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# SENSOR NETWORK WITH APPLICATION TO DISTRIBUTED DATA FUSION

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**Abstract:-**The present paper reports about the sensor network. During the course of investigation, the distributed data fusion structures have been studied. This structure contains several embedded sensor nodes. Keeping the view of simplicity of networking a new design has been introduced.

**Keywords:**Network, Sensor network & Data fusion

## INTRODUCTION :-

Networking is an integral part of connectivity as well as for findings of any object. Not only networking but also Sensor network popular now a days for embedded with several sensor nodes with operating independently or collaboratively [1-3]. The sensor network consists of the several sensor nodes (SNi), A single dedicated sensor node (FBC), A single external sensor node (CE). The CE node collects the information and reacts appropriately based on the incoming decisions. The CE represents the external back-office processing node of the sensor network [4]. Figure 1 provides a network structure and its major internal and external components.

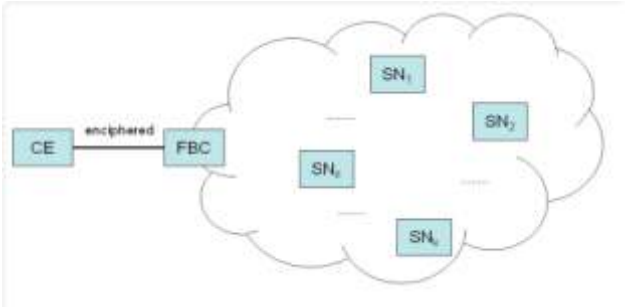


**Figure 1: sensor network structure and its components.**

## CLUSTERING

The sensor nodes SNs are organized in clusters, for example according to their types and their objects of interest. Thus, the clusters perform different fusion tasks on specific regions of the area under observation, e.g., an intersection, highway or urban road. In the second layer of the data fusion structure known as partial fusion clusters PFCs which represent such clusters that perform a dedicated task. The assignment of the SNs to appropriate clusters is performed a priori considering various constraints such as vicinity, adjacency and regions of interests. It strongly depends on the application and interfaced sensors that are used within the sensor network.

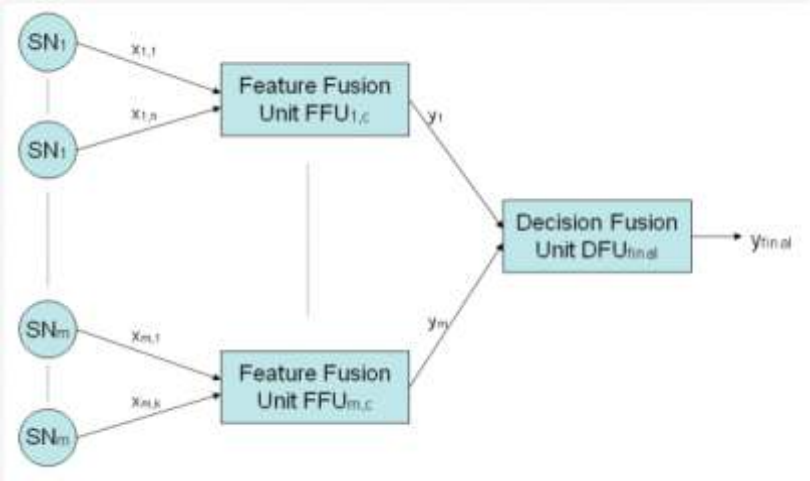


**Figure 2: fusion with reference to a fusion cluster c (PFC)**

## FUSION METHODOLOGIES

The sensor nodes (SNs) which communicate among themselves in order to exchange information to improve the performance of the fusion system. The information is represented either by features of the extraction process or partial decisions originating from the feature level fusion task of each sensor node SNi. Both, features and partial decisions are used to form a final fusion result for the object of interest. The following two fusion methodologies of the sensor network determine which type of data is exchanged from one SNi or cluster to another. Figures 3 is commonly-used fusion methodologies.

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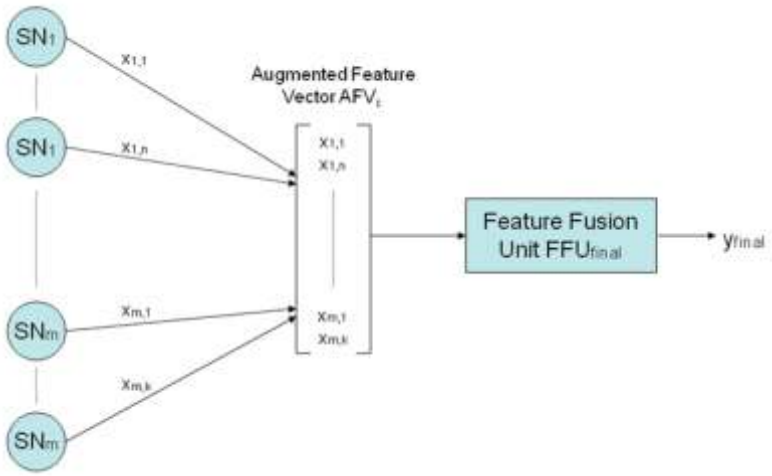


