Autonomous Underwater Vehicles for wireless underwater sensing. The proposed hardware architecture of the sensor nodes is based on an ultra-Low power Flash Microcontroller that takes measurements from water sensors, and synchronizes the network by means of a GPS. The receiver board incorporates a Digital Signal Processor and a Flash MCU that communicates data to a local server implemented on a Raspberry PI unit. Moreover, this paper proposes mechanisms to minimize the power consumption of the realized system.

E. *A Connectivity Enhancement Scheme Based on Link Transformation in IoT Sensing Networks*

Large-scale and heterogeneity of the Internet of Things (IoT) sensing networks introduce a big challenge to device connectivity. There exist some isolated nodes in randomly deployed IoT sensing networks running on a tree-typed topology due to limitations of some network parameters, which reduces network connectivity. In this paper, a connectivity enhancement scheme for the sensing networks of the IoT is proposed based on link transformation. Under constraints of network depth and the number of child nodes, we boost capability of an in-network node to connect more isolated nodes by reducing its or ancestors depth. Furthermore, three-level node shifting is utilized to take full advantage of network locality, thus highly improving ability of a potential parent node to accept connection request of an isolated node.

F. *Secure Surveillance Framework for IoT systems using Probabilistic Image Encryption*

This paper proposes a secure surveillance framework for IoT systems by intelligent integration of video summarization and image encryption. Firstly, an efficient video summarization method is used to extract the informative frames using the processing capabilities of visual sensors. When an event is detected from key frames, an alert is sent to the concerned authority autonomously. As the final decision about an event mainly depends on the extracted key frames, their modification during transmission by attackers can result in severe losses. To tackle this issue, we propose a fast probabilistic and lightweight algorithm for the encryption of key frames prior to transmission, considering the memory and processing requirements of constrained devices which increase its suitability for IoT systems. Our experimental results verify the effectiveness of the proposed method in terms of robustness, execution time, and security compared to other image encryption algorithms. Furthermore, our framework can reduce the bandwidth, storage, transmission cost, and the time required for analysts to browse large volumes of surveillance data and make decisions about abnormal events such as suspicious activity detection and fire detection in surveillance applications.

G. *IoT framework for fluctuation enhanced sensing*

Today, Internet of Things (IoT) is an important and very popular technical and research area, as IoT systems provide opportunity to continuously monitor our environment in a cost-effective way. One really important parameter is the quality of the air since it significantly influences comfort and health. Fluctuation Enhanced Sensing (FES) is a promising method to increase the selectivity and sensitivity of the sensors, however, most of the current implementations are not optimized for energy efficient embedded systems. In our current publication we will present a complete wireless sensor node system based on Wi-Fi communication. We describe in detail how can the data processing be shared between the sensor nodes and the server in order to provide a highly reliable and responsive system while minimizing energy consumption. We believe that the framework we built is a significant step that makes it possible for fluctuation based sensing methods to be used in everyday life. Beyond gas sensing, our method can be used in further noise diagnostic based applications and seamlessly fits into the concept of IoT.

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H. Gas Leakage Detection and Smart Alerting and Prediction Using IoT

IoT is an expanding network of physical devices that are linked with different types of sensors and with the help of connectivity to the internet, they are able to exchange data. Through IoT, internet has now extended its roots to almost every possible thing present around us and is no more limited to our personal computers and mobile phones. Safety, the elementary concern of any project, has not been left untouched by IoT. Gas Leakages in open or closed areas can prove to be dangerous and lethal. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we have used the IoT technology to make a Gas Leakage Detector having Smart Alerting techniques involving calling, sending text message and an e-mail to the concerned authority and an ability to predict hazardous situation so that people could be made aware in advance by performing data analytics on sensor readings.

I. City-ranking of European Medium-Sized Cities

Against the background of economic and technological changes caused by the globalization and the integration process, cities in Europe face the challenge of combining competitiveness and sustainable urban development simultaneously. Very evidently, this challenge is likely to have an impact on issues of Urban Quality such as housing, economy, culture, social and environmental conditions. This contribution, however, does not deal with the leading European metropolises but with medium-sized cities and their perspectives for development. Even though the vast majority of the urban population lives in such cities, the main focus of urban research tends to be on the 'global' metropolises. As a result, the challenges of medium-sized cities, which can be rather different, remain unexplored to a certain degree. Medium-sized cities, which have to cope with competition of the larger metropolises on corresponding issues, appear to be less well equipped in terms of critical mass, resources and organizing capacity. On the other hand, medium-sized cities may offer assets not available in larger cities. This paper emphasis the role city-rankings can play in identifying best practices of regional development strategies for medium-sized cities. The 'tool' of ranking cities is explored profoundly, elaborated by a case study and recommendations for designing meaningful comparisons of medium-sized cities and for interpreting their results are provided. It is particularly emphasized that the ranking of cities should be part of a more general process of lesson-drawing and policy transfer between medium-sized cities.

