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DEVELOPMENT OF ANALYSIS AND CLUSTERING PROCESS OF FT-TEEN ALGORITHM USED IN WIRELESS SENSOR NETWORK

T. X. Karimov
Samarkand Institute of Economics and Service Assistant of the "Information Technologies" Department teacher, tolmasbek.karimov@bk.ru

Abstract: This article analyzes the working principle of the FT-TEEN algorithm, which is widely used in wireless sensor networks, the clustering process, and the block diagram of cluster formation. At the same time, in order to compare the FT-TEEN algorithm with the main TEEN algorithm, modeling was carried out in the MATLAB environment and the results were presented.

***Keywords*:** Wireless sensor network, clustering, modeling, FT-TEEN algorithm, TENN algorithm, head node.

Wireless sensor network (WSN) is a distributed and self-organizing system of very small autonomous nodes connected by wireless communication channels. The main distinctive feature of SST is monitoring of various environmental parameters in large geographical areas and sending monitoring messages from sensor nodes along routes (consisting of a sequence of nodes) to the base station (data collection center). is the transmission ability of transmitters at low power.

Currently, SST is widely used in various fields of human activity - industry, agriculture, medicine, environmental protection, military and other fields. The effective operation of SST in the conditions of external interference, possible mobility and rejection of nodes is impossible without an effective network management system. Various algorithms are used in the operation of SST, one of which is the FTTEEN algorithm. The following network model was adopted in the development of the FT-TEEN algorithm:

- The sensor network is a homogeneous network, that is, all wireless sensor devices (SSQ) have the same basic parameters (initial energy, operating radius);
- SSQ performs its activity without centralized management;
- The proposed mechanism can be applied to the LEACH protocol and many similar hierarchical routing protocols;
- The base station is stationary and the radio channel is symmetrical. For propagation of electromagnetic waves, the standard model for wireless sensor networks is adopted.

In order to estimate the losses, the states of the sensor nodes, whether they are in the correct line of sight (LOS) or not (NonLOS) are taken into account [1]. The proposed algorithm is a modified version of the TEEN algorithm, includes a reserve mechanism for clustering, and consists of three steps. Figure 1 shows the stage of cluster formation in the developed algorithm. Figure 2 shows the block diagram of the developed algorithm.

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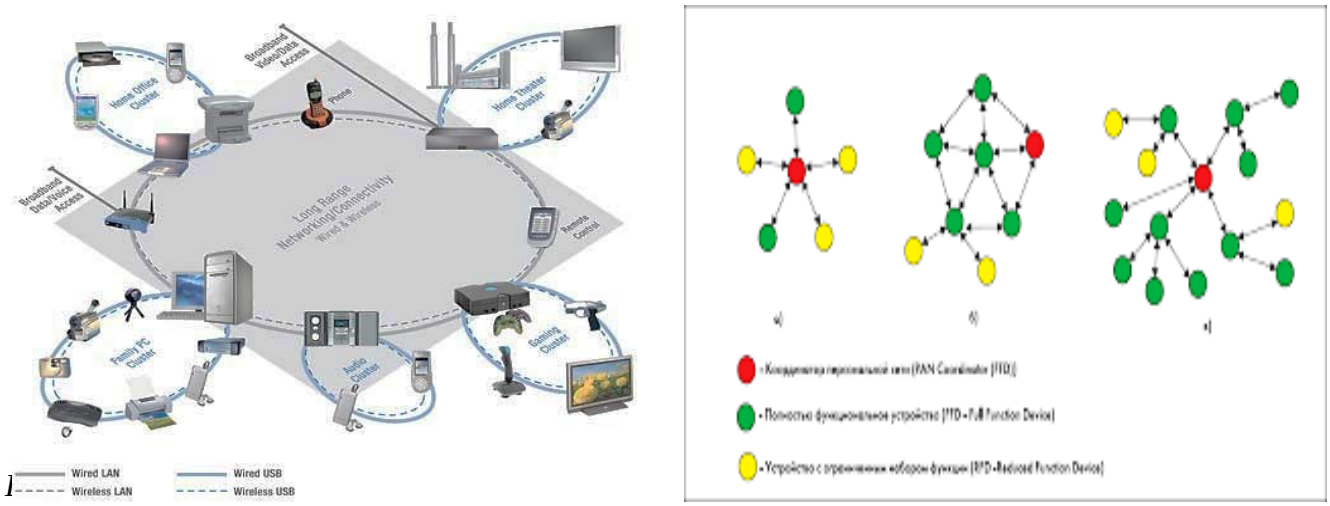
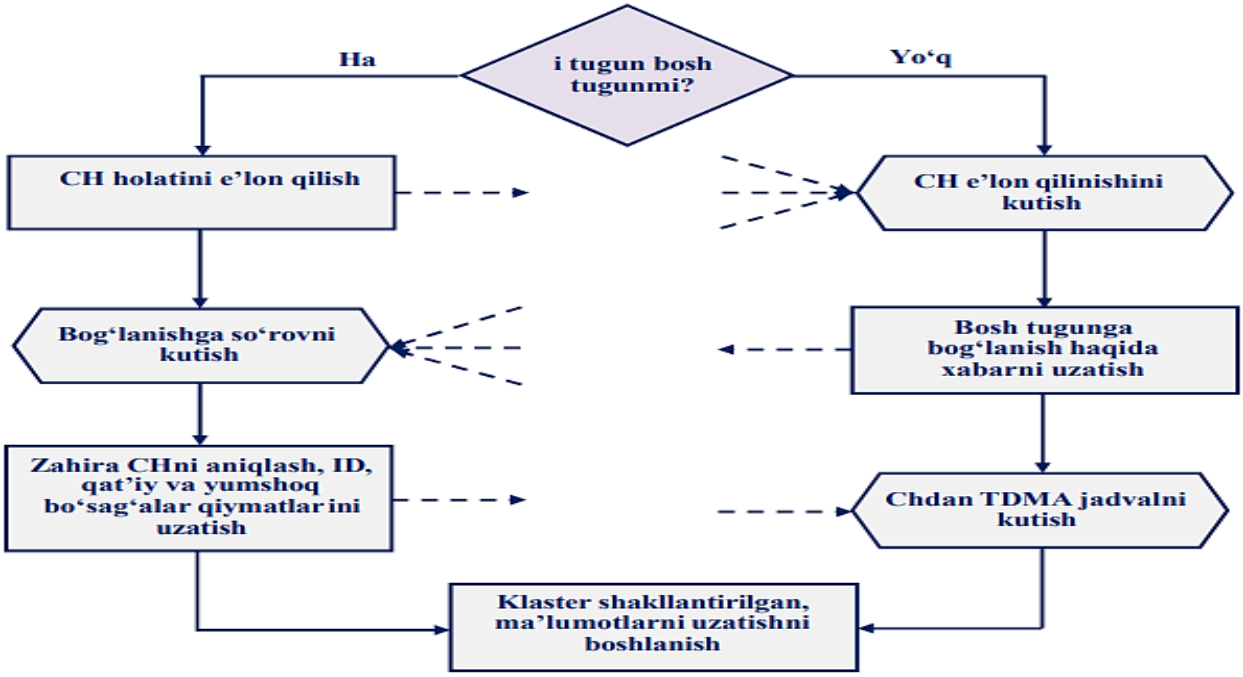


