# Priority Based Dynamic Scheduler for Mobile Sensor Networks

Madhuri Allapureddy[1], Dr. B.Lalitha[2]
*Student[1], Assistant Professor[2]*
*CSE Dept[1],[2], JNTUACEA[1],[2], Anantapur, A.P, India[1],[2]*
Email:madhuriallapureddy508@gmail.com[1], lalitha_balla@yahoo.co.in[2]

***Abstract*— Several applications need close to periodic reply for recognizing context modifications, particularly for health related applications. The fall detection [4] of senior individuals needs speediest recognition of any modification inside the body's posture to elude dangers. Those applications trust continuous recognition of the client's present state and snappy recognition of basic context modification. This steady observation needs continuous sensing of internal and external sensors to maintain a strategic distance from delays in recognizing fundamental context modification. To gather the required information numerous applications need to embedded the sensors into smart phones. Yet, the utilization of sensors will be prompts more consumption of energy. In the current framework to defeat energy consumption and lessen the delay in portable sensor systems Sirine Taleb et al, proposed a Viterbi-based Context Aware Mobile Sensing (VCAMS) [1] component. The VCAMS method accomplished better outcomes with the comparison of past state of the art mechanisms. Despite the fact that the VCAMS method would do well to execute but incapable to arrive at client fulfillment and not suggested for real time applications. In this paper we propose Priority based Dynamic Scheduler mechanism to gather the information by utilizing the smart phone sensors. This mechanism schedule the sensors dynamically based on priority. This mechanism decreases the energy consumption and delay. The simulation results show better performance.**

***Keywords*— Mobile computing, Mobile sensing, Continuous sensing, Sensor selection, Priority Based dynamic scheduler, Priority Calculation.**

## I. INTRODUCTION

Smart mobile devices have more capabilities like advanced computing and detecting capacities along with conventional communication abilities and evolved as multi-functional devices. Those mobiles seems to be a gateway between the social world and the user. It consists of PC capacities and it’s huge constancy makes possible to give the expansive scope to emerge in few domains. Many domains in context-aware computing [2] includes navigation, personal monitoring and healthcare. That rapid increase and notoriety have offered rise to context-aware computing as a part of mobile computing in which applications distinguish and misuse contextual data [3] such as activities, locations, and health conditions. Some applications depend on continuous recognition of the client's present state and speedy recognition of any critical context modification. This constant observation needs continuous sensing of external and internal sensors to maintain a deliberate distance from delays in recognizing critical context modification. Large numbers of such applications need the internal sensors usage on the phone to gather required information. Some different applications need the utilization of wearable sensors and wearable devices to gather information. Sadly, occurring of more energy consumption and exploits workloads on smart phones.

Here, Continuous sensing [5] replaced by effective dynamic mobile sensing schemes that enable the smart mobile device to brilliantly cooperate with internal sensors and external sensors while exchanging off resources' energy consumption and application delay targets. Hence, a mechanism needs to choose a sensing schedule that optimizes when sensors should be activated. There are some approaches to solve this issue to decrease the energy consumption, correctness, and delay of those applications. Some approaches suggest to do sensor selection while others propose sensor sampling to gather information in order to focus on specific state precisely while decreasing the usage of energy. Such approaches are suppose to get the knowledge of the specific context state of the user and those approaches are seems to be Application-specific. Viterbi-based Context Aware Mobile Sensing (VCAMS) method to optimize the trade-off between delay in sensing context change and energy consumption via taking decisions that when to trigger the sensors for data collection depends on the client’s behavior. VCAMS is context aware system that based on the instant data according to that situations regarding to the user and his/her surroundings. This type of method is used for real-time contexts like health conditions, activity and location. Each context consists of number of states; for instance, the location of the client may be at office, at home, or in shopping centre. The goal of the this mechanism is to give the time instants dynamically at which sensor requires to be activated at the particular state of the client and also refers as the sensing schedule of the sensor for the particular client and the specific state. This mechanism consists of two modes: learning mode and execution mode. In the learning mode, the sensing schedules are committed to utilizing a Vietrbi algorithm depends on the past information of the user model that grabs how much time the user expends specific states. Viterbi is selected for its less computational unpredictability. The user model is continuously refreshed when the system identifies real modifications of the state. The learning mode is executed once to initiate the mechanism, and on occasions while the mechanism runs and after a user's conduct changes importantly from its underlying constraints. At execution mode, the effective picked up sensing schedules are utilized to choose sensing triggers for a specific state.

