MODELING OF SENSOR NETWORKS WITH LIMITED ACCESS TO THE COMMUNICATION RESOURCES

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The technological development, in the last years, ensures the design and implementation process of sensor networks for different fields of the economy [1] with hardware devices and software solutions. Nowadays, it's impossible to imagine the activity of different companies, which don't have, information, decision-making and automatization systems based on sensor networks. A particular case of the sensor networks application is the Multi-Agent systems which are made up of hundreds and thousands of devices for data acquisition, storage and processing. One of the fundamental problems of these systems is the efficient organization of the information exchange process which will be able to ensure the functionality and the correctness of the taken decisions.

In this paper are presented some results obtained in modeling the sensor networks with limited access to communication resources, especially oriented for Multi-Agent systems.

The sensor network model $\boldsymbol{SNM}=\{\boldsymbol{SN},\boldsymbol{CH},\boldsymbol{T}\}$ presents a set of interconnected objects that repeat the network topology, where: $\boldsymbol{SN}=\{\boldsymbol{SN}_i,\forall \boldsymbol{i}=\overline{1,\boldsymbol{I}}\}$ - set of Objects – nodes, of the sensor network, with functions of the acquisition, processing, storage and communication modeling in the network; $\boldsymbol{CH}=\{\boldsymbol{CH}_j,\forall \boldsymbol{j}=\overline{1,\boldsymbol{J}}\}$ - set of communication Objects – channels destined to model the access and delays generated by the communication resources; $\boldsymbol{L}=\{\boldsymbol{L}_{i,j},\forall \boldsymbol{i}=\overline{1,\boldsymbol{I}},\ \boldsymbol{j}=\overline{1,\boldsymbol{J}}\}$ - the set of connections between the Objects – nodes of the sensor network $\boldsymbol{SN}$ and communication Objects-channels $\boldsymbol{CH}$.

Objects – nodes $\boldsymbol{SN}$ are defined by the multitude of variables and relations between them: $\boldsymbol{SN}_i=\{\boldsymbol{P}(\boldsymbol{t},\boldsymbol{a}_i),\boldsymbol{RAM}[1...\boldsymbol{N}_i]_i,\boldsymbol{P}(\boldsymbol{t},\boldsymbol{C}_i),\boldsymbol{CT}_T,\boldsymbol{CT}_R,\boldsymbol{CT}_L\}$, where: $\boldsymbol{P}(\boldsymbol{t},\boldsymbol{a}_i)$ - the probability of data acquisition from the sensor $\boldsymbol{i}$, in the time interval $\boldsymbol{t}$; $\boldsymbol{RAM}[1...\boldsymbol{N}_i]$ - stack memory for data storage, of $\boldsymbol{N}_i$ variable size; $\boldsymbol{P}(\boldsymbol{t},\boldsymbol{C}_i)$ - probability (algorithmic complexity) of data processing in time $\boldsymbol{t}$, where $\boldsymbol{P}(\boldsymbol{t},\boldsymbol{a}_i)\xrightarrow{\boldsymbol{P}(\boldsymbol{t},\boldsymbol{C}_i)}\boldsymbol{RAM}[1...\boldsymbol{N}_i]$; $\boldsymbol{CT}_T$ - call counting of data transmission in the network; $\boldsymbol{CT}_R$ - call counting of the successful data reception in network; $\boldsymbol{CT}_L$ - counting of missed calls of data in the network.

Keywords: *Sensor Networks; Modeling of Systems; Communications Resources; Limited Access; Object Model.*

References

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