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Increasing the Lifetime of Network by Enhancing Coverage in Wireless Sensor Network

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ABSTRACT

Background: Scheduling sensor activities is an effective way to prolong the lifetime of wireless sensor networks (WSNs). In this paper, we explore the problem of wake-up scheduling in WSNs where sensors have different lifetime. A novel Probability-Based Prediction and Sleep Scheduling (PPSS) strategy is proposed to prolong the network lifetime with full coverage constraint, tracking performance can be improved if the target motion can be predicted and nodes along the trajectory can be proactively awakened. In the PPSS strategy, to improve energy efficiency of proactive wake up. we start with designing a target prediction, Objective: Based on the prediction results, PPSS then precisely selects the nodes to awaken and reduces their active time, so as to enhance energy efficiency. Results: Simulation results reveal that PPSS yields better performance compared with the Energy-Efficient Local Wake-up Scheduling algorithm. Conclusion: The experimental results show that compared to PPSS algorithm, modified PPSS improves energy efficiency than the existing work

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INTRODUCTION

Wireless sensor networks (WSNs) are increasingly being envisioned for collecting data, such as physical or environmental properties, from a geographical region of interest. WSNs are composed of a large number of low-cost sensor nodes, which are powered by portable power sources, e.g., batteries

A wireless sensor network (WSN) consists of a large number of sensors which are densely deployed over a large area. Each sensor monitors a physical environment and communicates via wireless signals. With the advancements in hardware miniaturization and wireless communication technologies, WSNs have been used in various applications such as education, warfare, and traffic monitoring. Regardless of the applications, extending the network lifetime is a critical issue in WSNs. This is because the sensors are battery-powered and generally difficult to be recharged. Unlike detection, a target tracking system is often required to ensure continuous monitoring, i.e., there always exist nodes that can detect the targ*et al*ong its trajectory.

In target tracking applications, idle listening is a major source of energy waste. To reduce the energy consumption during idle listening, duty cycling is one of the most commonly used approach in which Sensor nodes are put into sleep state for most of the time, and only wake them up periodically. Sometimes, the sleep pattern of nodes may also be explicitly scheduled, i.e., forced to sleep or awakened on demand. This is usually called sleep scheduling.

On the contrary, a sensor in sleep mode does not perform the sensing task and consumes little energy. Therefore, by appropriately scheduling sensors to be in low-energy sleep mode and waking them up when necessary, the network lifetime can be prolonged. In the literature, various efforts have been made on optimizing the wake-up scheduling in WSNs.

We present a probability-based target prediction and sleep scheduling protocol (PPSS) to improve the efficiency of proactive wake up and enhance the energy efficiency with limited loss on the tracking performance. With a target prediction scheme, PPSS not only predicts a target's next location, but also describes the probabilities with which it moves along all the directions. Target prediction of PPSS provides a directional probability as the foundation of differentiated sleep scheduling in a geographical area. Then, based on the

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prediction results, PPSS enhances energy efficiency by reducing the number of proactively awakened nodes and controlling their active time in an integrated manner.

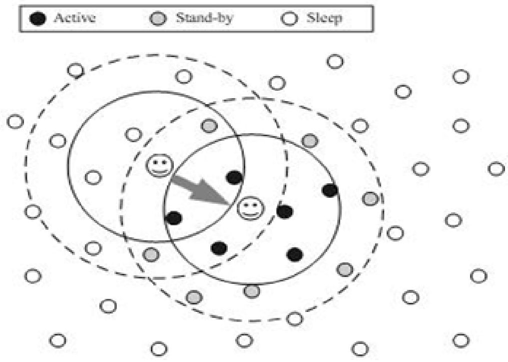

Fig. 1: scheduling sleep pattern based on Target prediction.

Since nodes often run on batteries that are generally difficult to be recharged once deployed, energy efficiency is a critical feature of WSNs for the purpose of extending the network lifetime. However, if energy efficiency is enhanced, the quality of service (QoS) of target tracking is highly likely to be negatively influenced. For example, forcing nodes to sleep may result in missing the passing target and lowering the tracking coverage. Therefore, energy-efficient target tracking should improve the trade off between energy efficiency and tracking performance—e.g., by improving energy efficiency at the expense of a relatively small loss on tracking performance.

When nodes operate in a duty cycling mode, tracking performance can be improved if the target motion can be predicted and nodes along the trajectory can be proactively awakened (Bo Jiang, 2013). However, this will negatively influence the energy efficiency and constrain the benefits of duty cycling. In this paper, we present a Probability-based Prediction and Sleep Scheduling protocol (PPSS) to improve energy efficiency of proactive wake up. We start with designing a target prediction method based on both kinematics and probability. Based on the prediction results, PPSS then precisely selects the nodes to awaken and reduces their active time, so as to enhance energy efficiency with limited tracking performance loss. We evaluated the efficiency of PPSS with both simulation-based and implementation-based experiments.

Data collection is a fundamental operation in wireless sensor networks (WSN) where sensor nodes measure attributes about a phenomenon of interest and transmits their readings to a common base station. In this chapter, we survey contention-free Time Division Multiple Access (TDMA) based scheduling protocols for such data collection applications over tree-based routing topologies. We classify the algorithms according to their common design objectives, identifying the following four as the most fundamental and most studied with respect to data collection in WSNs: (i) minimizing schedule length, (ii) minimizing latency, (iii) minimizing energy consumption, and (iv) maximizing fairness.