This paper also consists of the principle benefactions as follows : a) A method that triggers learning mode to refresh the sensing schedule just when critical changes are caught in real-time situations, dodging needless computations. To determine the expression of VCAMS, we led simulation experiments on one state inferred utilizing a context simulator; and b) Detail information for Viterbi usage with the meaning of latest customized rewards to master sensing schedules for real-time decisions on when sensing must be activated. The energy and delay reward metrics are figured to ideal refers the utility associated with every transition between trellis nodes in a Viterbi-based algorithm. The details consists of unified model that grabs both the client's and the smartphone's states. To determine the computational complexity under real-time operational constraints, we implemented this mechanism (VCAMS) on a smart phone. Moreover, we considered a case study by utilizing real data-set with multi-state modifications to determine the efficiency of the proposed mechanism.

## II. RELATED WORK

Mobile phone sensors consists of a noteworthy source for energy consumption. Many approaches have been considered in the literature to catch contextual data from sensors while limiting the energy used, and surveys have been published to know about the existing mechanismsssssssss work. Applications have been proposed in several domains constituting activity recognition, healthcare, and location detection. The additional points are as follows:

### *2.1 Mobile Sensing*

Smart mobile phone as a sensor is used to gather, process and serve information throughout individuals. Todays latest mobile phones have various features included in sensors involving surrounding gyroscope, accelero-meter, light sensor, digital compass, proximity sensor, GPS, and general purpose sensors such as microphone and camera. Here, we can get the dynamic information by appending a sensory gadget to a mobile phone, mobile sensing allocates the chance to track dynamic data about environmental impacts and enhance maps and understand patterns of human movement, air pollution and traffic. Large number of new applications across a broad assortment of domains such as ecommerce, social networks, healthcare, transportation, homecare, ecological observing, and safety. The fields which utilize mobile phone sensors are shown in Fig 1. Mobile Phones are winding up rapidly increasing in the territory of health observing.

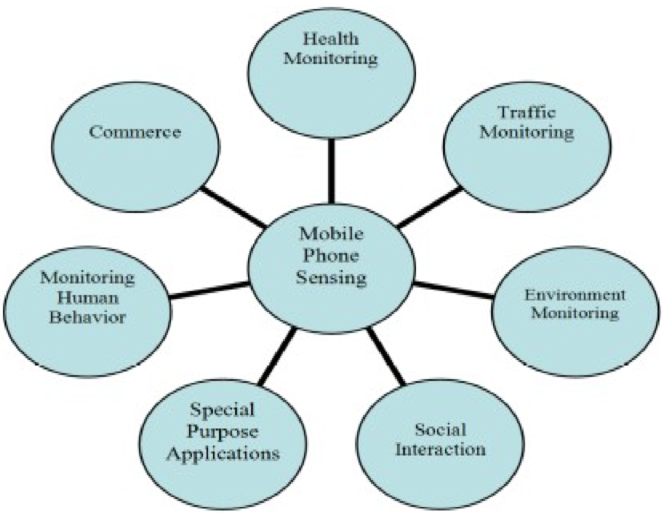


Fig. 1. Fields of Mobile Sensing

Smart phone sensors, or a mix of biosensors are used for gathering data about human's health such as pulse, blood pressure, etc by using some type of sensors. For example, Electrocardiogram (ECG) [6], Electroencephalogram (EEG) [7] etc, contingent on the system needs. These sensor devices work in the below manner: Firstly, the sensors gather information and is transferred by wireless transmission utilising GPRS, Bluetooth, GSM etc for further processing. Singular smart mobile phones gather the sensor's raw information from mobile phone consists of GPS, GSM, camera and so on. The data is separated from the sensor information by implementing AI and machine learning techniques. Either in the Central Processing Unit or phone will perform the operations. After this, the information is enlightened to a hospital or medical centre. These kinds of devices have demonstrated to be powerful in enhancing for better health.

