RTOS ASSIGNMENT

REAL TIME INFANT SAFETY MONITORING SYSTEM BASED ON FREE RTOS

SUBMITTED BY,

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CONCEPTS USED

1. Worst case execution time calculation: Number of assembly instructions*time taken for execution of each instruction

2. Priority assignment: Priority based pre-emptive scheduling

3. Scheduling: Pre-emptive scheduling

ABSTRACT:

All infants should be put down for sleep on their backs to reduce the risk for Sudden Infant Death Syndrome, also called as SIDS. In the proposed system, the health of the infant is monitored using Real time health monitoring system using necessary sensors and accordingly actions will be taken according to their priorities and this happens when they reach their threshold values and then necessary actuations will be taken. The proposed system consists of 3 tasks which are mentioned below and the priorities has been given to the tasks in a Priority based pre-emptive scheduling manner.

TASKS:

1.Task1: Measuring the heart rate of the infant when it exceeds its threshold.

2.Task2: Checking the position of the infant using accelerometer, checking if the infant is lying in its back or sideways or normal position. If infant is lying in its back, then it’s a critical condition.

3.Task3: Measuring the temperature of infant when it exceeds a particular threshold.

SENSORS USED:

1.Task1: AD8232

2.Task2: ADXL335

3.Task3: NTC thermistors

ACTUATIONS DONE:

1.Task1: SMS indicating heart rate alert is send and also buzzer is turned on.

2.Task2: A buzzer is turned on and a message is send to their parents indicating that infant position is critical.

3.Task3: A message is send indicating that infant's temperature is not normal and also a buzzer is turned on.

EXECUTION TIME CALUCULATION:

1. Number of assembly instructions of task1 = 10

Time taken for execution of each clock cycle= 80microsec

WCET of task1=10*20=800microsec

2. Number of assembly instructions of task2 = 10

Time taken for execution of each clock cycle= 60microsec

WCET of task1=10*20=600microsec

3. Number of assembly instructions of task3 = 10

Time taken for execution of each clock cycle= 40microsec

WCET of task1=10*20=400microsec

TICK SELECTION:

As the times taken for the execution of all the three tasks is 400,600,800

Let us consider one tick as "200microsec"

Ticks required for task1=2

Ticks required for task2=1

Ticks required for task3=2

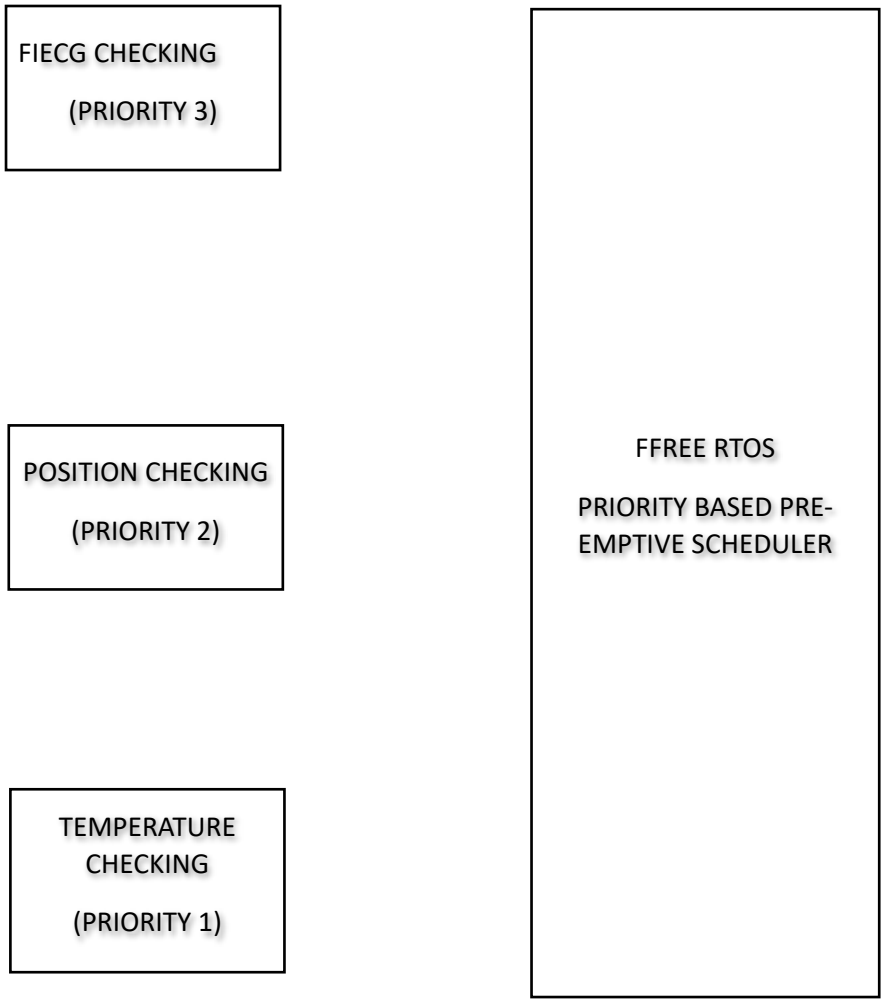
TASK PARAMETERS:

TASK1- PRIORITY (3)-DEADLINE (800ms=4 ticks) {highest priority}

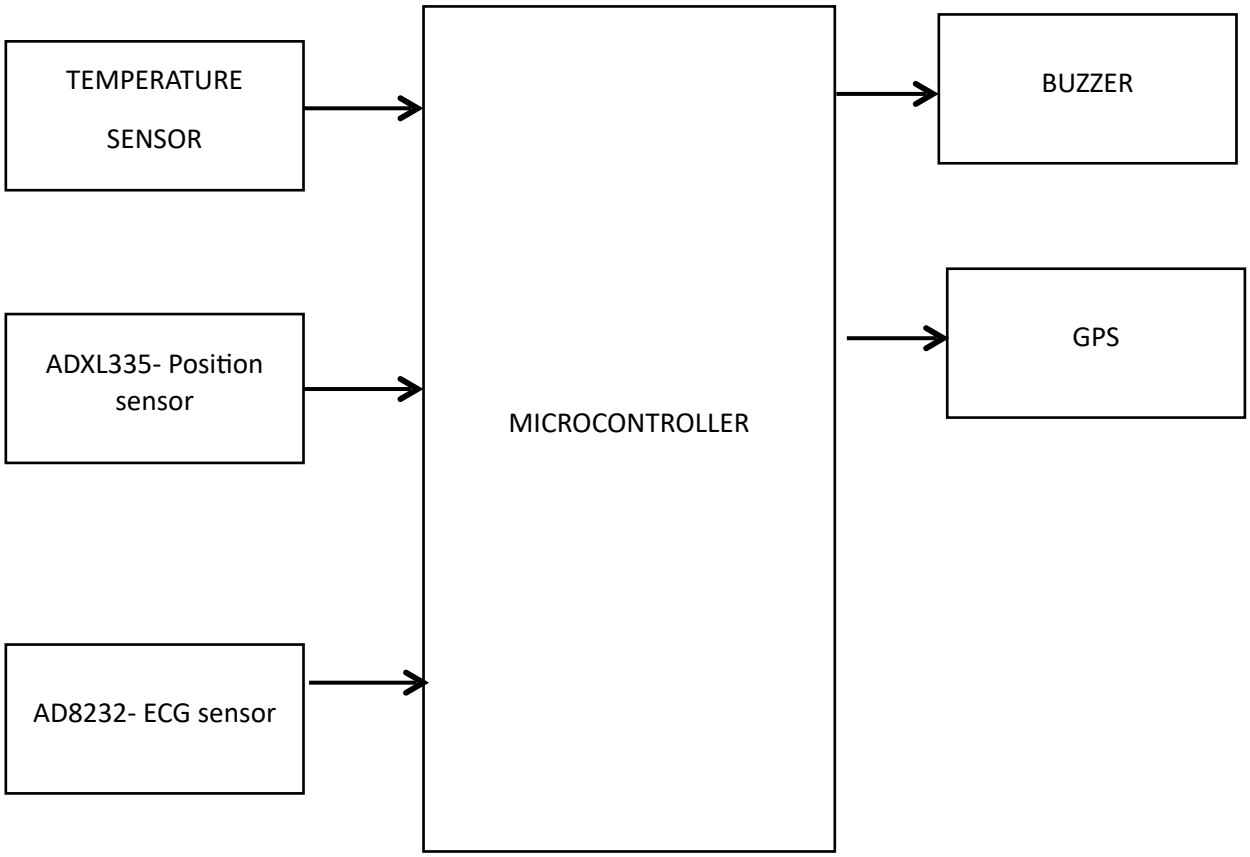
TASK2- PRIORITY (2)-DEADLINE (1200ms=6 ticks) {medium priority}

TASK3-PRIORITY(1)-DEADLINE(1600ms=8ticks) {low priority}

BLOCK DIAGRAM



Increasing order of priority.



WORKING

Here the first task is to check the ECG (heart rate) of the infant. If it exceed its thresold(upnormal variation in the ECG signal) then SMS is send indicating that a heart rate alert has occurred to their parents and also buzzer is turned on. The second task is to measure the position of the infant. If the infant is lying in its back then it's a critical condition, then a buzzer is turned on and a message is send to their parents indicating that infant position is critical. The third task is to check the temperature of the infant and if it exceeds its critical threshold value then a message is send indicating that infant's temperature is not normal and also a buzzer is turned on.