J. Ear-Phone: An End-to-End Participatory Urban Noise Mapping System

A noise map facilitates monitoring of environmental noise pollution in urban areas. It can raise citizen awareness of noise pollution levels, and aid in the development of mitigation strategies to cope with the adverse effects. However, state-of-the-art techniques for rendering noise maps in urban areas are expensive and rarely updated (months or even years), as they rely on population and traffic models rather than on real data. Participatory urban sensing can be leveraged to create an open and in-expensive platform for rendering up-to-date noise maps. In this paper, we present the design, implementation and performance evaluation of an end-to-end participatory urban noise mapping system called Ear-Phone. Ear-Phone, for the first time, leverages Compressive Sensing to address the fundamental problem of recovering the noise map from incomplete and random samples obtained by crowdsourcing data collection. Ear-Phone, implemented on Nokia N95 and HP iPAQ mobile devices, also addresses the challenge of collecting accurate noise pollution readings at a mobile device. Extensive simulations and outdoor experiments demonstrate that Ear-Phone is a feasible platform to assess noise pollution, incurring reasonable system resource consumption at mobile devices and providing high reconstruction accuracy of the noise map.

K. Image Browsing, Processing, and Clustering for Participatory Sensing: Lessons From a Diet Sense Prototype

Imagers are an increasingly significant source of sensory observations about human activity and the urban environment. Image Scape is a software tool for processing, clustering, and browsing large sets of images. Implemented as a set of web services with an Adobe Flash-based user interface, it supports clustering by both image features and context tags, as well as retagging of images in the user interface. Though expected to be useful in many applications, Image Scape was designed as an analysis component of Diet Sense, a software system under development at UCLA to support (1) the use of mobile devices for automatic multimedia documentation of dietary choices with just-in-time annotation, (2) efficient post facto review of captured media by participants and researchers, and (3) easy authoring and dissemination of the automatic data collection protocols. A pilot study, in which participants ran software that enabled their phones to autonomously capture images of their plates during mealtime, was conducted using an early prototype of the Diet Sense system, and the resulting image set used in the creation of Image Scape. Image Scape will support two kinds of users within the Diet Sense application: The participants in dietary studies will have the ability to easily audit their images, while the recipients of the

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images, health care professionals managing studies and performing analysis, will be able to rapidly browse and annotate large sets of images.

L. Noise SPY: A Real-Time Mobile Phone Platform for Urban Noise Monitoring and Mapping

In this paper we present the design, implementation, evaluation, and user experiences of the Noise Spy application, our sound sensing system that turns the mobile phone into a low-cost data logger for monitoring environmental noise. It allows users to explore a city area while collaboratively visualizing noise levels in real-time. The software combines the sound levels with GPS data in order to generate a map of sound levels that were encountered during a journey. We report early findings from the trials which have been carried out by cycling couriers who were given Nokia mobile phones equipped with the Noise Spy software to collect noise data around Cambridge city. Indications are that, not only is the functionality of this personal environmental sensing tool engaging for users, but aspects such as personalization of data, contextual information, and reflection upon both the data and its collection, are important factors in obtaining and retaining their interest.

M. An evaluation of participatory sensing as an alternative to standard techniques for environmental monitoring.

Participatory sensing enables a person-centric collection of environmental measurement data with, in principle, high granularity in space and time. In this paper we provide concrete proof that participatory techniques, when implemented properly, can achieve the same accuracy as standard mapping techniques. We do this through a citizen science experiment for noise mapping a 1 km2 area in the city of Antwerp using Noise Tube, a participatory sensing framework for monitoring ambient noise. At the technical side, we set up measuring equipment in accordance with official norms insofar as they apply, also carrying out extensive calibration experiments. At the citizen side, we collaborated with up to 10 volunteers from a citizen-led Antwerp-based action group. From the data gathered we construct purely measurement-based noise maps of the target area with error margins of about 5dB, comparable to those of official simulation-based noise maps. We also report on a survey evaluating Noise Tube, as a system for participative grassroots noise mapping campaigns, from the user perspective.

N. Participatory Sensing: Applications and Architecture

Participatory sensing is the process whereby individuals and communities use ever more capable mobile phones and cloud services to collect and analyze systematic data for use in discovery. The convergence of technology and analytical innovation with a citizenry that is increasingly comfortable using mobile phones and online social networking sets the stage for this technology to dramatically impact many aspects of our daily lives.

One application of participatory sensing is as a tool for health and wellness. For example, individuals can self-monitor to observe and adjust their medication, physical activity, nutrition, and interactions. Potential contexts include chronic-disease management and health behavior change. Communities and health professionals can also use participatory approaches to better understand the development and effective treatment of disease.

