Implementation of Crowd Sensing in Mobile Network & Analysis of Incrementing Technology

M. Ishvarya, R. Swaathi, R. Hannah
Department of Electronics and Communication Engineering
Velammal college of Engineering and Technology, Madurai

***Abstract:* - MCS stands for Mobile Crowd Sensing (MCS) .Mobile Crowd Sensing emerges as a new sensing paradigm based on the criteria power of the crowd combined with the essential sensing capabilities of various mobile devices, such as smart phones or wearable devices. This new paradigm takes advantage of mobile devices to collect data in a distributed and crowd-sourced manner, enabling numerous large scale applications. From sensing the cellular coverage of network to the carbon-dioxide monitoring in cities, from traffic monitoring to the Internet of Things (IoT), mobile crowd sensing offers unlimited opportunities. In this regard, MCSN is a key technology in future generation networking and plays a major role in the advancement of embedded system technology. An operator-assisted user-provided network (UPN) has the potential and the ability to achieve a low cost always accesable Internet connectivity, without significantly increasing the network infrastructure investment. In the previous works, they have presented the concept of mobile crowd sensing and its applications to everyday life.**

Keywords: Mobile Crowd-Sensing, Key Technology,5G , Wireless networks.

I .INTRODUCTION

Mobile crowd-sensing, is a technique in which a large group of users having mobile devices which is capable of sensing and computing (such as smart phones, personal computers) collectively share data and extract information to indicate, connect , measure, estimate or infer (predict) any data of common interest. In short, this means crowd sourcing of sensor data from mobile devices. Most smart phones can sense ambient light, noise (via microphone), location (via GPS), movement (via accelerometer). These sensors can collect vast amounts of data that are useful in a variety of ways. For example, accelerometer and GPS can be used to locate potholes in cities, and microphones can be used with GPS to locate noise pollution.

The design and implementation of crowd sensing, this mobile crowd sensing platform, which was used to run a user study with over 50 users. The data reliability issues in mobile crowd sensing by presenting several scenarios involving malicious behavior. All the previous works have included the usage of Bluetooth and Wi-Fi radios.

In our work, we have improvised from the existing methodology and have introduced various new technologies.The Mobile crowd sensing technology is introduced in the Millimeter wave band cellular networks in the upcoming 5G technology.We have also introduced incentive measures for the subscribers in increase the user density.

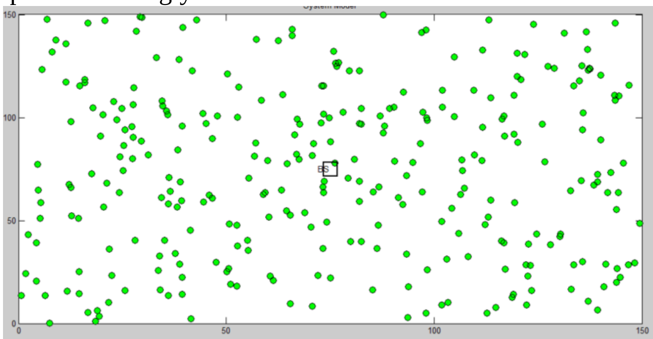
II. CROWD-SOURCING

Prior to the process of differentiation between the various types of mobile crowd sensing activities, it is important to first provide clarity to avoid ambiguity in the use of the terms crowd sensing and crowd sourcing. In crowd sourcing, a top-down approach is adopted and the main aim is to provide source to the solution to a complex problem by splitting it into smaller tasks that can be executed by individual members of the public. Often times, the crowd source has an idea of what to expect and the geographical location of participants is not a barrier. Whereas in crowd sensing, a bottom-up approach is adopted and the aim is to understand the problem or sense a complex problem of interest by splitting the responsibility of relevant information to the group of people and then collecting the results to obtain an remarkable outlook of the phenomenon . In the case of crowd sensing, geographical location of participants is critical and there is often no knowledge about what to expect, hence the need for sensing is to obtain an output that is approximately similar to the opinion of the whole crowd. In broad terms, crowd sensing can be divided into three major divisions namely group sensing, community sensing, and urban sensing.