Lifetime maximization is one key element in the design of sensor-network-based surveillance applications. We propose a protocol for node sleep scheduling that guarantees a bounded-delay sensing coverage while maximizing network lifetime. Our sleep scheduling ensures that coverage rotates such that each point in the environment is sensed within some _nite interval of time, called the detection delay. The framework is optimized for rare event detection and allows favourable compromises to be achieved between event detection delay and lifetime without sacricing (eventual) coverage for each point (Cao, Q., 2005).

II Objective of the Paper:

Scheduling sensor activities is an effective way to prolong the lifetime of wireless sensor networks (WSNs). The proposed Concept has a limitation of detecting only single target so in order to detect the multiple number of Mobile targets we have to enhance the proposed concept of Local Active Environment and sleep scheduling with boundary selection nodes

III Routing protocols in ad hoc network:

3.1 Protocols:

Table-driven (or proactive):

The nodes maintain a table of routes to every destination in the network, for this reason they periodically exchange messages. At all times the routes to all destinations are ready to use and as a consequence initial delays before sending data are small. Keeping routes to all destinations up-to-date, even if they are not used, is a disadvantage with regard to the usage of bandwidth and of network resources.

On-Demand (or Reactive):

These protocols were designed to overcome the wasted effort in maintaining unused routes. Routing information is acquired only when there is a need for it. The needed routes are calculated on demand. This saves the overhead of maintaining unused routes at each node, but on the other hand the latency for sending data packets will considerably increase.

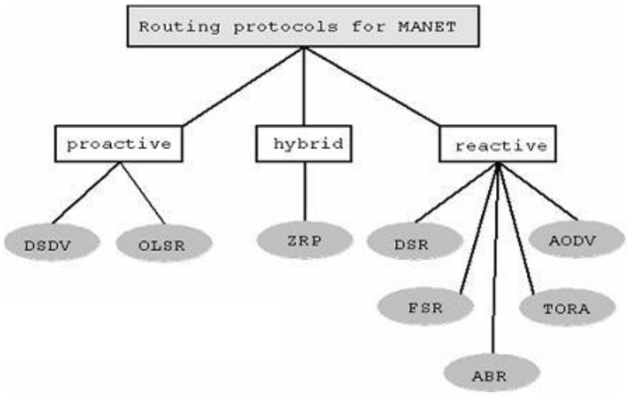

Fig. 2: Routing protocol.

3.1.1 Proactive:

DSDV (Destination-Sequence Distance Vector):

DSDV has one routing table, each entry in the table contains: destination address, number of hops toward destination, next hop address. Routing table contains all the destinations that one node can communicate. When a source A communicates with a destination B, it looks up routing table for the entry which contains *destination* address as B. Next hop address C was taken from that entry. A then sends its packets to C and asks C to forward to B. C and other intermediate nodes will work in a similar way until the packets reach B. DSDV marks each entry by sequence number to distinguish between old and new route for preventing loop.

DSDV use two types of packet to transfer routing information: full dump and incremental packet. The first time two DSDV nodes meet, they exchange all of their available routing information in full dump packet. From that time, they only use incremental packets to notice about change in the routing table to reduce the packet size. Every node in DSDV has to send update routing information periodically. When two routes are discovered, route with larger sequence number will be chosen. If two routes have the same sequence number, route with smaller hop count to destination will be chosen.

DSDV has advantages of simple routing table format, simple routing operation and guarantee loop-freedom.

The disadvantages are

(i) A large overhead caused by periodical update

(ii) Waste resource for finding all possible routes between each pair, but only one route is used.

3.1.2 Reactive:

On-demand Routing Protocols:

In on-demand trend, routing information is only created to requested destination. Link is also monitored by periodical Hello messages. If a link in the path is broken, the source needs to rediscovery the path. On-demand strategy causes less overhead and easier to scalability. However, there is more delay because the path is not always ready. The following part will present AODV, DSR, TORA and ABR as characteristic protocols of on-demand trend.

AODV Routing:

Ad hoc on demand distance vector routing (AODV) is the combination of DSDV and DSR. In AODV, each node maintains one routing table. Each routing table entry contains:

- Active neighbor list: a list of neighbor nodes that are actively using this route entry, Once the link in the entry is broken, neighbor nodes in this list will be informed.
- Destination address
- Next-hop address toward that destination

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- Number of hops to destination
- Sequence number: for choosing route and prevent loop
- Lifetime: time when that entry expires

Routing in AODV consists of two phases: Route Discovery and Route Maintenance. When a node wants to communicate with a destination, it looks up in the routing table. If the destination is found, node transmits data in the same way as in DSDV. If not, it start Route Discovery mechanism: Source node broadcast the Route Request packet to its neighbor nodes, which in turns rebroadcast this request to their neighbor nodes until finding possible way to the destination. When intermediate node receives a RREQ, it updates the route to previous node and checks whether it satisfies the two conditions:

- There is an available entry which has the same destination with RREQ
- Its sequence number is greater or equal to sequence number of RREQ. If no, it rebroadcast RREQ.