O. Sensing Atmosphere

The World Health Organization reports that 2 million people die each year from the effects of air pollution, twice the number of fatalities as from automobile accidents [1]. Direct causes of air pollution related deaths include aggravated asthma, bronchitis, emphysema, lung and heart diseases, and respiratory allergies. While civic agencies address large-scale environmental health problems from the top down by working directly with governments and industries, we explore the design of personal platforms for sensing our natural environment and empowering collective action across blocks, neighborhoods, cities, and nations. In this paper, we report early findings from two field studies of human centered air quality measurements and a simple technology deployment in the spirit of this new Participatory Urbanism: (1) an interview survey of air quality awareness, (2) a field study using several mobile air quality environmental sensors deployed across Accra, Ghana, and (3) the release of an on-the-go air quality awareness mobile SMS tool.

P. SmartRoad: A Crowd-Sourced Traffic Regulator Detection and Identification System

In this paper we present Smart Road, a crowd-sourced sensing system that detects and identifies traffic regulators, traffic lights and stop signs in particular. As an alternative to expensive road surveys, Smart Road works on participatory sensing data collected from GPS sensors from in-vehicle smartphones. The resulting traffic regulator information can be used for many assisted-driving or navigation systems. We implement Smart Road on a vehicular smartphone testbed, and deploy on 35 external volunteer users' vehicles for two months. Experiment results show that Smart Road can

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robustly, effectively and efficiently carry out its detection and identification tasks without consuming excessive communication energy/bandwidth or requiring too much ground truth information.

Q. UrbanMobilitySense: A User-Centric Participatory Sensing System for Transportation Activity Surveys

Transportation activity surveys collect the travel behavior of people, including when, where, and how they travel for urban planning purposes. Traditionally, transportation activity surveys are carried out using conventional questionaires, which are labor intensive and error prone. In this paper, we have developed a smartphone-based mobility sensing system, called Urban Mobility Sense, which captures human mobility information automatically to conduct transportation activity surveys. The Urban Mobility Sense system was designed to address two critical issues: 1) energy conservation and 2) privacy preservation To optimize the energy utilization of smartphone, we avoid using the GPS sensor when the user is at long-stay places and filter out redundant data before data uploading. To preserve personal privacy, each smartphone maintains the user's long-stay places by two separate profiles: 1) private place profile and 2) public place profile. The former maintains the privacy-preserved places (e.g., home), whereas the latter maintains the public places (e.g., parks). We implement the Urban Mobility Sense system to conduct real-world transportation activity surveys, study the performance of our system through extensive experiments, and analyze the computational complexity of the proposed algorithms. The outcome of our work has been deployed in Singapore to support the Land Transport Authority's transportation activity surveys.

R. Waste collection multi objective model with real time traceability data

Waste collection is a highly visible municipal service that involves large expenditures and difficult operational problems, plus it is expensive to operate in terms of investment costs (i.e. vehicles fleet), operational costs (i.e. fuel, maintenances) and environmental costs (i.e. emissions, noise and traffic congestions). Modern traceability devices, like volumetric sensors, identification RFID (Radio Frequency Identification) systems, GPRS (General Packet Radio Service) and GPS (Global Positioning System) technology, permit to obtain data in real time, which is fundamental to implement an efficient and innovative waste collection routing model.

The basic idea is that knowing the real time data of each vehicle and the real time replenishment level at each bin makes it possible to decide, in function of the waste generation pattern, what bin should be emptied and what should not, optimizing different aspects like the total covered distance, the necessary number of vehicles and the environmental impact.

This paper describes a framework about the traceability technology available in the optimization of solid waste collection, and introduces an innovative vehicle routing model integrated with the real time traceability data, starting the application in an Italian city of about 100,000 inhabitants. The model is tested and validated using simulation and an economical feasibility study is reported at the end of the paper.

S. RFID-based Real-time Smart Waste Management System

In an environmental context, the use of RFID (Radio Frequency Identification) and load cell sensor technology can be employed for not only bringing down waste management costs, but also to facilitate automating and streamlining waste (e.g., garbage, recycling, and green) identification and weight measurement processes for designing smart waste management systems. In this paper, we outline a RFID and sensor model for designing a system in real-time waste management. An application of the architecture is described in the area of RFID and sensor based Automatic Waste Identity, Weight, and Stolen Bins Identification System (WIWSBIS).

III. *CONCLUSIONS AND FUTURE WORK*

This survey's focus is on more energy-efficient IoT as an enabler of various applications including waste management. Specifically, it aims to present a large set of models dealing with the efficient waste management. Special attention is paid on the waste collection. We present efforts for the intelligent transportation within the context of IoT and Smart Cities for waste collection. We propose an inductive taxonomy to perform comparative assessment of the surveyed models. We focus only on efforts that incorporate ICT models for waste collection in SC. We deliver the strengths and weaknesses of the surveyed models. Finally, our future work is focused on the definition of an effective IoT-enabled model for waste collection, which will touch on the incorporation of high capacity waste trucks as mobile depots. In addition, waste bins are placed to optimize comfort of residents. However, as part of the future work we will be looking at bin connectivity constraints that may affect their placement, for example, the output power of a communicating sensor would need to be set too high which may drain the battery faster. In this case, the bin may be placed somewhere where energy consumption is more efficient.

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