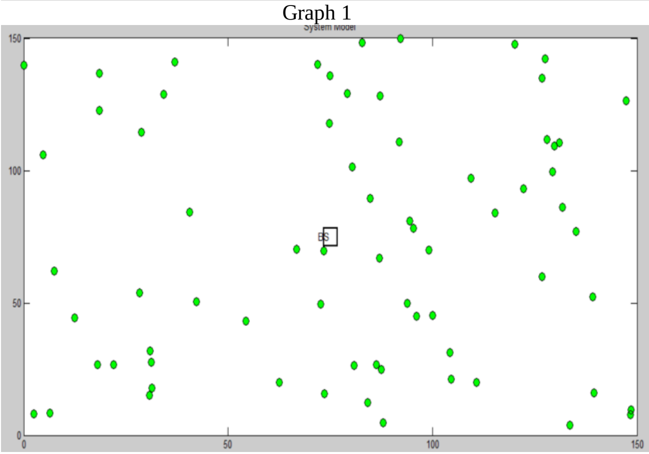
Table 1:Indicating the WSN and MSN

	Operators	Deployment Cost	Coverage	Data Quality
Wireless sensor network (WSN)	Government agencies, public institutions	High: Expensive sensors and infrastructure to deploy the network	Limited coverage with static sensor nodes	High, sound level sensors
Mobile crowd sensing and computing (MCSC) Mobile crowd sensing and computing (MCSC)	Potentially everyone	Low: Leveraging existing infrastructure, i.e., broad proliferation of cellular network and mobile device usage	The inherent mobility of the phone carriers provides unprecedented spatiotemporal coverage	Low, suffering from issues such as builtin sensor performance and the trustworthy of user contributed data

Group sensing occurs when an ad hoc group formed loosely and opportunistically (e.g., spatially nearby phones) aggregately contribute sensed data to address a localised shared problem. A typical example is SignalGuru, a crowd sensing solution that enables vehicles passing through an intersection to detect and share the traffic signal information and warn their driving speed and adjust the speed accordingly.

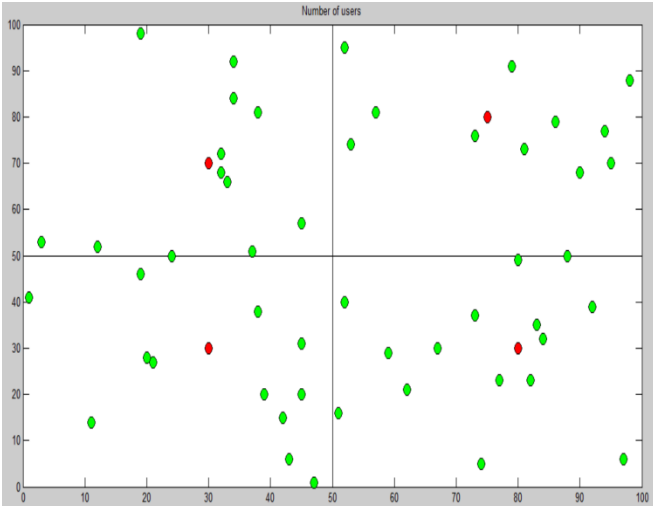


Graph 1



Graph 2

Community sensing occurs when the participants in the crowd sensing performance comes from a strongly bonded community, with established social synchronisation and trust amongst community. The output of community sensing is usually of very high quality as participants are more committed in contributing to solve a common problem of interest to the community. Urban sensing on the other hand is a broader crowd sensing campaign targeting participants at city-scale level to contribute data from the urban landscape. In this scenario, any citizen can participate, including strangers and visitors who may not have invested interest in the phenomenon of concern. Hence, the quality of output is usually less accurate compared to that obtained in group or community sensing, and the presence of fake data is also eminent . Depending on the awareness and degree to which the custodians of sensing devices are involved in the architecture, there are three types of mobile crowdsensing, i.e., group sensing , community sensing, and urban sensing,This can be further subdivided into opportunistic sensing and participatory sensing. The Opportunistic sensing is a mobile crowd sensing paradigm, wherein mobile devices are automatically used to sense data without the knowledge of user's or explicit action.



Graph 3

A typical example of opportunistic crowd sensing is Crowd Sense (place), an application that accurately capture images and audios from mobile phones in order to divide places into a variety of categories such as park, departmental stores, etc.

In participatory sensing, the active involvement of device custodians is required and it is the case that most community and urban sensing initiatives are more widely participatory in nature. Lastly, based on those to whom crowd sensed data is shared, the opportunistic and participatory sensing can be further subdivided into three divisions namely personal, social and public sensing. Personal sensing includes individual monitoring and focuses on vital information such as daily life style and physical performance, social contacts and personal location, health vitals (e.g. heart rate, blood pressure and sugar level), etc.By aggregating data from various personal sensing activities. It is possible to detect patterns of physical and health outcomes in a given community. When individual shares social information collected from personal sensing activities with colleagues or other people of a social group or community, the process is referred to as social sensing. On a broader scale, when mobile crowd sensing data such as environmental, traffic, safety etc is shared with everyone for public good, the process is referred to as public sensing.