*2.1.1 Urban Sensing*

Numerous elements that incorporate the urban landscape for example individuals, trees, buildings, vehicles, environment, and so forth. Deploying sensors for gathering information from the urban topography and afterward settle on to make decisions appropriately. Urban sensing empowers we all to illuminate and change our general surroundings. Urban sensing is utilised because all the created smart phone sensing devices are being conveyed and utilised in urban areas yet it doesn't imply that they are confined to urban areas just however they can also be utilised in country or whatever other domains. Urban sensing can be ordered into two noteworthy classes in agreement to the awareness and involvement of individuals in the engineering as sensing device custodians.

a) Participatory Sensing
b) Opportunistic Sensing

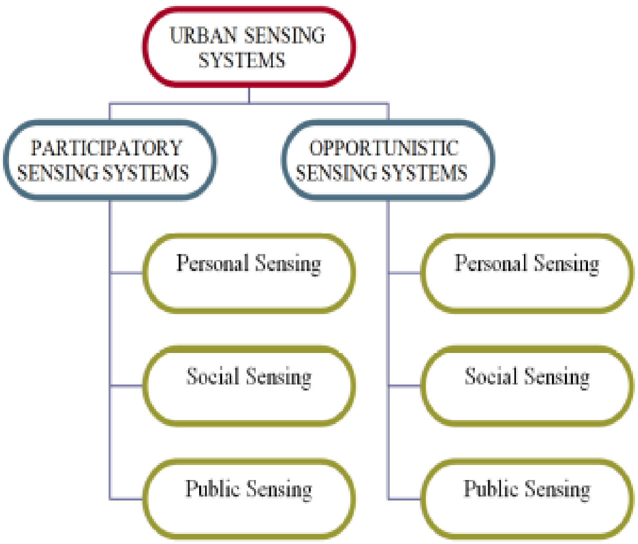


Fig. 2. The Urban Sensing

*a) Participatory Sensing:*

In Participatory Sensing, the participating client is legitimately participated in the sensing activity for example to snap obvious events or locations. This method incorporate individuals into important decision stages of the sensing systems, deciding effectively what application requests to acknowledge. An enormous count of laptops, mobile phones, cars and PDAs are furnished with GPS receivers and sensors.

*b) Opportunistic Sensing:*

In this type of Sensing, the client is unaware of dynamic applications. He/she is not included in making decisions instead of the Mobile phone itself settle on decisions in accordance to the sensed and stored information. When we determine various features of a person and his/her social life depends on where he is and what he is doing and so forth, while enhancing the features of mobile phone sensing systems.

Moreover, People Centric Urban sensing is divided into three important groups.

- Personal Sensing: Personal sensing [8] devices monitor or share individual's personal data i.e., the data of the client is very sensitive. It should not be shared with others. Such as his/her movements, activities, and day by day life patterns, health (for example pulse, blood pressure, sugar level and so forth), and location.
- Social Sensing: Here the data shares among the groups and communities. Here, The groups refers to social groups. This kind of sensing gather the information of any person and shares with others.
- Public Sensing: Here the data of shares with everybody which means the information of a person or a group available publicly. The data, which is very helpful for throughout population.

Fig. 2 gives an image of categorization of urban sensing systems. This figure is in accordance of urban mobile phone sensing systems are catagorized, the client is involving in important decision making of the sensing system or he/she may unaware about dynamic applications and the device itself recieves decisions brilliantly without any person's involvement.

### *2.2 Energy Efficient Sensing*

EEMSS stands for Energy-Efficient Mobile Sensing [9], which utilises internal sensors of smart mobile phone to perceive client's states and recognize state transitions and EEMSS also utilises a mixture of sensor readings from the Wi-Fi identifier, accelerometer, microphone, and GPS to naturally perceive client's state as explained by 3 real-time conditions; to be specific location (like present at office or visiting a hotel), background environment (like calm or noisy) and movement (like running and walking). An assessment of EEMSS with 10 clients more than multi week, utilised to distinguish transitions between end-user activities, discloses that a mobile device battery life can be increased by over 75%. Achieving decreased energy consumption needs the capacity to identify the user versatility context which will help in the administration of location sensors like GPS. Here we implements the accelerometer sensor, because of the accelerometer's capacity is used to distinguish development and less energy consumption of 96 mW. This implementation is just worried about whether the client portability state is "stationary" or "in-motion". For example, Sleeping at room or seating at your classroom board is catagorized as a "stationary" state. A person seated in a moving train or bus is categorized as an "in-motion" state.

