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Hierarchy Based Proactive Energy Control Using MANET

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Abstract: Energy plays a key role in determining the node life time in the mobile ad-hoc network. Due to the limited energy, storage space and limited computation power the mobile ad-hoc network required lots of energy optimization. Now days the huge development in the Smartphone, This enables us to make more tasks ranges from making a call to monitor the user's health. This makes the smart phone to gel so much with the personal communication. This paper proposes a FP-Tree structure based pro active energy optimization. This learns the user behaviour and constructs the FP-Tree to decide which options to be turned on and/or turned off during the current user environment to preserve the energy without affecting the user activities. the experimental results shows the performance of the proposed fp-growth based system gives better results than the other methods like location, time and fuzzy.

Key words: WSN · Data privacy · Advertising · Context-aware Computing · Proactive control · Adaptive control · Energy optimizing

INTRODUCTION

The developing advances in mobile phones, computation, low storage capabilities, together with aggressive market have empowered data innovation to be more moderate and accessible to nearly everyone around the globe. Additionally, with the approach of mobile computing with wireless communication called Mobile Ad hoc Networks (MANETs) came. The operation of MANET does not rely on upon pre-presence infrastructure or base stations, since there is no focal hub in the system and hubs cooperatively share all the system exercises. The effortlessness of MANET sending accompanies a cost of multifaceted nature of the algorithms in various layers. What's more, the nonappearance of the framework actuates new difficulties to remote systems in the area of routing, security, control protection and etc [1].

In this paper a novel method has proposed, which builds an automatic control system that can react to the current situation and proactively save the energy in the network. At the same time, this should affect the functionality of the mote as well as the support to the users. This technique is experimented with the smart phones and the following things are changed dynamically based on the FP-Tree based proactive energy optimization (FTPEO), profile settings such as volume of ringing, vibrator mode, Wi-Fi, Bluetooth, mobile data and screen brightness [2].

Generally all these setting will be changes by the users manually based on the current environment of the user. It is impractical in unequaled. In this way, in this proposed framework those operations are naturally adjusted with the best setting for the present environment and choose the best configuration to streamline the energy usages and maintain a strategic distance from the undesirable interferences. To make this things happen, the proposed method needs to adjust the client conduct on various environment and the parameter, for example, the time, geo location, current battery level and adjacent gadgets status must be recorded. From the previous user base the FP-tree will be constructed and the best shortest path based the ranking of the each option [3].

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The client behavior is the consistently evolving one, which requires nonstop observing and the proposed method need to record this entire example in the meantime without affecting the energy usage. The rest of the paper is organized as follows. Section II presents an overview of the association rule mining with fp-tree construction, Section II discusses the related work Section III presents the proposed FP-Tree based proactive energy optimizing, Section IV briefs the experimental setup and results are compared with other methods and Section V concludes the works [4].

FP-Tree: The FP-tree is a solid depiction of all relevant frequency information in a database. The construction of FP-tree is as follows:

Input: A user log DB and the event triggered.
Output: FP-tree, the frequent-pattern tree of DB.
Method: The Construction of FP-tree is depicted in the following steps.
1. Scrutinize the user log DB as first. Collect F, the set of frequent items and the supporting to every recurrent item and then Sort F in support-descending order as Freq List, the list of frequent items.
2. Create the root of an FP-tree, T and label it as "null". For each transaction Trans in DB do the following [5].

a. Select the frequent items in Trans and sort them according to the order of Freq List. Let the sorted frequent-item list in Trans be [p|P], where p is the first element and P is the remaining list. Call insert_fp_tree ([p|P], T).

b. The function insert_fp_tree ([p|P], T) is performed as follows.

If T has a child N such that
N. item-name = p.item-name,
Then increment N's count by 1;

Else

Create a new node N, with its count initialized to 1, its parent link linked to T and its node-link linked to the nodes with the same item-name via the node-link structure [6].

If P is nonempty,

Call insert_fp_tree (P, N) recursively.

Each division of the FP-tree represents a frequent itemset and the nodes along the branch division are stored in lessening order of occurrence of the equivalent items, with leaves representing the least frequent items. Compression is achieved by building the tree in such a way that overlapping item sets shares the prefixes of the consequent branches. The FP-tree has a header table related with it. Single items and their counts are stored in the header table in lessening order of their frequency. The entry for an item also contains the head of a list that links all the corresponding nodes of the FP-tree. Like this the FP-Tree will be working [7].

Related Work: The current profile switching technique works upon based by three different methods.

Time Based: In this, switching settings are based on the clock. For example, the time is 10pm to 6am then the mobile will be switched to mild mode and during the office hours, it will be in the silent mode. Like this the settings are switched. This is not accurate one because we may get some holidays and different environments also [8].

Location Based: In this method the settings are switched based upon the area. For example, the tower is in the office location that will switch to predefined settings. But in this method, it works same for the conference hall and in the cafeteria.

