Mobile Based Wireless Sensor Networks for Common Fidelity via Information Sharing

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Abstract- The Ubiquitous nature of cell phone and the recent advancement in the cell phone technology andEvolution of smart phones has created a new room for researchers in the area of wireless sensor networks (WSN). It created a new paradigm of using the cell phone as sensor device and so called sensor enabled cell phone based data sharing. The proposed method of sensor data sharing uses the cell phone as the sensor device and motivates the public to use their cell phone as sensor device and contribute for data sharing to the knowledge bank and increase the availability of real time data in the knowledge database. The special categories of sensor embedded smart phones, which can sense multiple parameters like motion, temperature, pollution etc..are developed for this purpose. Using these smart phones different users at different locations are invited and coordinated for data sharing. This is more or less the social commitment and responsibility of and individual towards his society. The collected data can be used for improving the well being of human beings.

Index Terms- Cell Phone based WSN, sensor embedded cell phone, user privacy, protocols, android.

I.   INTRODUCTION

It is estimated that the number of mobile phones in theworld will exceed the world population by mid of 2014[2]. Through the use of sensors (e.g., cameras, motionsensors, and GPS) built into mobile phones and web services to aggregate and interpret the assembledinformation, a new collective capacity is emerging—onein which people participate in sensing and analyzingaspects of their lives that were previously invisible. If weconsider an individual sensor node it may be cheap, butthe deployment of large number of sensor nodes makesthe traditional wireless sensor networks expensive. If wisely used these sensor embedded cell phone devices can be used for a wide variety of applications since it isremarkably affordable and sharable. Using cell phone assensor node quite a lot of money and infrastructure couldbe saved by decreasing the number of sensor nodes inlocations where mobile phone users exists[1]. Some of thebenefits of using sensor embedded cell phone as a sensordevice are listed below.

II.   TRAFFIC MANAGEMENT & POLLUTION CONTROL

Consider the situation of heavy traffic at a particular place in a city. Many people spend much time in traffic, waiting for thered signal to turn green. If these people spend few secondsto collect the traffic or pollution statics using their cellphone and share
this information to the knowledgedatabase it would be useful for the other commuters toselect an alternate root or divert the direction of anambulance coming in that root, with a medical emergencyand would possible save some one's life.

III.   CRIME CONTROL

The cases of illegal activities like, illegal sand mining, drug & sexual offences and related Crimes, corruption etc can be controlled more effectivelyand the culprits could be nabbed if the people who witnessthe incident use their cell phone to record the same andshare that information via social Medias or to theConcerned authorities.

IV.   MEDICAL CARE FOR PEOPLE

Mobile phone and webtechnology are now being used to provide information toelders, their families, and doctors about changes inlifestyle of a person that are early warnings of diminishinghealth.

V.   HABITAT MONITORING AND WILD LIFE PROTECTION

Cellphone based sensor devices can be used to monitor thehabitat of birds and animals whose population isdwindling. The crimes like hunting, animal torturing etccan be controlled by this.

VI.   GARBAGE MANAGEMENT

Garbage management hasbecome a serious problem in metros in India. Disposingthis huge amount of waste produced every day, includingthe bio-waste is a dreary task for the municipality. Haveno proper attention if given to garbage management itwould cause for spreading of epidemic like chikungunya, dengue, malaria etc.

VII. OTHER BENEFITS

The other benefits of using cellphone based wireless sensor networks are controllingwater and electricity wastage. Anyone who carry a smartphone if observe the water or electricity wastagehappening he/she can immediately collect the visual proofand share it via social media and bring it to the attentionof authorities so that the wastage can be controlled.

VIII. CHALLENGES

The deployment of such cell phone based WSN becomesa challenge because the cell phone users are dynamic andwireless networks are relatively static. To develop thehardware module we need to embed different applicationsensors like motion sensor, temperature sensor, vibrationsensor, etc with mobile phones. The application specificsoftware need to be developed.