If yes, it generates a RREP message to the source node. When RREP is routed back, node in the reverse path updates their routing table with the added next hop information. If a node receives a RREQ that it has seen before (checked by the sequence number), it discards the RREQ for preventing loop. If source node receives more than one RREP, the one with greater sequence number will be chosen. For two RREPs with the same sequence number, the one will less number of hops to destination will be chosen. When a route is found, it is maintained by Route Maintenance mechanism: Each node periodically send Hello packet to its neighbors for proving its availability. When Hello packet is not received from a node in a time, link to that node is considered to be broken. The node which does not receive Hello message will invalidate all of its related routes to the failed node and inform other neighbor using this node by Route Error packet. The source if still want to transmit data to the destination should restart Route Discovery to get a new path. AODV has advantages of decreasing the overhead control messages, low processing, quick adapt to net work topology change, more scalable up to 10000 mobile nodes. However, the disadvantages are that AODV only accepts bi-directional link and has much delay when it initiates a route and repairs the broken link.

Dynamic Source Routing Protocol:

DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration.

For restricting the bandwidth, the process to find a path is only executed when a path is required by a node (On-Demand-Routing). In DSR the sender (source, initiator) determines the whole path from the source to the destination node (Source-Routing) and deposits the addresses of the intermediate nodes of the route in the packets.

DSR contains 2 phases:

- Route Discovery (find a path)
- Route Maintenance (maintain a path)

Route Discovery:

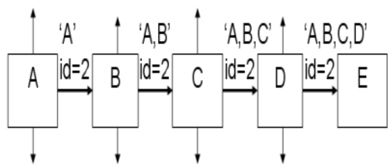

Fig. 3: Route discovery.

If node A has in his Route Cache a route to the destination E, this route is immediately used. If not, the Route Discovery protocol is started:

- Node A (initiator) sends a Route Request packet by flooding the network
- If node B has recently seen another Route Request from the same target or if the address of node B is already listed in the Route Record, Then node B discards the request!
- If node B is the target of the Route Discovery, it returns a Route Reply to the initiator. The Route Reply contains a list of the "best" path from the initiator to the target. When the initiator receives this Route Reply, it caches this route in its Route Cache for use in sending subsequent packets to this destination.
- Otherwise node B isn't the target and it forwards the Route Request to his neighbors (except to the initiator).

Route Maintenance:

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In DSR every node is responsible for confirming that the next hop in the Source Route receives the packet. Also each packet is only forwarded once by a node (hop-by- hop routing). If a packet can't be received by a node, it is retransmitted up to some maximum number of times until a confirmation is received from the next hop.

Only if retransmission results then in a failure, a Route Error message is sent to the initiator that can remove that Source Route from its Route Cache. So the initiator can check his Route Cache for another route to the target. If there is no route in the cache, a Route Request packet is broadcasted.

- If node C does not receive an acknowledgement from node D after some number of requests, it returns a Route Error to the initiator A.
- As soon as node receives the Route Error message, it deletes the broken-link-route from its cache. If A has another route to E, it sends the packet immediately using this new route.
- Otherwise the initiator A is starting the Route Discovery process again.
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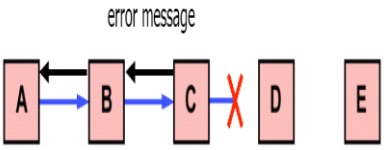

Fig. 4: Route maintenance.

Advantages:

Reactive routing protocols have no need to periodically flood the network for updating the routing tables like table-driven routing protocols do. Intermediate nodes are able to utilize the Route Cache information efficiently to reduce the control overhead. The initiator only tries to find a route (path) if actually no route is known (in cache). Current and bandwidth saving because there are no hello messages needed (beacon-less).

Disadvantages:

The Route Maintenance protocol does not locally repair a broken link. The broken link is only communicated to the initiator. The DSR protocol is only efficient in MANETs with less than 200 nodes. Problems appear by fast moving of more hosts, so that the nodes can only move around in this case with a moderate speed. Flooding the network can cause collusions between the packets. Also there is always a small time delay at the begin of a new connection because the initiator must first find the route to the target.

TORA (Temporary Ordered Routing Algorithm):

TORA is based on link reversal algorithm. Each node in TORA maintains a table with the distance and status of all the available links. Detail information can be seen at [38]. TORA has three mechanisms for routing:

Route Creation:

TORA uses the "height" concept for discovering multiple routes to a destination. Communication in TORA network is downstream, from higher to lower node. When source node does not have a route to destination, it starts Route Creation by broadcasting the Query messages (QRY). QRY is continuing broadcasted until reaching the destination or intermediate node that have the route to the destination. The reached node then broadcast Update (UPD) message which includes its height. Nodes receive this UPD set a larger height for itself than the heightin UPD, append this height in its own UPD and broadcast. This mechanism is called reversal algorithm and is claimed to create number of direct links from the originator to the destination.

Route Maintenance:

Once a broken link is discovered, nodes make a new reference height and broadcast to their neighbors. All nodes in the link will change their reference height and Route Creation is done to reflect the change.

Route Erasure:

Erases the invalid routes by flooding the "clear packet" through the network. The advantages of TORA are: having multiple paths to destination decreases the route creation in link broken case therefore decrease overhead and delay to the network. TORA is also claimed to be effective on large and mildly congested network . The drawbacks are requiring node synchronization due to "height" metric and potential for oscillation. Besides that, TORA may not guarantee to find all the routes for reserving in some cases.