**Figure 3 fusion based on the fusion cluster c**

Figure 3shows the combination of feature- and decision-level fusion. This approach is applied to large sensor networks that consist of many sensor nodes where the overall bandwidth between sensor nodes is low or costly. In this case it is more efficient to exchange partial (soft) decisions that are generated by the feature fusion units (FFUs) between the sensor nodes of the same cluster as to send the complete list of extracted features. A dedicated SN then performs decision fusion with the partial decisions of the involved SNs belonging to that cluster.

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## DATA FUSION ARCHITECTURE

In this section, we introduce three-layered distributed data fusion architecture within the sensor network topology. The proposed architecture basically follows the principles of data flow and abstraction of a modified

waterfall model. Table 1 compares the basic tasks of each layer of the modified and original waterfall model.

**Table 1: levels of the standard and modified waterfall model**

| Level | Waterfall Model | Modified Waterfall Model |
|---|---|---|
| Level 1 | Sensors<br>Pre-Processing | Data Acquisition<br>Pre-Processing |
| Level 2 | Feature Extraction<br>Pattern Recognition | Feature Extraction<br>Feature/Decision Fusion<br>Feature-Based Identity Declaration |
| Level 3 | Situation Assessment<br>Decision Making | *Optional Level*<br>Situation Assessment<br>Decision-Based Identity Declaration |

**DATA FUSION LAYERS**

The proposed architecture consists of three layers. These layers abstract and encapsulate the various processing tasks into independently working processing units (for each layer). The basic structure of the architecture is shown in Figure 3. Each fusion layer performs a dedicated task in order to contribute to the whole data fusion process. The following three paragraphs describe the three layers of the hierarchical data fusion architecture in detail.

Layer 1 The first layer performs the

(i) Acquisition and optional normalization of raw data originating from either homogeneous and/or heterogeneous sensory devices such as microphones, cameras and laser sensors.

Layer 2 corresponds to the intra-cluster fusion task within the sensor network. These PFRs represent preliminary decisions which represent soft decisions.

Layer 3. The nature of the estimate depends directly on the classifier and the application it is used for further post-processed either by automatic procedures or responsible executives such as law enforcement or accounting departments.

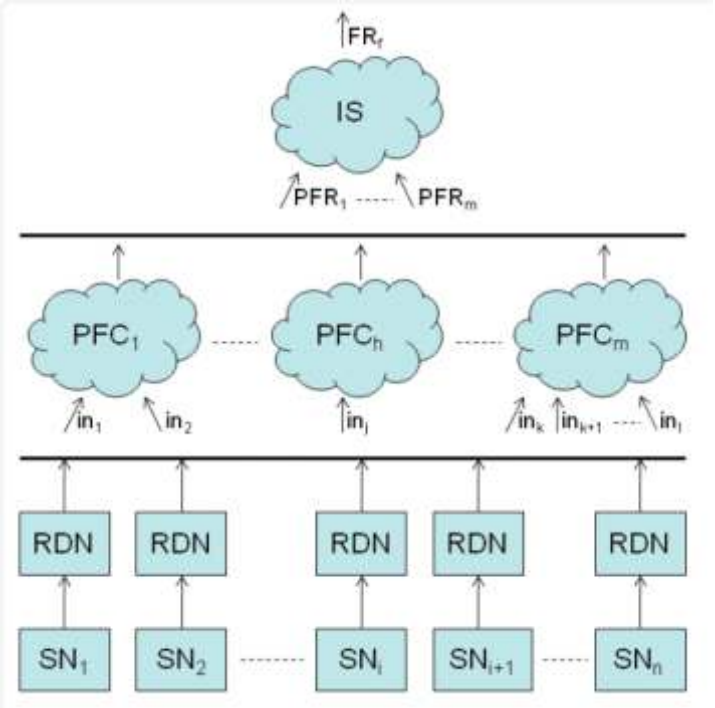


**Figure 4: three-layered data fusion architecture with SNr, RDN, INS**

## CONCLUSION

In conclusion, the extraction and identity declaration within the proposed fusion architecture has been studied. The sensor network structure has also been taken under consideration, which consists of only a single PFC. Thus, as there is only a single PFR generated by this PFC.

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