Hybrid Fuzzy Logic Based Proactive Energy Optimizing (HFPEO): In this method, the setting are switched with help of the fuzzy logic which will work based on the different inputs. These fuzzification output will contain the optimized configuration setting and this gives the better performance when compare to the time and location [9].

The Proposed Hybrid Fuzzy Logic Based Proactive Energy Optimizing: The proposed method will be triggered whenever there has changes in the options or the change in the timeline and/or user location these are the input to the proposed system Current Location (L), Current Date and time (T), Mobile Signal Strength (MSS) and remaining battery power (RB). The normal fp-Tree takes the frequency here the proposed method takes the frequency is calculated with the battery consumption and the number of times used before. Generally the FP-tree has used in the large database but here the database size is small when compare to the other dataset [10].

The advantages of the fp-tree are its compact tree data structure which is each to travel and not required to scan the whole database frequently. This will be helpful in persevering the battery in these constrained network the proposed system keep the cache copy called header table. This header table contains the very often used frequent item set i.e., the frequent item set is option's frequency and battery consumption so the shortest path.

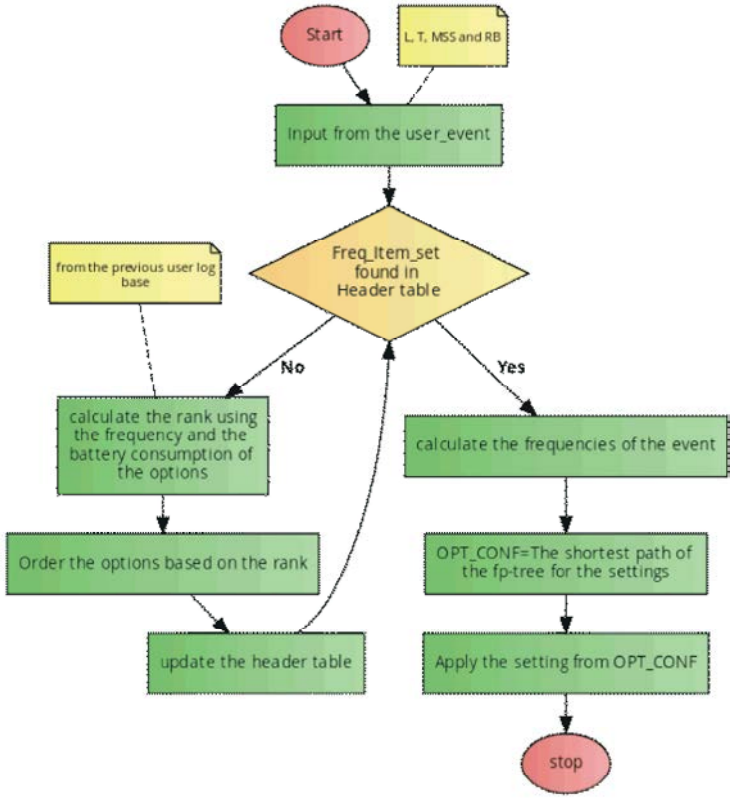

Fig. 1: Proposed fp-tree based proactive energy optimizing

The proposed system follows the node-link from the header table to get the entire frequent pattern containing the triggered item (i.e., the user geo location, time, any options changed [11].

To get the patterns containing the more than one item e.g. if the geo location changes to the college might be the user will be in the seminar hall or in the play ground. In this case the proposed system search for the patterns containing these inputs and then filters out the patterns contains the user input. Sometimes the frequent item set might not be available in the header table in this case the whole database will be scanned but this happen occasionally because the most of the patterns will be available in the header table itself. The overall process has shown in the Figure 1 [12].

The configuration takes the control over the following factors. *Call answering:* This will decides whether to attend the incoming call or send automatic reply or even allow ringing only for the selected numbers. *Ringer volume*: mobile speaker volume will be set based on this OPT_CONF. *Flight mode*: This option cuts the connections of mobile from network another wireless connection like Bluetooth and wifi tethering. *Mobile data*: data service from the mobile network will be controlled. *Wi-Fi settings*: OPT_CONF will decide whether to turned on the wifi automatically connect to the preferred one or turned off when not required. *Screen time out*: Screen back light will be turned off to the interval of the time that the user mentioned in that screen time out. This option time interval also changed based on the OPT_CONF. *Brightness*: Display brightness will be increased or decreased based on the OPT_CONF. *Bluetooth*: It manages the connected Bluetooth devices and turns off when not required [13].

Experimental Setup: The proposed FTPEO has implemented as mobile application and deployed in the ten different android based mobiles. The following factors are analyzed in that battery backup, number of times that the settings changed manually. The results are compared with the time based, location based and HFPEO based systems [14].

The battery utilized time for the ten users are tabulated in the below Table 1 and represented in the Figure 4. The number of time the settings changed manually is represented in the Table 2 and represented in the Figure 5 [15].