IX. SECURITY

It is mandatory to provide security for thedata as well as we need to preserve the identity of the person who shared the information. Only authenticatedpersons will be allowed to participate in data sharing. Thisis done to prevent misuse of the system. ParticipatorySensing data often include particularly sensitiveinformation such as images of one's family and friends,and the participant's location collected over time. Soencryption of the data allows sharing it only with peoplewe trust.

X. ADDRESSING PROBLEM

Multi-hop Routing in WirelessSensor Networks is extremely demanding due to the intrinsic characteristics [3]. There is no globally uniqueaddress system since the addressing scheme is not wellappropriate and enormous number of nodes makes it morecomplex. Thus addressing scheme problem cannot besolved by conventional IP based protocols.

XI. ROUTING PROTOCOLS

In common, routing in WSNs canbe divided into three main categories such as data-centricrouting, hierarchical based (cluster based) routing [5], andlocation based routing depending on the networkstructure. In flat based routing all nodes plays the samerole and it is not feasible to assign a global identifier tothem. Base Stations sends queries and waits for data fromthe sensors. Well known protocols proposed are theSensor Protocol for Information via Negotiation [7], [8],Directed Diffusion [9], Rumor Routing [10], MinimumCost Forwarding Algorithm [11], Gradient based Routing[12], Information driven sensor Querying [13]. In ahierarchical architecture, sensor nodes are grouped andthe one with the greatest residual energy is usually chosenas the cluster head. Higher energy nodes can be used toprocess and send the information, while low energy nodescan be used to perform the sensing task of theenvironment. This routing also

called cluster basedrouting method. Some of the proposed cluster basedprotocols are the Low-Energy Adaptive ClusteringHierarchy (LEACH) [13], Power-Efficient Gathering inSensor Information Systems (PEGASIS) [14], Thresholdsensitive Energy Efficient sensor Network protocol(TEEN) [15].The location information of the sensor nodes iselegantly utilized in order to determine energy efficientrouting paths. The distance can be estimated according tothe level of signal strength. To save energy, some location based schemes demand that nodes should go to sleep if.

There is no activity. Well known protocols in this categoryare the Minimum Energy Communication Network(MECN) [4]. Geographic Adaptive Fidelity (GAF),Geographic and Energy Aware Routing (GEAR), MostForward within Radius (MFR) [6] etc.Wireless sensor networks (WSN) are nascenttechnology that builds upon the recent decade's advancesin electrical, mechanical engineering including wirelesscommunications, low-power embedded systems, MEMSsensordesign, network architectures and instrumentationapplications. This work addresses the problems peopleface in their day today life and helps to provide solutionsto their problems and a better living style in an effectiveway with the help of cell phone technology. Theavoidance or negligence of a person can create seriousimpacts on the society. Such situations need to be handledcarefully in time and necessary actions needs to be taken.This work collaborate the sensor networking technologyand mobile phone technology. Thus the methodologypresented herein may serve as a model for similarly sizedprograms.

XII. OBJECTIVES

1. To divulge the problems we are facing in ourdaily life like air pollution, wastage ofresources like electricity and water, garbagemismanagement, corruption, criminalactivities, illegal selling of drugs, safety ofwomen etc.

2. To collaborate with various NGOs andgovernment departments like police,municipality, water and electricitydepartment, lokpal etc.

3. Develop a sensor embedded phone capableof collecting the adequate data.

4. To develop a mobile application to send datafrom persons mobile to the centralizeddatabase for necessary actions/solutions.