Figure 2. Clustering block diagram for FT-TEEN algorithm



In the cluster formation phase, the head node (CH) of the cluster is selected as the backup head node (sub-CH). When all nodes join a cluster, the head node broadcasts a widely distributed message that it is the head. After receiving all the information, the head node combines and summarizes these reports and asks if the node is the head node? No Announce CH status Wait for CH to be announced Wait for connection request Transmit connection message to master node Reserve CH detection, ID, threshold values Transmit hard and soft ini From Ch TDMA table wait Cluster is formed, start data transmission only then transmit them to the base station or gateway.

Having a fixed threshold (NT), as in the TEEN algorithm, reduces the number of messages, since transmission is carried out only when the current energy is in the given range. In addition, the soft threshold also reduces the number of messages by excluding messages whose energy value has changed to at least the threshold energy. In order to compare the FT-TEEN algorithm with the main TEEN algorithm, modeling was carried out in the MATLAB environment. Modeling was conducted

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for the same initial data as conventionally adopted for TEEN and LEACH algorithms. In order to compare the FT-TEEN algorithm with the main TEEN algorithm, modeling was carried out in the MATLAB environment. Modeling was carried out for the same initial data traditionally adopted for TEEN and LEACH algorithms [2]. Figure 3 and Figure 4 show the number of successfully transmitted packets from cluster members to the head node and from the head node to the base station, respectively, with a 10% error probability.

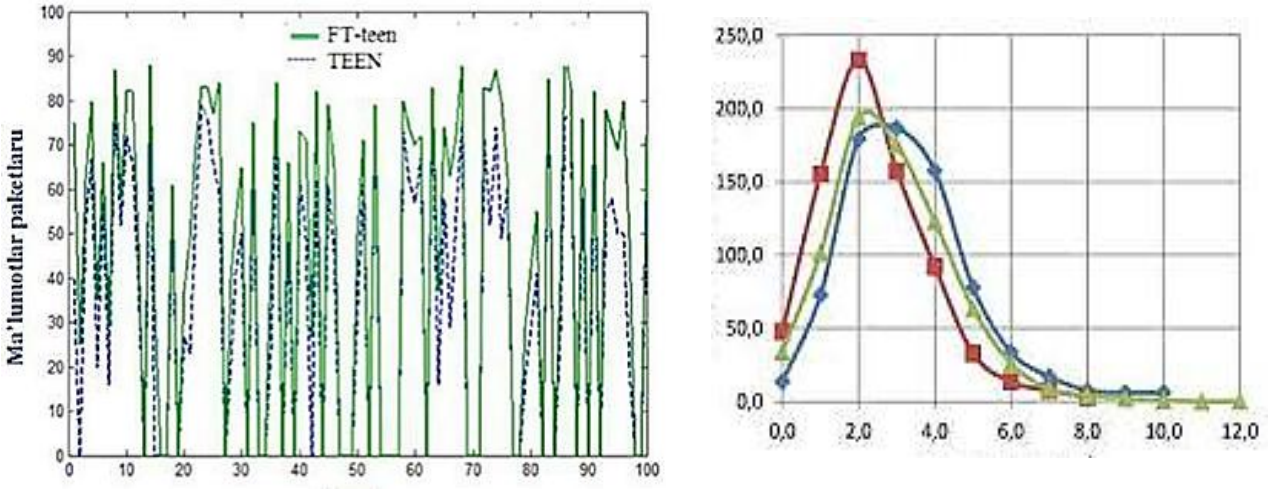

Figure 3. The number of packets successfully transmitted from cluster members to CH head node (probability of errors - 10%)

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