Utilising probability statics we can separate among stationary and in-motion mobility states utilising the signals from the smart phone accelerometer. Several versatility recognisation devices need the sensor to be put on perticular parts of the body. Our design doesn't need this as it works irrelevant of the smart phone situation. To mix up the readings nevertheless of the smart phone position we utilize the extent of the vector.

### *2.3 Sensor Selection*

Smart phone sensors incorporate WiFi, accelerometer, audio, video, GPS, temperature sensor, and light sensor. The first essential input of the sensor is observing the client's context for latest collaberative applications. In any case, these sensors are energy consuming, and continuously gathering sensor information on smart phones sustain an inadmissible energy cost that leads to exhausting the constrained phone's battery speedly. The battery limit of an ongoing smart phone is constrained by size and weight; thusly, energy effectiveness of devices has turned out to be one of the real metrics that needs to be upgraded.

At that point we dig into the selection of sensors that can be used to evaluate the client's geographical location specifically. Arriving diminished energy consumption of sensors needs recognising the client's context utilising more energy productive sensors. Also, few applications need careful context data whereas others need an unpleasant evaluation about the context; consequently, which sensors to utilisation based on the needed exactness which is application-based.

#### *2.3.1 Classifying Sensors*

A crucial stage is to divide the sensors accessible in accordance of the context identified by everybody. A activity-based decision tree was create that points the client state and action in accordance to various sensor specifications. At that point, it's able to implement reverse engineering on this tree to determine the kind of context that can be give as output by every sensor. A bottom-up methodology could have been connected to explore this tree and examine which sensors gives a perticular kind of context; be that as it may, we just attentive on location sensors.

*2.3.2 Location Identification*

By using some experiments of Andro Sensor v1.9.4.4 mobile application, 3 alternatives were seen for recognising location which are CPS (Cellular Positioning System), WPS (Wireless Positioning System), or GPS (Geographical Positioning System). The mechanism sorts the alternatives in descending request of their effectiveness, and after that proficient sensor that reassures the minimum application accuracy need are picked.

*2.3.3 Features*

Various features can influence the decision of the sensor selection is to identify the client's location. The attributes are as follows:

- WiFi recognition-A binary property that inspects whether the present WiFi connection is a distinguished access point; like office, home, or university.
- Accelerometer-A binary trait that tells whether the accelerometer is identifying movements or not. Application accuracy-A discretized real-valued characteristics are measured in meters which separates the values into ranges of worthy ac-curacies by applications requesting location detection.
- Battery-A trait that tells about the state of the remaining battery lifetime (Average, Full, Empty).
- WiFi state-A binary trait which inspects whether WiFi is OFF or ON.

These features help in the decision of which is the majority energy effective location sensor to select the required application exactness at the same time.

*2.3.4 Data collection*

To gather information for supervised learning tasks, it was need to have an enormous count of experiments accomplished on smart phone. To understand every sensor's capacities and abilities, AndroSensor application was utilised. This application helps to every one of the sensors. It gives the estimation of every running sensor on the system; it also records this data. Specifically, this application gives the location of the client notwithstanding the exactness (in meters) of the sensor being utilised. These data collection experiments secured every single feasible combination of the previously mentioned highlight values.

*s*

The mark of the dataset is the selected sensor; thus, it consists 3 feasible values which are CPS, WPS, or GPS. Few of these rules consists as follows:

- If battery is full, the algorithm decides to pick the sensor.
- If battery is nearly unfilled e.g., less than 20%, regardless of the decision received by the algorithm and pick alternatively the sensor that uses the less energy regardless of what its exactness is.
- If WiFi is ON officially, at that point WPS will have greater effectiveness than CPS.
- If accelerometer is unrecognising any movement, don't find for the location because it tends to be found from the previous location recognized.
- If WiFi AP is recognised, don't find for the location since it can be well-known from the saved WiFi connection.