5. To inform/aware the concerned authorities to take corrective/necessary measures andreceive necessary action/solution about aparticular problem being faced by the public.
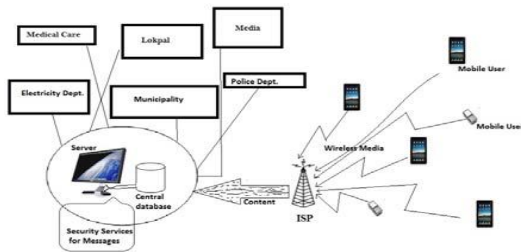
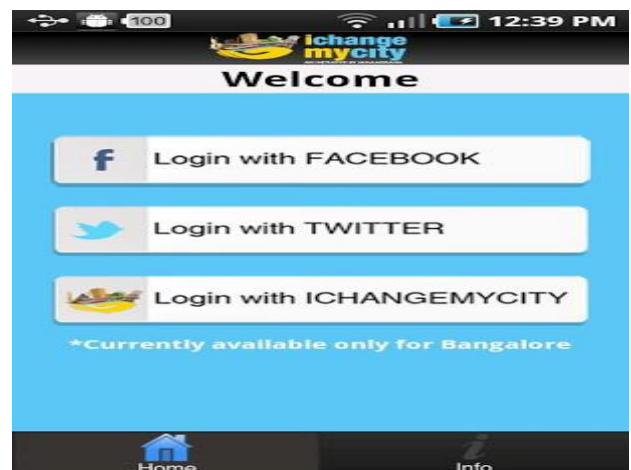XIII. RESEARCH METHODOLOGY

Fig.1: Project Overview Diagram

Figure1 shows the project overview diagram. APerson who is near to/victim of social problems/issues canuse his mobile to collect the necessary information, whichcan be a picture of any incident, data like traffic details,air pollution readings etc. First an embedded hardware isdeveloped where different applications specific sensorslike temperature sensor, gas sensor, motion sensor, etc areembedded with the mobile phone. An android basedapplication is developed which can collects dataautomatically if required, when turned on the auto sensingmode and forwards it to the database. The application isalso used for manually submitting the user complaints. These mobile users are connected to their serviceprovider.

The collected data is then passed to a centraldata base for storage. Adequate security and safety isprovided for the data and the identity of the person who issending the data is preserved for safety purposes. This data is then categorized and shared with thepolice department, lokpal, electricity department,municipality, other concerned authorities and variousNGO's. In this way all the related authorities arecollaborated with the project and the required correctivemeasure is taken with the support of public. These datacan be shared via social networks like facebook, twitteretc in case of any warning or awareness need to be sharedamong public. An energy efficient routing protocol isdeveloped and security for the data is provided with dataencryption.
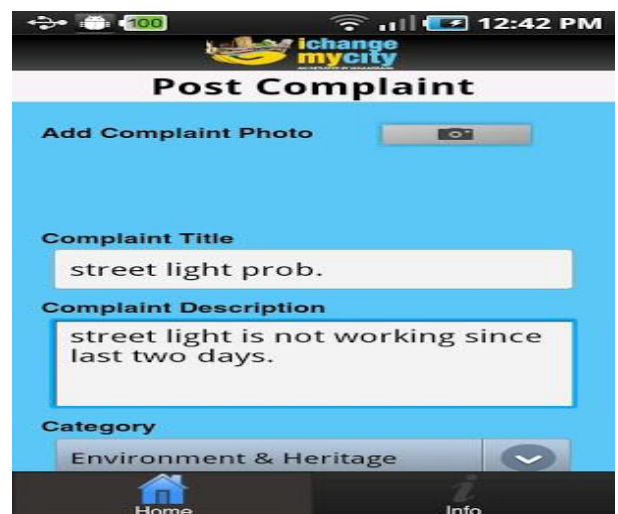
XIV. RESULTS

Following shows the snapshots of an androidapplication developed for the people of Bangalore toregister a complaint regarding any problem they face intheir locality to the concerned authorities. Figure2 showsthe user is provided with login option with different socialwebsites to facilitate data sharing via social media. Figure3shows a column to describe the complaint, and the user can even select the category of complaints. Figure4 shows anoption to take a snapshot of the event and attach a file as aproof. Figure 5 shows how user can set the location ofevent using Google maps and using GPS. Figure 6 showsan auto generated message received by user once acomplaint is successfully posted.

