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A Hybrid Approach for Scheduling in WIMAX for Reduction of Process Waiting Time

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ABSTRACT: Wireless sensor networks consist of hundreds or thousands of applications such as environmental monitoring, traffic analysis, tactical systems and industrial process monitoring. Most of the packet-scheduling mechanisms of WSN use First Come First Served (FCFS), non-preemptive priority and preemptive priority scheduling algorithms. These algorithms incur a high processing overhead and long end-to-end data transmission delay due to the FCFS concept .These algorithms are not dynamic to the changing requirements of WSN applications since their scheduling policies are predetermined. Developing packet scheduling algorithms in wireless sensor networks can efficiently enhance delivery of packets through wireless links. Packet scheduling can guarantee quality of service and improve transmission rate in wireless sensor networks. Considering this combination we are basically focusing on the nodes of wireless sensor network as the process required shortest coverage area to reach. We apply FCFS algorithm & priority algorithm for calculating delay. We can use it for mixing with coverage area for further process. After priority on the basis of time reduction we have to apply SJF (shortest job first) execution time finding. Finally, we have to compare on the basis of delay and execution time. Improve the performance of task scheduling schemes in terms of end to end delay and deadlock prevention.

KEYWORDS: WSN, Scheduling, CPU, Delay, Matlab

1 INTRODUCTION

In wireless communication systems, the process of scheduling users for communication plays an important role for the overall performance. Scheduling is normally part of the general resource management, and typically involves allocating communication resources, such as the transmission resources of a shared radio medium, to users according to some priority order. Scheduling is of outmost importance in many wireless applications and system environments such as the IP Multimedia Subsystem (IMS) that supports user-to-user communication services. For example, real-time user-to-user multimedia telephony services play a key role to satisfy the needs of different services and to improve perceptual quality. When a lot of users enjoy the multimedia services concurrently, the available communication resources need to be allocated efficiently. This requires an efficient strategy and implementation for scheduling user access the communication resources. In order to schedule processes fairly, a round-robin scheduler generally employs time-sharing, giving each job a time slot or *quantum* (its allowance of CPU time), and interrupting the job if it is not completed by then. The job is resumed next time a time slot is assigned to that process. In the absence of time-sharing, or if the quanta were large relative to the sizes of the jobs, a process that produced large jobs would be favored over other processes.

First-Come-First-Served (FCFS) Scheduling:

First-Come-First-Served algorithm is the simplest scheduling algorithm is the simplest scheduling algorithm. Processes are dispatched according to their arrival time on the ready queue. Being a non preemptive discipline, once a process has a CPU, it runs to completion. The FCFS scheduling is fair in the formal sense or human sense of fairness but it is unfair in the sense that long jobs make short jobs wait and unimportant jobs make important jobs wait. FCFS is more predictable than most of other schemes since it offers time. FCFS scheme is not useful in scheduling interactive users because it cannot guarantee good response time. The code for FCFS scheduling is simple to write and understand. One of the major drawbacks of this scheme is that the average time is often quite long. Other names of this algorithm are:

- First-In-First-Out (FIFO)
- Run-to-Completion
- Run-Until-Done

Round robin scheduling algorithm:

Round robin is the scheduling algorithm used by the CPU during execution of the process. Round robin is designed specifically for time sharing systems. It is similar to **first come first serve scheduling algorithm** but the preemption is the added functionality to switch between the processes. Round-robin (RR) is one of the algorithms employed by process and network schedulers in computing. As the term is generally used, time slices are assigned to each process in equal portions and in circular order, handling all processes without priority (also known as cyclic executive). Round-robin scheduling is simple, easy to implement, and starvation-free. Round-robin scheduling can also be applied to other scheduling problems, such as data packet scheduling in computer networks. It is an Operating System concept The name of the algorithm comes from the round-robin principle known from other fields, where each person takes an equal share of something in turn.

