PCA ANALYSIS AND DATA TRANSMISSION FORM VESSEL

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1. Introduction

Principal Component analysis (PCA) is a useful statistical technique that has found application in fields such as face recognition and image compression, and is a common technique for finding patterns in data of high dimension.

It is a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences. Since patterns in data can be hard to find in data of high dimension, where the luxury of graphical representation is not available, PCA is a powerful tool for analysing data.

The other main advantage of PCA is that once you have found these patterns in the data, and you compress the data, ie. by reducing the number of dimensions, without much loss of information. [1-2]

The departure hypothesis is based in that it is possible to use PCA theory to manage great quantity of data recollected onboard form vessel control system to send it through satellite.

2. Results and Discussion

The materials used were the data (numbers) collected in LNG vessel "Castillo de Villalba". With this information, PCA algorithm was performed and Row Feature vector of eigenvectors, original data means and final data of PCA obtained.

After choosing proper components, was prepared the package of double precision numbers (64 bit) to send once for satellite.

These data was received on shore and the procedure of reconstruction of the data settles down in destination, comparing them with the originals.

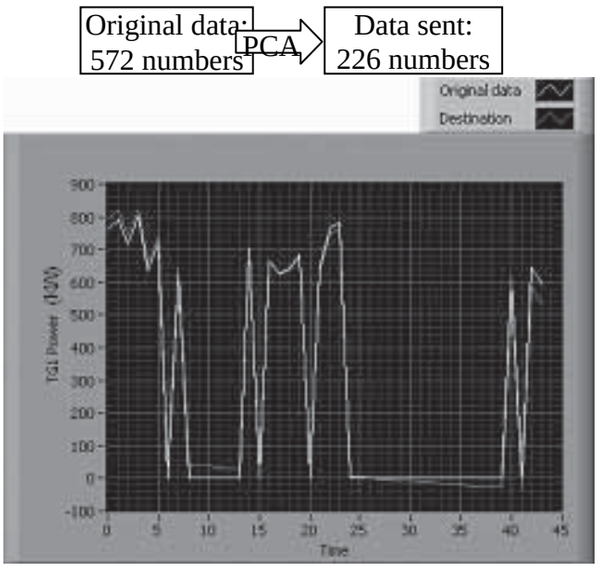

Figure 1.- Comparison between original and reconstructed data in destination. Original data were 572 numbers and transmitted 226.

3. Conclusions

PCA help to reduce significantly data amount e send via satellite, reducing communication costs. This strategy will be proper to take maintenance decision on-shore.

4. References

[1] J., Baró, et al "Estadística II". Ed. Fundació per a la Universitat Oberta de Catalunya. Barcelona, 2000.

[2] D. Peña Sánchez de Rivera, "Estadística. Modelos y Métodos. Volumen 2". Ed Alianza. Madrid, 2007.

LOW COMPLEX WIRELESS SENSOR NETWORK UPLINK IN THE HF BAND

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1. Introduction

This paper presents the uplink digital communication system for WSN (Wireless Sensor Network) applications in the HF (High Frequency) band. The downlink connection is presented in another paper. We are currently prototyping the system and we need to conclude this work in order to perfectly define a parameters system. In a WSN in which there is a node working as a BS (Base Station), this node needs to transmit information to all other nodes, so we have proposed a downlink based on a OFDM-DCMA (Orthogonal Frequency Division Multiplexing - Code Division Multiple Access) strategy. The nodes that only collect information and transmit it to the BS will occasionally use an uplink strategy based on OFDM (Orthogonal Frequency Division Multiplexing). The signal from each node to the BS will be composed of a burst of several OFDM symbols. The symbols at the beginning of the burst are known and bring information for synchronization, channel estimation and equalization. As the BS transmits a continuous signal with time and periodic information for all nodes, when a node needs to send information, in order to avoid collisions, it waits for its time and then uses all the uplink bandwidth to transmit its information. Optionally, the nodes can change to a low-power function mode for a time period. [1]

The first issue to take into account in developing a digital communication environment like this, is that, today, it is possible to construct digitally the HF signal to attach the amplifier directly from the DAC (Digital Analogue Converter). It is also possible to take samples just in the output antenna amplifier. The transceivers could almost all be built using digital technology, and the RF (Radio Frequency) subsystem is reduced to an amplifier and an antenna. In the HF band, filters, rough synchronization, base band conversion, fine synchronization,