IV Review stage:

Introduction:

Wireless sensor networks (WSNs) are increasingly being envisioned for collecting data, such as physical or environmental properties, from a geographical region of interest. WSNs are composed of a large number of low-cost sensor nodes, which are powered by portable power sources, e.g., batteries. When nodes operate in a duty cycling mode, tracking performance can be improved if the target motion can be predicted and nodes along the trajectory can be proactively awakened. However, this will negatively influence the energy efficiency and constrain the benefits of duty cycling. In this paper, we present a Probability-based Prediction and Sleep Scheduling protocol (PPSS) to improve energy efficiency of proactive wake up. We start with designing a target prediction method based on both kinematics and probability. Based on the prediction results, PPSS then precisely selects the nodes to awaken and reduces their active time, so as to enhance energy efficiency with limited tracking performance loss.

In the Existing work all wireless sensors in field region are activated for monitoring and it should remain active 24/7 for surveillance, so the drawback is, if the sensor remains active 24/7 its energy will be depleted completely at some point and that sensor will not be taking part in monitoring or it will not function, it will be difficult to check and replace those sensors whose battery is drained, so in order to overcome this issue we go for duty-cycling mode, in which selected sensor are choose to remain active for particular time period for eg., 12hrs and the rest of the sensors go to sleep mode and vice-versa. In this way the selected sensors will perform the work of monitoring.

4.1 PPSS Design:

PPSS is designed based on proactive wake up: when a node (i.e., alarm node) detects a target, it broadcasts an alarm message to proactively awaken its neighbor nodes (i.e., awakened node) to prepare for the approaching target. To enhance energy efficiency, we modify this basic proactive wake-up method to sleep-schedule nodes precisely. Specifically, PPSS selects some of the neighbor nodes (i.e., candidate node) that are likely to detect the target to awaken. On receiving an alarm message, each candidate may individually make the decision on whether or not to be an awakened node, and if yes, when and how long to wake up. We utilize two approaches to reduce the energy consumption during this proactive wake-up process:

1. Reduce the number of awakened nodes.
2. Schedule their sleep pattern to shorten the active time.

Once a target's potential movement is predicted, we may make sleep scheduling decisions based on these probabilistic models: take a high probability to awaken nodes on a direction along which the target is highly probable to move, and take a low one to awaken nodes that are not likely to detect the target.

*1. **Target prediction:***

The proposed target prediction scheme consists of three steps: current state calculation, kinematics-based prediction, and probability based prediction. After calculating the current state, the kinematics-based prediction step calculates the expected displacement from the current location within the next sleep delay, and the probability-based. Prediction step establishes probabilistic models for the scalar displacement and the deviation.

*2. **Awakened node reduction:***

The number of awakened nodes is reduced with two efforts: controlling the scope of awake regions, and choose a subset of nodes in an awake region.

*3. **Active time control:***

Based on the probabilistic models that are established with target prediction, PPSS schedules an awakened node to be active, so that the probability that it detects the target is close to 1.

Target tracking:

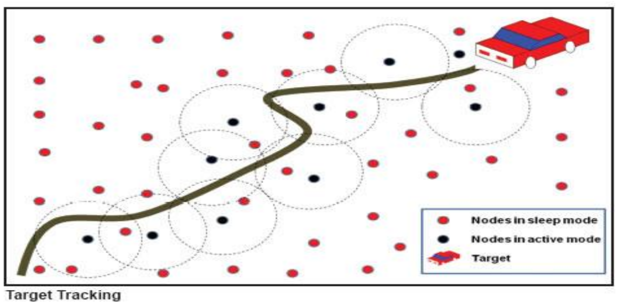

Fig. 5: Target Tracking.

4.3 ***Target prediction:***

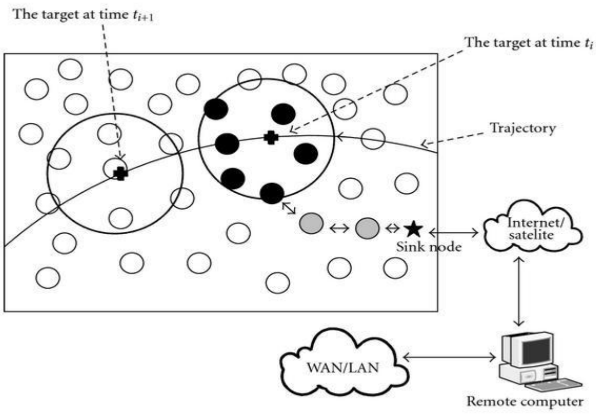

Fig. 6: Detects and Tracks the Mobile Target and sends the information to the Sink node.

In the real world, a target's movement is subject to uncertainty, while at the same time it follows certain rules of physics.
This apparent contradiction is because:
1) At each instant or during a short time period, there is no significant change on the rules of a target's motion; therefore, the target will approximately follow kinematics rules;
2) However, a target's long-term behavior is uncertain and hard to predict, e.g., a harsh brake or a sharp turn cannot be predicted completely with kinematics rules.

In fact, even for a short term, it is also difficult to accurately predict a target's motion purely with a physics-based model. However, the prediction is absolutely helpful for optimizing the energy efficiency and tracking performance tradeoff. Thus, we consider a probabilistic model to handle as many possibilities of change of the actual target motion as possible.

4.4 Active Time Control:

After reducing the number of awakened nodes, energy efficiency can be enhanced further by scheduling the sleep patterns of awakened nodes, as not all the awakened nodes need to keep active all the time. We schedule the sleep patterns of awakened nodes by setting a start time and an end time of the active period. Out of this active period, awakened nodes do not have to keep active. Therefore, the time that an awakened node has to keep active could be reduced compared ith the Circle scheme.