PSEUDO CODE:

Step1: All the tasks will be released at a time and task 1 will be executing first as it is having the highest priority, the heart rate of the infant is monitored

Step2: After meausring the heart rate, it is compared with the threshold value. If it is above or below the threshold value the actuation is done.

```
If(n>threshold)
{
Make the buzzer pin high;
SMS is send;
}
```

Step3: The task with the second highest priority will be executed i.e, position of the infant is monitored ie x,y and axis are checked

```
If((x>threshold1)&&( y>threshold2)&&( z>threshold3))
{
Make the buzzer pin high;
SMS is send;
}
```

Step4: The task with lowest priority will be exected next if there is no highest priority task is there to execute ie the temperature of the infant is monitored

```
If(temp>threshold)
{
Make the buzzer pin high;
SMS is send;
}
```

Step4: Check whether there is any highest priority task comes to ready que

If(highpriority)

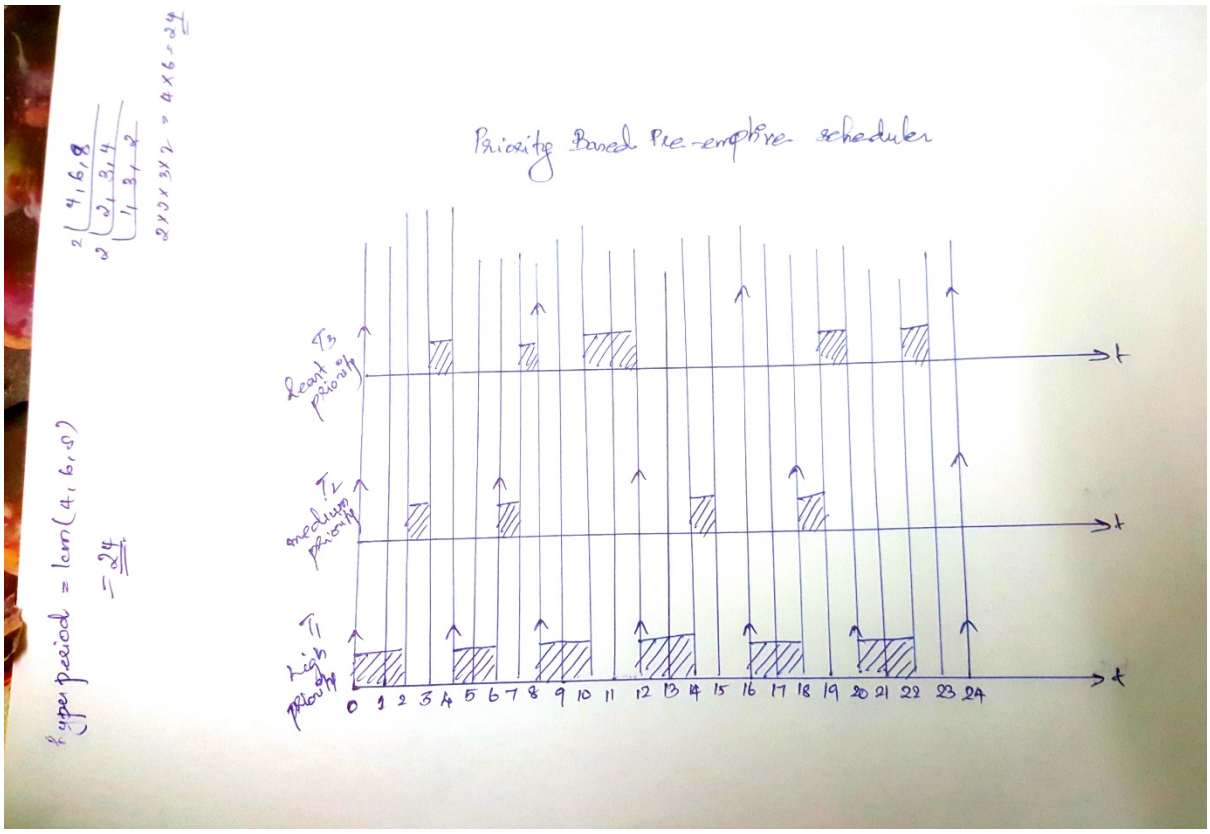
{

Preempt(lowpriorty);

Execute(highpriority);

}

EXECUTION TRACE:



CONCLUSION

By seeing the execution trace we can clearly say that all the tasks are schedulable. As all of them are meeting their deadlines. By using real time operating system, we can ensure that all the tasks are executing on a timely basis by giving assurance to the tasks meeting their dead line. As the scheduling is done on the basis of priority based pre-emptive scheduling assignment it is very easy to implement and the obtained results will be accurate.