*2.4 Context-Awareness*

Context awareness [10] is the capability of a system or system segment to collect data about its environment at some random time and adjust behaviors appropriatly. Context-aware computing utilises software and hardware to naturally gather and examine information to manage responses.

Context encompasses any data that is pertinent to a given entity, like an application, a person or a device. As such, contextual data falls into a huge scope of classificatons consisting location, device, time, role, user, identity, activity, task, nearby devices/users privilege level, and process.

Cameras, microphones, Web browsers, and sensors and GPS receivers are on the whole prospective repositories of information for context-aware computing. It may accumulate information by using these and different repositories and answer in accordance to pre-established policies or by using computational intelligence. For user applications, context awareness can guide services and empower upgraded experiences consisting increased reality, contextual marketting messages and context-relevant information delivery.

A characteristic of mobile phones utilised to present pertinent, noteworthy data to the client, context awareness is also an innovative driver for Internet of Things (IoT), M2M (machine to machine), event-driven computing and ubiquitous computing environments.

## III. PROPOSED METHOD

In this paper, we proposed Priority based Dynamic Scheduler mechanism to gather the information utilizing the advanced mobile phone sensors. Priority based Dynamic Scheduler is a kind of scheduling mechanism where the needs are determined during the execution of the method. The objective of priority based dynamic scheduling is to adapt to dynamically changing progress and form an optimal configuration in self-sustained manner. Least slack time scheduling and Earliest deadline first scheduling are instances of Priority-Based Dynamic Scheduler. This mechanism diminishes the energy consumption and delay. The simulation results will shows better execution. This mechanism schedule the sensors optimally, Reduce the energy consumption and delay, and computation cost. This mechanism maximizes the performance of mobile sensor networks.

*Optimal Schedulable Utilization—* The aim is to limit the processor use under schedulable utilisation of a specific scheduling algorithm, which is scaled from 0 to 1. Higher schedulable utilisation implies higher utilisation of resource and the better the algorithm. For example, Earliest Deadline First (EDF) gives the perfect schedulable utilisation of 1 as opposed to under 0.69 with constant priority scheduling, for example, rate monotonic (RM).

In periodic real-time task model, a task's processor utilisation is characterised as execution time over period. Each set of periodic tasks with absolute processor utilisation less or equivalent than the schedulable utilisation of an algorithm can be attain-ably scheduled by that algorithm. In contrast to constant priority, priority-based dynamic scheduling could dynamically prioritise task deadlines accomplishing optimal schedulable utilisation [11] in the preemtible case.

*Routing Protocol (AODV Protocol)—* Here, we are using AODV protocal as Reactive protocol, AODV stands for Ad-hoc On-demand Distance Vector. It will send packets, when the sender node ready to send the packets. Before sending the data packets this protocol perform best path selection process by sending the RREQ (Route Request) packets. Best path is confirmed by the destination node with RREP (Route Reply) packets. Once it confirm the best then it will send actual data packets.

*Queue Model—* Queue model is used for maintain the queue length. That means link capacity. Using queue model we configure the link capacity. The no .of sending packets exceeds the link capacity. That packets will drop. So the excess packets will store in queue model. Even if the queue model capacity exceeds that packets will drop in network.

## IV. SYSTEM MODEL AND MODULES

The project is implemented by dividing the proposed system into four modules. Those are….

- Network Initialization
- Sensor Scheduling
- Collect Information
- Performance Analysis

### *4.1 Network Initialization*

In this module we construct the network with sensor devices. Each sensor node will collect the information by sensing signal. In this phase sensor nodes are activate and ready to collect the data.

*4.2 Sensor Scheduling*

In this module we schedule the sensors for data collection. In sensor scheduling we following priority calculation approach for optimal scheduling. The priority is based on bandwidth , high bandwidth sensors are high priority and low bandwidth sensors are low priority. The sensor scheduler , schedule the high priority sensors first and later low priority sensors. Here, the dynamic sensor selection [19] requires to select the sensor for which we can schedule them easily.

The general work flow of the Priority-Based Dynamic Scheduler is shown in Fig. 3.