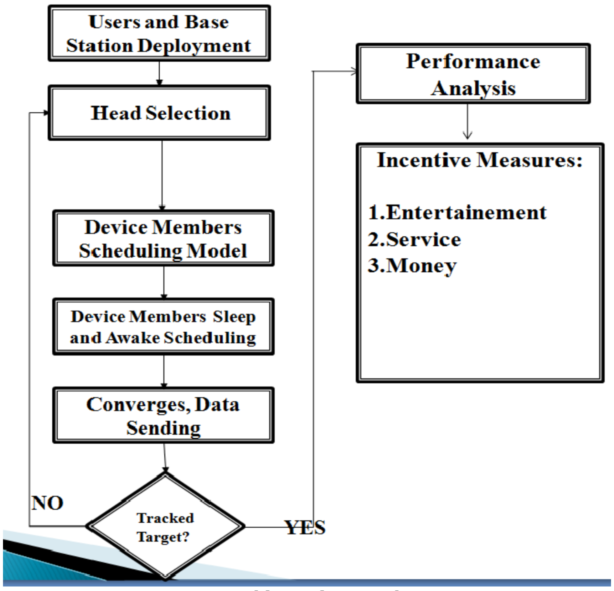


Table 1: Flow graph

III .PROPOSED METHODOLOGY

Basically, the mobile base station to identify the total number of mobile users in a particular area. The users, who are active, are separated from the other users. The base station then statically allocates the region where more number of users are present. The access points for each allocated region are pre –fixed and cannot be altered for each region. The access points, and then sends out the questionnaire to the users. In our, we have introduced a method by which the users who have actively participated throughout the entire process is given out incentive. The graphs given below, explains the flow of our project. ***Graph 1:*** explains the total number of users present in a particular area. ***Graph 2:*** explains the total number of users present in a area who are active. ***Graph 3:*** explains the total number of access points allocation and the static allotment of users. ***Graph 4:*** explains the incentive measure given to each user.

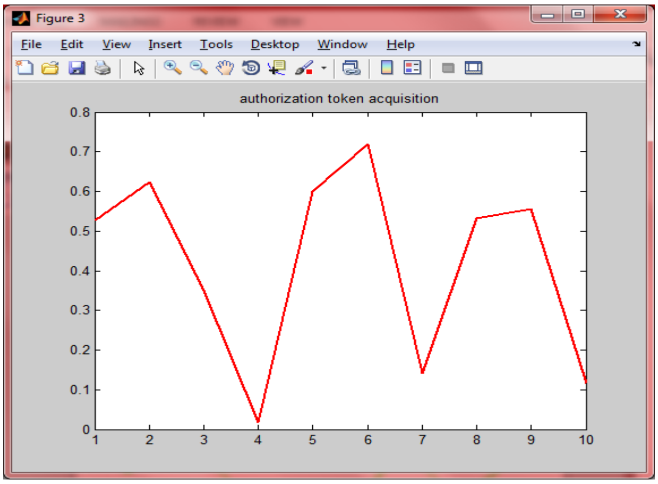
III. TYPES OF INCENTIVE MEASURES.

Majorly two types of incentive measures can be used in mobile crowd sensing applications. They are monetary and non-monetary incentives.

1. Monetary incentive measures.
2. Non-monetary incentive measures.

1. Monetary Incentive measures.

Monetary incentives are the need for money or any other financial needs such as virtual cash, redeemable credit, etc. that the users consider as most beneficial. Depending on the individual who sets the price for a sensing task, monetary incentives can be either platform-centric or user-centric. In the platform-centric model, otherwise referred to as crowd source centric incentive mechanism, the initiator sets the price and aims to maximize the profit of the platform’s .



Graph 4

Table 2: Incentive measures graph parameters

S.NO	GRAPH	X-PARAMETER VALUES	Y-PARAMETER VALUES	INFERENCE
1.	Incentive-1	Ch= 30	Ch=70	Explains incentive measure given to each user.
2.	Incentive -2	Ch=30	Ch=30	Explains incentive measure given to each user.
3.	Incentive-3	Ch=75	Ch=80	Explains incentive measure given to each user.