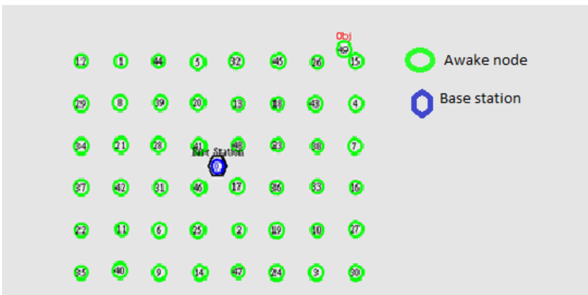

Fig. 7: PPSS in initial state.

4.5 Problem existing:

All wireless sensors are activated initially and idle listening is a major source of energy waste. Once an active sensor runs out of energy, that sensors are not present in the network. So communication is not fully completed

4.6 Disadvantages of existing system:

- All sensors are activated initially (power consumption high)
- Network lifetime is low.
- Drop high.
- Throughput is low.

V Final Stage:
Introduction:

In the proposed concept, it is possible to save more energy by reducing energy consumption i.e., if we are able to predict the probability by which the Mobile target moves, we can make the sensors along that direction to be active and putting rest of the sensors in sleep mode, so we can save comparatively more energy than the existing work, this can be achieved by creating a Local Active Environment and sleep scheduling. for eg., a wireless sensor which detects the mobile target will create a Local active environment i.e., by awakening the neighbor sensors or next hop sensors and sensors in the routing table to send the information about the target to the base station, putting the remaining sensors to sleep mode.

By this way the sensors that are close to mobile target will predict the direction in which mobile target moves and creates a Local Active Environment dynamically each time the target moves. Thus the energy efficiency is increased to great extent compared to the Existing works which maximizes the network lifetime.

5.1 Modification:

The proposed Concept has a limitation of detecting only single target so in order to detect the multiple numbers of Mobile targets we have to enhance the proposed concept of Local Active Environment and sleep scheduling with boundary selection nodes. i.e., In the proposed concept when a Mobile Target enters the field region or surveillance region the first sensor that detects the Mobile target will create Local Active Environment putting the remaining sensors to sleep mode, the limitation here is if another mobile target enters the surveillance region the sensors that are in sleep mode cannot detect the Target, so to overcome this we are synchronizing this Local Active environment with Boundary selection nodes in which the sensors along the boundary of the field region are allowed to remain active, since the Mobile Target can enter the field region only through the boundaries, so when we are activating the boundary selective nodes we can detect multiple number of Target entering the Surveillance region from different direction and once the Mobile Target is detected it will be informed to the base station

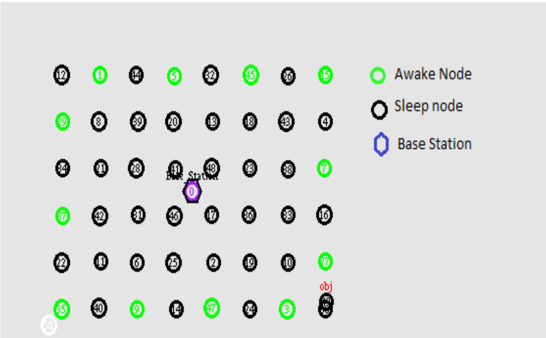

Fig. 8: Proposed technique initial state.

5.1 Modules:

1.Topology Formation.
2.Predicting the target and creating Local Active environment.
3.Probability prediction and sleep scheduling.
4.Modified PPSS protocol.

5.1.1.Topology Formation:

All sensors are deployed initially. Each sensor updates their information to its neighbour sensor. This is called Initial Neighbour Discovery. Wireless sensor networks (WSNs) are deployed in a wide range of areas, with a large number of sensor nodes detecting and reporting some information of urgencies to the end-users. As there may be no communication infrastructure, users are usually equipped with communicating devices to communicate with sensor nodes.

As sensor nodes for event monitoring are expected to work for a long time without recharging their batteries, sleep scheduling method is always used during the monitoring process, The emerging technologies in low-power micro-sensors, actuators, embedded processors, and RF radios have facilitated the deployment of large scale sensor networks. Due to their low cost and capabilities for pervasive surveillance, sensor networks and their applications have tremendous potential in both commercial and military environments.

5.1.2. Predicting the target and creating Local Active environment:

In this module all sensors communicate with each other and update the routing information, In killer applications - object tracking.

Among the technical issues to be addressed in developing sensor networks for object tracking, energy conservation is probably the most critical one since the sensor nodes are often supported by batteries which could be difficult to replace. A lot of existing researches are focused on optimizing the communication cost by inactivating radios as much as possible or by trading off computation for communication. However, these studies neglected a fact that, while the sensing and computing components consume less power than the communication components, they are still important sources of energy dissipation in sensor nodes, especially after the communication cost being optimized once object is detected creates a Local Active environment predicts the Target movement and sends the information to base station.

We develop a localized distributed protocol for (near-optimally) solving the aforementioned constrained optimization problem while ensuring upper bounds on the worst-case detection delay. We also addresses sleep scheduling schemes for minimizing packet delivery latency to a common base-station. protocol is optimized for detection of rare (but urgent) events. In such applications, network longevity is especially important, since mission lifetime must be appropriately large. Nodes operate at very low duty cycles and do not communicate unless an event is detected.