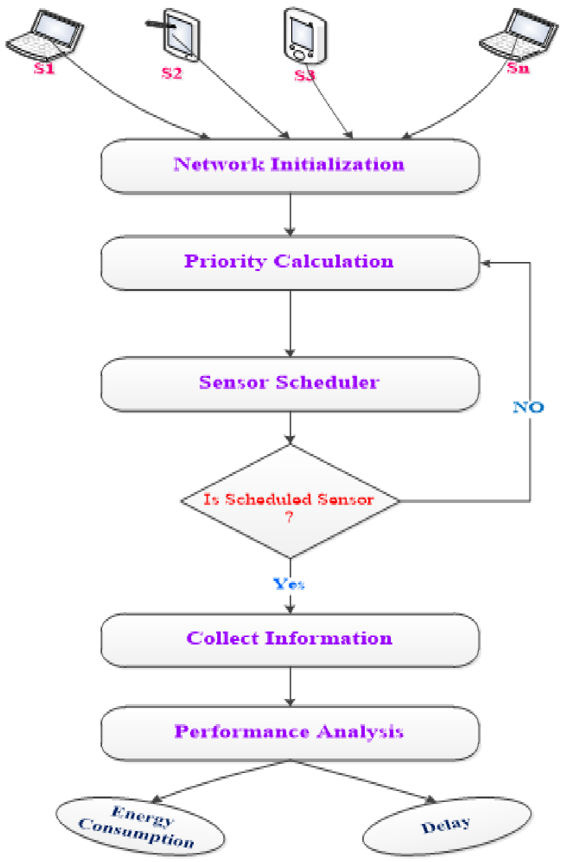


Fig. 3. General work flow of Priority-Based Dynamic Scheduler

*4.3 Collect Information*

In this module the each scheduled sensor node will collect the information by sensing the signals. Before collect the information the sensor node should be schedule by the sensor scheduler based on priority.

*4.4 Performance Analysis*

In this module we trace the information from different sensor nodes. Using the trace file we analyze the performance. The performance can be measured in different terms, those are delay and energy consumption.

The algorithm which is using in the proposed is as follows:

Algorithm Name : Priority Based Scheduling Algorithm
Input :Scheduled Sensor Nodes
Output : Measure Performance Metrics

1) Activate Sensor Nodes ($SN_n$) in WSN
2) Calculate Priority of Each Sender Sensor Node($SSN(p_n)$)
3) If($SSN(p_n) > SSN(p_{(n-1)})$)

4) Set Sensor Node Priority
5) Schedule Sensor Node
6) If( Sensor Node Not Schedule)
7) Repeat the step 2
8) Collect the Information
9) Measure Performance Metrics
10) End

## V. RESULTS

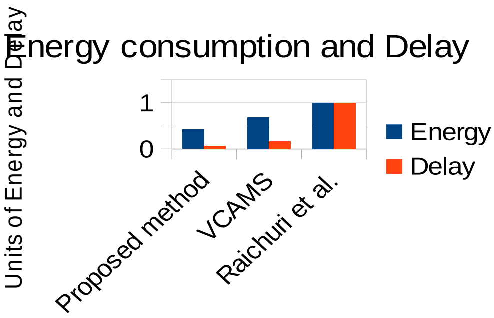


Fig. 4. Comparision of Energy consumption and Delay

Here, in the figure 4, we compared the energy consumption and delay of proposed method and existing methods. The proposed method consumed 0.4% units. The existing VCAMS utilized approximately 0.70% and other consumed 1.00%. Here we compared the delay of proposed method and existing methods. The proposed method consumed 0.07% units. The existing VCAMS utilized approximately 0.16% and other consumed 1.00%.

## VI. CONCLUSION

The mobile devices plays a important role in wireless sensor networks. The mobile devices work as gateway between the user and social world. In mobile sensor networks wide range of applications developed. Grabing few domains in context-aware computing involving personal monitoring, healthcare, and navigation. Such growth and fame have given rise to context aware computing as a branch of mobile computing in which applications recognise and use contextual data such as health conditions, locations, and activities. In this paper, we proposed Priority based Dynamic Scheduler mechanism to gather the information using the smart phone sensors. This mechanism schedule the sensors dynamically based on priority. This mechanism reduces the energy consumption and delay. The simulation results showed better performance.

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