2 RELATED WORK

Scheduling is a rule that specifies which user is allowed to transmit and which user is allowed to receive at each timeslot. Basically Scheduling in Wireless Networks reviews the problem of scheduled channel access in wireless networks with emphasis on ad hoc and sensor networks as opposed to Wi-Fi, cellular, and infrastructure-based networks. It is intended to provide a reference point for the rich set of problems that arise in the allocation of resources in modern and future networks. Some of the factors which effect scheduling are as follows:

- **Deadline:**
  Packet scheduling schemes can be classified based on the deadline of arrival of data packets to the base station (BS), which is: First Come First Served (FCFS). In FCFS, many data packets arrive late and thus, experience long waiting times. Earliest Deadline First: Whenever a number of data packets are available at the ready queue and each packet has a deadline within which it should be sent to BS, the data packet which has the earliest deadline is sent first. This algorithm is considered to be efficient in terms of average packet waiting time and end-to-end delay.

- **Priority:**
  Packet scheduling schemes can be classified based on the priority of data packets that are sensed at different sensor nodes.
  - **Non-preemptive:**
    In non-preemptive priority packet scheduling, when a packet t1 starts execution, task *t*1 carries on even if a higher priority packet *t*2 than the currently running packet *t*1 arrives at the ready queue. Thus *t*2 has to wait in the ready queue until the execution of *t*1 is complete.
  - **Preemptive:**
    In preemptive priority packet scheduling, higher priority packets are processed first and can preempt lower priority packets by saving the context of lower priority packets if they are already running.

- **Packet Type:**
  Packet scheduling schemes can be classified based on the types of data packets, which is following as

- **Real-time packet scheduling:**
  Packets at sensor nodes should be scheduled based on their types and priorities. Real-time data packets are considered as the highest priority packets among all data packets in the ready queue. Hence, they are processed with the highest priority and delivered to the BS with a minimum possible end-to-end delay.
- **Non-real-time packet scheduling:**
  Non-real time packets have lower priority than real-time tasks. They are hence delivered to BS either using first come first serve or shortest job first basis when no real-time packet exists at the ready queue of a sensor node. These packets can be intuitively preempted by real-time packets.

- **Number of Queue:**
  Packet scheduling schemes can also be classified based on the number of levels in the ready queue of a sensor node. These are as follows: Single Queue, Multi-level Queue.

As per literature review previous algorithm as FCFS, Priority, Round robin which resulted in many problems like delay or waiting time. Therefore, overall execution time is more. So there is need of such algorithm which will provide better QOS.

3 PROPOSED WORK

Scheduling is basically a tool to control the execution of processes that is performed by a computer. Therefore at first we have used priority based packet scheduling scheme which aims at scheduling different types of data packets, such as real time and non-real-time data packets at sensor nodes with resource constraints in Wireless Sensor Networks. Most of the packet-scheduling mechanisms of Wireless Sensor Networks use First Come First Served (FCFS) but these algorithms results in many problems such as long end-to-end data transmission delay, high energy consumption, deprivation of high priority real-time data packets also it results in improper allocation of data packets to queues. So here in this thesis we are making a combination of priority scheduling with the coverage area consideration and SJF which is a priority scheduling where priority is the predicted next CPU burst time. Hence by using this combination we can overcome those entire problems which were occurred previously. Considering this combination we are basically focusing on the nodes of wireless sensor network as the process required shortest coverage area to reach .Thus by the use of this combination the execution time will get reduced and give much better results than before.