Therefore, we consider sensing power as the predominant energy drain over the system lifetime. Once detection occurs, a prompt reaction may be needed (e.g., activating a camera or reporting an emergency).Our protocol offers a design space in which the designer cans trade-off these parameters in a near-optimal fashion. large class of critical monitoring and sensing-actuation systems (e.g., fire alarm sprinkler systems or wireless sensor based control systems) are deployed specifically to detect events that occur rarely but require immediate notification and (b) transfer delay sensitive actuation commands to a particular node or a set of nodes in the network.

Therefore, the design of such systems must not only strive to reduce average power consumption but also provide packet delivery guarantees over potentially multiple hops. A popular approach towards increasing longevity of sensor networks is by employing sleep scheduling where nodes stay in low-power or sleep modes for most of the time, periodically waking up to check for activity. We use Wakeup on-demand (out-of-band wakeup): It is assumed that the nodes can be signaled and awakened at any point of time and then a message is sent to the node.This is usually implemented by employing two wireless interfaces.

5.1.3.Probability prediction and sleep scheduling:

In this Module We define the problem and the requirements of object tracking applications and develop some basic energy-saving solutions which reduce the number of sensor nodes needed for monitoring the moving objects or decrease the frequency of sampling the environment, respectively. Moreover, we discuss other possible solution, we propose a Prediction-based Energy Saving scheme, called PES, that minimizes the number of nodes participating in the tracking activities, while inactivates other nodes into sleeping mode. These approaches imply that a minimum number of nodes must remain awake for the right degree of coverage to remain satisfied.

Simulation based performance evaluation, in terms of total energy consumption and missing rate, has been conducted. Observe that at very low duty cycles, it is likely that sensor nodes that are awake at any given time do not form a connected graph unless their wakeup times are appropriately synchronized.

We develop a heuristic that provides partial synchronization to reduce delivery latency without significantly impacting the average detection delay. We focus on the synchronous scheduled wakeup methods which provide bidirectional delay guarantees. We present a novel class of wakeup methods called multi-parent schemes which assign multiple parents (forwarding nodes) with different wakeup schedules to each node in the network. This method takes a cross-layer approach and exploits the existence of multiple paths between the nodes in the network to significantly improve the energy-efficiency of wakeup process and therefore increase the lifetime of the network while meeting the message delay constraints.

Once Target is detected creates an awake region and based on the prediction results assigns Sleep scheduling to individual sensors at synchronized time and the graph is plotted for Energy efficiency in comparison with the Existing concept along with Throughput, Packet Delivery ratio.

5.1.4. Modified PPSS protocol:

In this phase we are synchronizing the proposed PPSS protocol, i.e., Local Active environment with Boundary selection nodes in which the sensors along the boundary of the field region are activated, thus the Mobile target that comes from different directions are detected, once it detects the Moving object along the boundaries, it will start sending the information about the mobile target to the base station, so we are enhancing the proposed concept to detect multiple targ*et al*ong with improved power efficiency.

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The simulation result shows that the Modified PPSS can effectively reduce the energy consumption on MCU and sensor components. Moreover, the different heuristics discussed in this paper can be used to balance the energy savings and application requirements. Sensor networks promise surveillance of large areas with possibly unprecedented accuracy.

5.2*Advantages Of Proposed System:*

- Particular sensors are activated (power consumption low)
- Network lifetime is high.
- Reduce the drop.
- Increase throughput.

VI Experimental Evolution:

Introduction:

In the proposed concept, it is possible to save more energy by reducing energy consumption i.e., if we are able to predict the probability by which the Mobile target moves, we can make the sensors along that direction to be active and putting rest of the sensors in sleep mode, so we can save comparatively more energy than the existing work, this can be achieved by creating a Local Active Environment and sleep scheduling.

6.1 Multiple Target Tracking:

The proposed Concept has a limitation of detecting only single target so in order to detect the multiple numbers of Mobile targets we have to enhance the proposed concept of Local Active Environment and sleep scheduling with boundary selection nodes. i.e., In the proposed concept when a Mobile Target enters the field region or surveillance region the first sensor that detects the Mobile target will create Local Active Environment putting the remaining sensors to sleep mode, the limitation here is if another mobile target enters the surveillance region the sensors that are in sleep mode cannot detect the Target, so to overcome this we are synchronizing this Local Active environment with Boundary selection nodes in which the sensors along the boundary of the field region are allowed to remain active, since the Mobile Target can enter the field region only through the boundaries, so when we are activating the boundary selective nodes we can detect multiple number of Target entering the Surveillance region from different direction and once the Mobile Target is detected it will be informed to the base station.

6.2 The Network Simulator 2.33 (Ns2):

Network Simulator (NS2) is a discrete event driven simulator developed at UC Berkeley. It is part of the VINT project. The goal of NS2 is to support networking research and education. It is suitable for designing new protocols, comparing different protocols and traffic evaluations. NS2 is developed as a collaborative environment. It is distributed freely and open source.

6.3 Structure Of Ns2:

NS2 is built using object oriented methods in C++ and OTcl (object oriented variant of Tcl.