Fig.2: Login Options
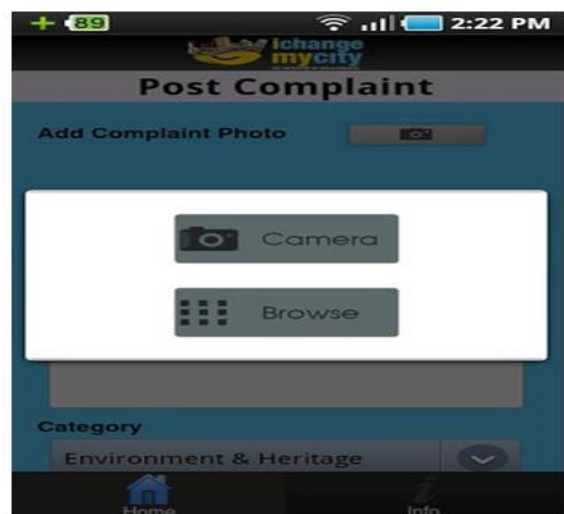

Fig. 3: Complaint Description
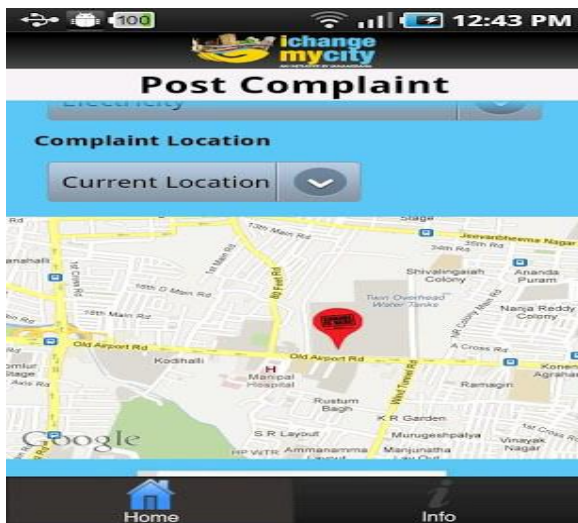

Fig.4: Attach photo/file for proof
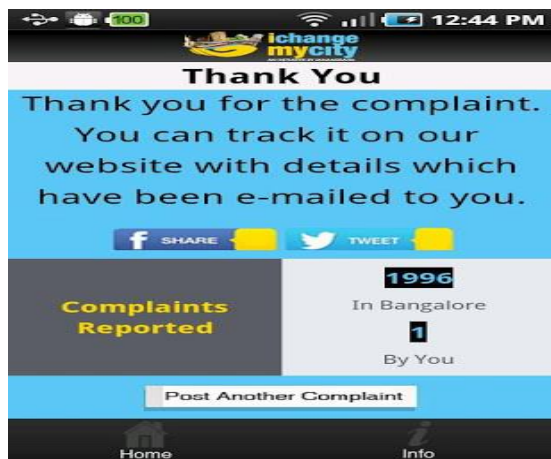
Fig.5: Add location of Incident

Fig.6: Compliant Acceptance Feedback

The below table shows the feedback of people collected from different parts of Bangalore (India) after implementation of the project. Out of 100 people surveyed 85 % of people have responded positively whereas 10 % people talked about the difficulty in implementation and 5 % people showed no interest.

Sl No	Area of Survey	No of people surveyed	Do you think Cell phone based WSN useful for society?		Any suggestions?
01	Electronic City	30	27 yes	3 No	Good application. make it free of cost
02	White field	20	15 yes	5 No	Volunteers required
03	ITPL	30	25 yes	2 No	Need publicity
04	Brigade Road	20	18 yes	5 NA	Not interested

Table 1: User Feedback

XV.   FUTURE WORKS

We propose an approach to call for online campaign whenever we need to address a problem at particular areaso that the localities will be informed in advance and amajor contribution can be expected from the public. Wealso expect some volunteers to come forward and take it asa challenge to implement this project nationwide with thehelp of social networks. We also expect good cooperationand support from the government towards such initiatives.

XVI.   REFERENCES

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