In the user-centric model, its vice versa that is the case as the price is defined by the participants. Moreover, the platform-centric and user-centric models can either operate as static or dynamic incentive mechanisms based on its preference. In static incentive, the price for a task is estimated in prior case and remains the same rather in dynamic incentive. The price changes based on the minimal rate of money a participant is willing to accept to perform the task. Adding to participants’ preference, incentives for mobile crowd sensing can also be designed by dynamically changing. Depending on few phenomenons such as the time of day, number of available participants, location and various types of data obtained as demonstrated in a participation-aware incentive mechanism.

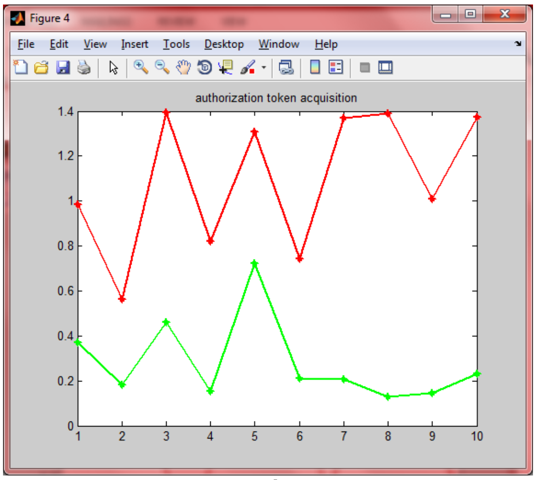
2.NON-MONETARY INCENTIVES

Non-monetary incentives are providing rewards which do not involve any money or financial links. In broad terms, non-monetary incentives can be divided into three divided into *entertainment, service,* and *social* incentives

(i)Social incentives

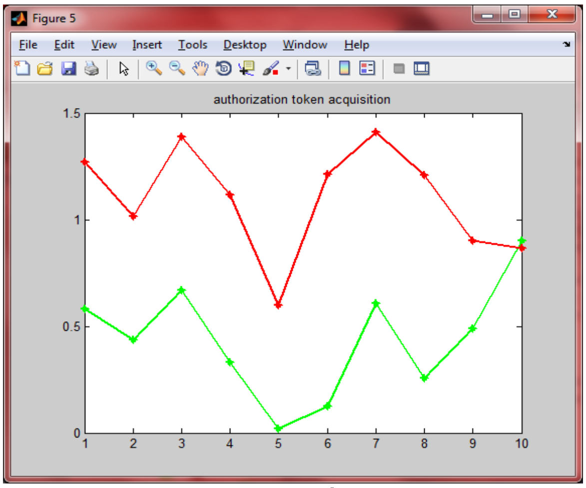
The social incentives in mobile crowd sensing applications is based on the scenario that people could be motivated to participate in sensing tasks for social and ethical reasons . Typical factors that drive social incentives include the need to socialise with others that is society based, reputation and social recognition. People rarely engage in mobile crowd sensing works depending on the pleasure they derive from doing that.

This is called altruism. Other factors that drive social incentive include self satisfaction derived as result of being the major part of the crowd sensing tasks, self-esteem and love of the community in which a crowd sensed task is being performed.



Graph 5

For example, *Cached Sensing* is a game-based incentive that is based on the idea of geo caching, the service providers who are interested in monitoring the environment write sensing tasks on NFC tags, hide the tags, and publish their coordinates, with the intention of exploring the altruistic nature and the competing spirit between users who go searching and performing the defined sensing tasks. Another example of social incentive mechanism is social trust assisted reciprocity (STAR) STAR exploits the synergistic marriage of social trust, which is an important aspect of social relationship, and the reciprocity to stimulate mobile crowd sensing. Such incentive models are suited for community-based sensing where strong social bonds exist and people are motivated to contribute to a common good. Social psychological factors can also be used as non-monetary incentive mechanism to improve mobile crowd sensing activities. In this sense, some people may engage better with crowd sensing tasks when there is someone else watching and facilitating the process than when they are alone . There is also need for research to develop standardised approach for quantitatively measuring the effect of these social incentive factors on mobile crowd sensing systems.



Graph 6

(ii)Service incentives

The non-monetary reward system includes service incentives, here the participants in mobile crowd sensing systems are requested to contribute sensed data in return for service usage . These services may be one that is offered using the collected crowd sensed data. In contrast, a service that provides utility to a unanswered question of society is used as incentive, it is not the one that necessarily derives its value from the crowd sensed data. For example, a telecommunication provider could offer users many beneficial services such as, free calls, free texting, mobile internet data, discounts, 4G packs etc. in order to motivate them to contribute sensed data to be utilised for market research or network improvement purpose. Here, this type of incentive undergoes certain limitations, which can be rectified with more difficulties.

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