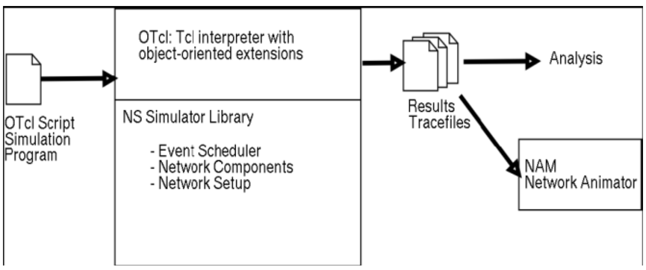


Fig. 9: Simplified User’s View of Ns.

We can see in Fig 5.1, NS2 interprets the simulation scripts written in OTcl. A user has to set the different components (e.g. event scheduler objects, network components libraries and setup module libraries) up in the simulation environment. f he needs new network components, he is free to implement them and to set them up in his simulation as well.

6.4 Functionalities Of Ns2.33

Functionalities for wired, wireless networks, tracing, and visualization are available in NS2.

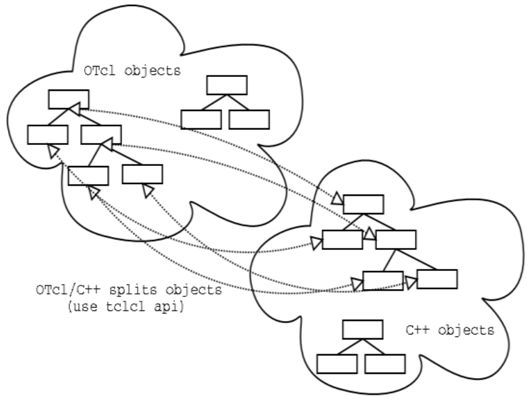


Fig. 10: OTcl and C++: the duality.

6.4.1 Mobile Networking In Ns2.3:3

This section describes the wireless model that was originally ported as CMU's Monarch group's mobility extension to NS2. The first section covers the original mobility model ported from CMU/Monarch group. In this section, we cover the internals of a mobile node, routing mechanisms and network components that are used to construct the network stack for a mobile node. The components that are covered briefly are Channel, Network interface, Radio propagation model, MAC protocols, Interface Queue, Link layer and Address resolution protocol model (ARP). MobileIP was also extended to the wireless model.

6.4.2 The basic wireless model in ns:

The wireless model essentially consists of the MobileNode at the core, with additional supporting features that allows simulations of multi-hop ad-hoc networks, wireless LANs etc. The MobileNode object is a split object. The C++ class MobileNode is derived from parent class Node. A major difference between them, though, is that a MobileNode is not connected by means of Links to other nodes or mobilenodes. In this section we shall describe the internals of MobileNode, its routing mechanisms, the routing protocols dsdv, aodv, tora and dsr, creation of network stack allowing channel access in MobileNode, brief description of each stack component, trace support and movement/traffic scenario generation for wireless simulations.

6.4.3 Mobile Node: Creating Wireless Topology:

Mobile Node is the basic *ns* Node object with added functionalities like movement, ability to transmit and receive on a channel that allows it to be used to create mobile, wireless simulation environments. The class Mobile Node is derived from the base class Node. Mobile Node is a split object. The mobility features including node movement, periodic position updates, maintaining topology boundary etc are implemented in C++ while plumbing of network components within Mobile Node itself (like classifiers, dmux , LL, Mac, Channel etc) have been implemented in Otcl.

6.5 Implementation Environment:

Network simulator 2 is used as the simulation tool in this project. NS was chosen as the simulator partly because of the range of features it provides and partly because it has an open source code that can be modified and extended.

6.6 Network Simulator (Ns):

Network simulator (NS) is an object–oriented, discrete event simulator for networking research. NS provides substantial support for simulation of TCP, routing and multicast protocols over wired and wireless networks. The simulator is a result of an ongoing effort of research and developed.

NS is written in C++, with an OTcl1 interpreter as a command and configuration interface. The C++ part, which is fast to run but slower to change, is used for detailed protocol implementation. The OTcl part, on the other hand, which runs much slower but can be changed very fast quickly, is used for simulation configuration

NS can simulate the following:

1. Topology: Wired, wireless
2. Scheduling Algorithms: RED, Drop Tail,
3. Transport Protocols: TCP, UDP
4. Routing: Static and dynamic routing
5. Application: FTP, HTTP, Telnet, Traffic generators

6.7 Network Components:

This section talks about the NS components, mostly compound network components. Figure 1.1 shows a partial OTcl class hierarchy of NS, which will help understanding the basic network components.

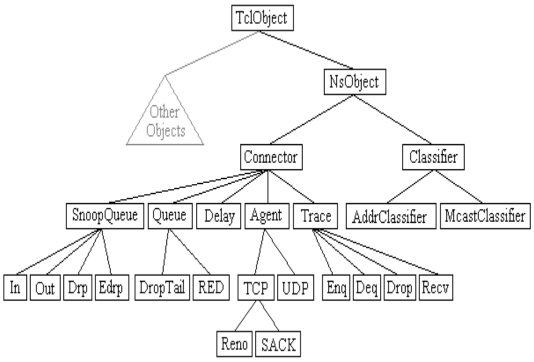


Fig. 11: OTclClass Hierarchy.

The root of the hierarchy is the TclObject class that is the super class of all OTcl library objects (scheduler, network components, timers and the other objects including NAM related ones).