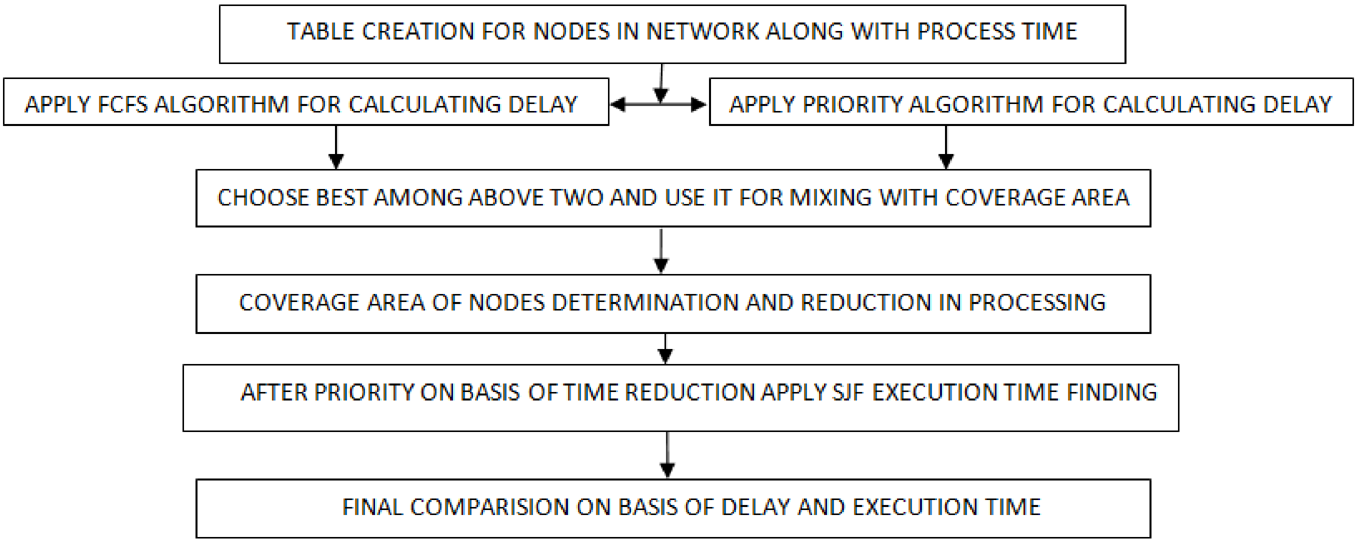
Objective:

1. To implement fast and Modified Scheduling algorithm.
2. To reduce node to node delay time.
3. To reduce overall processing time.
4. Compare with previous algorithm.

4 METHODOLOGY

Here, in this research the process of scheduling includes:

1. Firstly we have to create a table for nodes present in the network along with the process time.
2. Then, apply FCFS algorithm for calculating delay.
3. At the same time apply priority algorithm for calculating delay simultaneously.
4. After this we can choose best algorithm among both and then we can use it for mixing with coverage area for the further process.
5. Now, the determination and reduction in processing of the coverage area of nodes has been done.
6. Most importantly now after priority on the basis of time reduction we have to apply SJF (shortest job first) execution time finding.
7. Now, finally we have to compare on the basis of Delay and Execution time.



5 Performance Analysis

For the analysis we have used MATLAB tool. Table 1 shows a number of 12 processes that arrive at same time in the given order. To analyze the performance of these processes, we have applied various scheduling (namely FCFS, Priority & Proposed) algorithms.

Table 1. List of Processes with Burst time and Priority

Process	CPU Burst Time (ms)	Priority
P1	22	6
P2	14	4
P3	26	5
P4	30	11
P5	24	9
P6	45	10
P7	32	7
P8	40	2
P9	19	1
P10	26	3
P11	10	12
P12	15	8

Final results obtained from the proposed scheduling algorithm for the Average Dealy Time and the Average Completion Time along with their comparative analysis with the other scheduling algorithms (FCFS and Priority) are given below in Table 2 and Table 3 respectively.

Table 2. Average Delay Time (ms)

FCFS	PRIORITY	PROPOSED
144.4167	140.0833	90.5833

Table 3. Average Completion Time (ms)