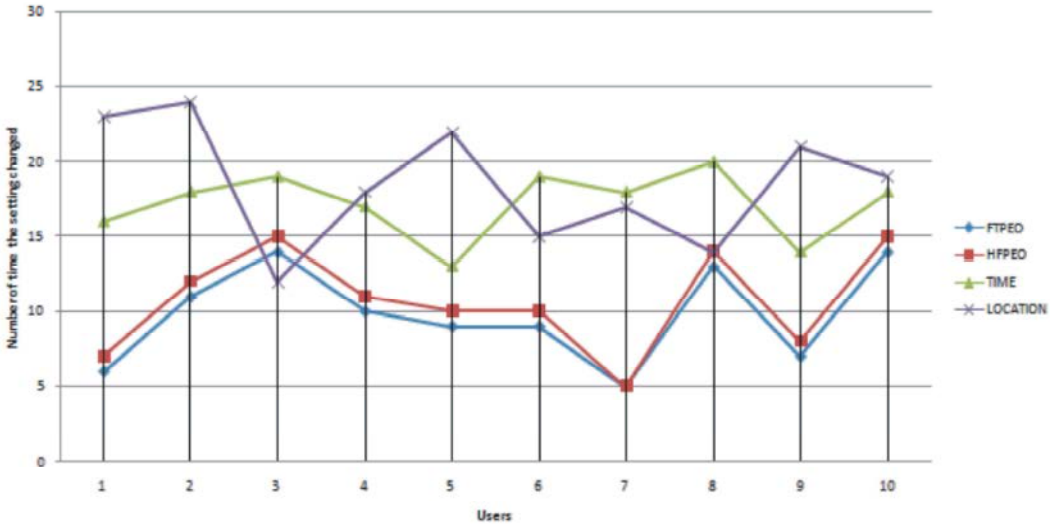

Fig. 2: Energy Utilization

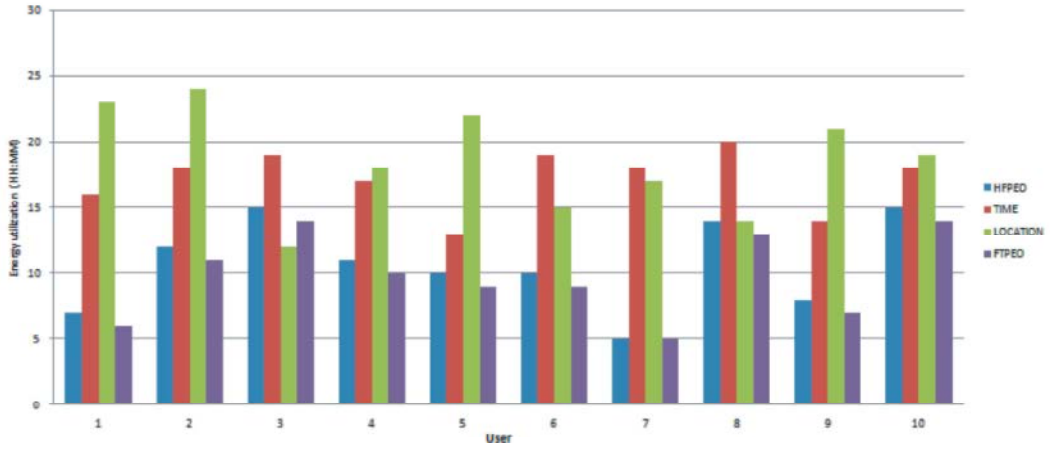

Fig. 3: Number of Time the settings changed

Table 1: The battery usage of ten users using the FTPEO, HEPEO, Time and Location based

USER	1	2	3	4	5	6	7	8	9	10
FTPEO	39.43	39.9	39.55	28.24	32.1	36.3	32.54	30.05	34.36	36.61
HFPEO	38.13	38.59	38.25	27.31	31.04	35.11	31.47	29.06	33.23	35.41
TIME	35.51	27.55	28.74	19.58	20.55	34.37	23.14	23.09	28.38	29.09
LOCATION	31.5	34.47	23.17	24.21	30.24	33.45	23.31	27.52	25.54	18.52

Table 2: Number of time the settings changed while using FTPE, HEPEO, Time and Location based

USER	1	2	3	4	5	6	7	8	9	10
FTPEO	6	11	14	10	9	9	5	13	7	14
HFPEO	7	12	15	11	10	10	5	14	8	15
TIME	16	18	19	17	13	19	18	20	14	18
LOCATION	23	24	12	18	22	15	17	14	21	19

CONCLUSION

In this paper, frequent pattern (FP) Tree based Proactive Energy Optimizing (FTPEO) has been proposed. This is compared with the Hybrid Fuzzy based proactive Energy optimizing (HFPEO) time and location based techniques. The results show that FTPEO optimizes the energy usage in the smart phones. The experimental results presents that energy consumption is low in the proposed FTPEO method. The HFPEO, time and location

based techniques drain most of the energy and decrease the motes life span. The number of times the settings changed is also very high in the HFPEO, time and location based techniques. In the future, this work can extended using decision tree, in direction to achieve more efficiency along with the more accuracy.

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