6.8 Class Tcl:

The class Tcl encapsulates the actual instance of the OTcl interpreter and provides the methods to access and communicate with that interpreter, code. The class provides methods for the following operations:
1.Obtain a reference to the Tel instance
2.Invoke OTcl procedures through the interpreter
3.Retrieve, or pass back results to the interpreter
4.Report error situations and exit in an uniform manner
5.Store and lookup "TclObjects"
6.Acquire direct access to the interpreter.

6.8.1 Obtain a Reference to the class Tcl instance:

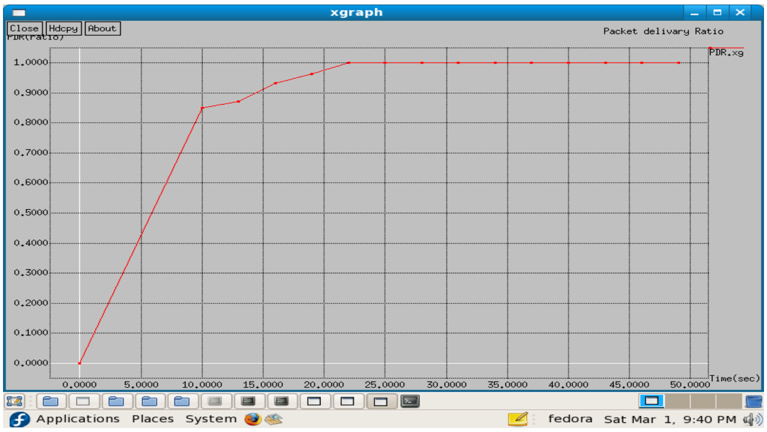
A single instance of the class is declared in -tclcl/Tcl.cc as a static member variable. The statement required to access this instance is Tel& tel = Tcl::instance();

6.8.2 Invoking OTcl Procedures:

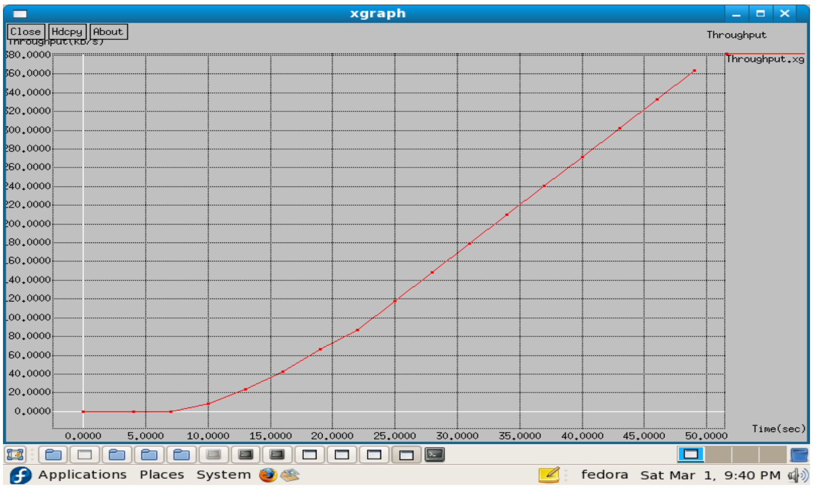
There are four different methods to invoke an OTcl command through the instance, tcl. They differ essentially in their calling arguments. Each function passes a string to the interpreter that then evaluates the string in a global context. These methods will return to the caller if the interpreter returns TCL_OK. On the other hand, if the interpreter returns TCL_ERROR, the methods will call tkerror{}.

VII Simulation Results:

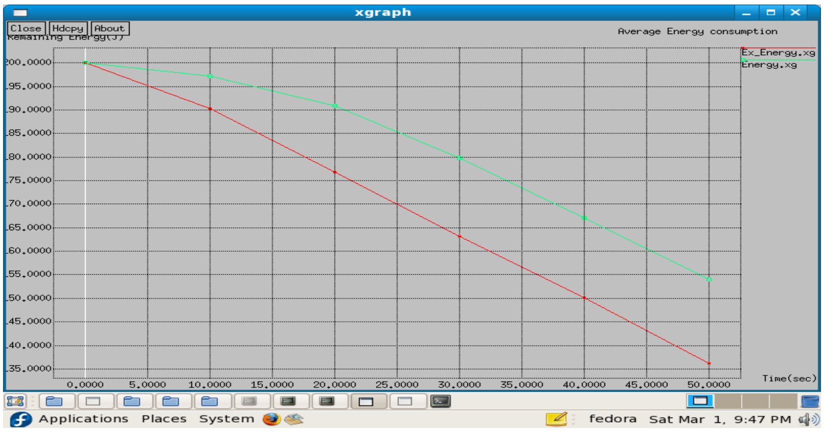
7.1 Packet delivery ratio:



7.2 Throughput:



7.3 Energy consumption comparison:



Conclusion:

The wake-up scheduling of sensors has significant impact on the lifetime and coverage of a WSN. In this paper, a duty-cycled sensor network, proactive wake up and sleep scheduling can create a local active environment to provide guarantee for the tracking performance.

Thus we efficiently schedule sleep and wake up patterns for each sensors based on the probability of the direction in which the Mobile Target moves and we have also enhanced the proposed concept to detect and track multiple Mobile Target efficiently by activating the boundary nodes. Simulation results on different networks demonstrate that the proposed PPSS yields better performance than the previous defined protocol.

Future Enhancement:

Future work is to extend the algorithm framework to other network models such as those take into account the network connectivity constraints and the routing strategy.

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