FCFS	PRIORITY	PROPOSED
169.6667	165.3333	113.4167

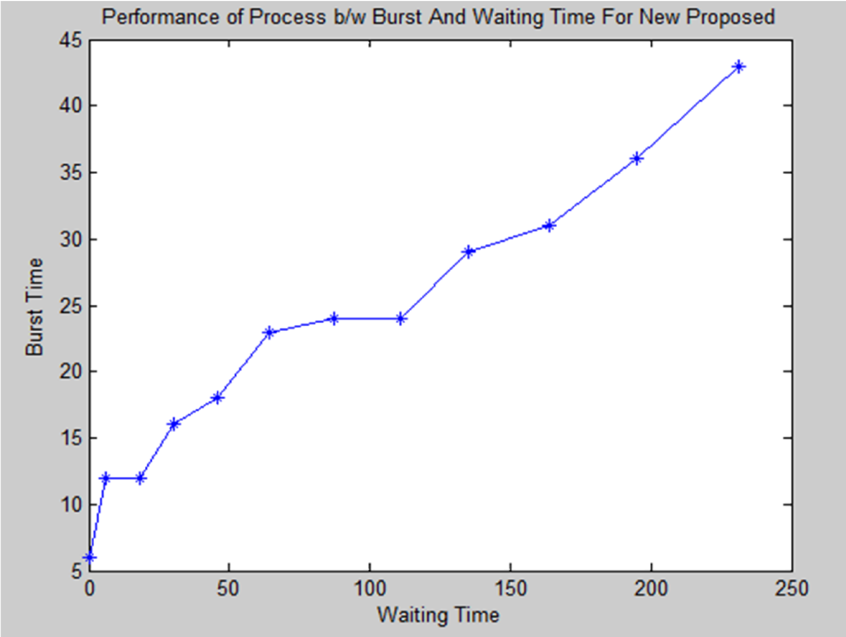


Fig. 1. Performance of process b/w Burst and Waiting time for proposed algorithm

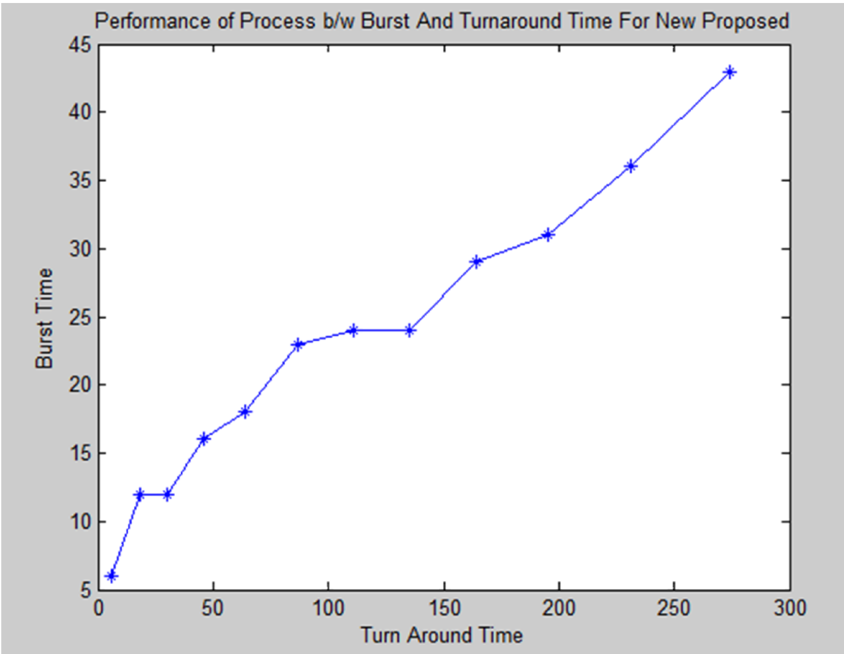


Fig. 2. Performane of Process b/w Burst and Turnaround for proposed algorithm

6 CONCLUSION

It ensures minimum end-to-end data transmission for the highest priority data while exhibiting acceptable fairness towards lowest-priority data. Experimental results show that the proposed DMP packet scheduling scheme has better performance than the existing FCFS and Multilevel Queue Scheduler in terms of the average task waiting time and end-to-end delay. The degradation of the system performance such as end-end delay and packet delivery ratio can done by a condition called deadlock a situation in which the resources held by the real time task for a longer period of time such that the other tasks need to wait for an undefined period time.

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