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Prediction-based energy saving in wireless sensor networks: Combining Kalman Filter and Grey Model

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*Abstract* — XXXXXXXX XXXXXXXXX XXXXXXXX XXXXXXX XXXXXX XXXXXXXXXXXXXXXWireless sensor networks (WSNS) has been widely XXXXXXXXXXXXused to mon

***Index Terms*** – **WSN,XXXXXXXX,**

# INTRODUCTION

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ensor technology has been widely used in a variety of domains dealing with monitoring, such as health monitoring, environmental monitoring, and seism monitoring; control, such as agriculture control; and surveillance, such as battlefield surveillance. A wireless sensor networks (WSNs) is composed of tiny, battery-powered devices, called sensor nodes[1]. In many applications, distributed sensor systems supply environment information or measure condition of process or machine. In the future, due to the rising number of wireless sensor networks, more and more sensors will be available for collecting data about the environment. In this scenario, the different sensor nodes establish an instrumented and intelligent environment with the capability of varying the degree of information exchanged according to

solve data processing, energy saving, fault detection, and security problem in WSNs. Finally, the summary will be given Section V.

# Prediction-based data collection protocol

The wireless sensor network has many advantages and will be widely used in both Industry and society field. On the contrary, there are several challenges related to sensor network and wireless technology. In this section, we will categorize those application functions and challenges into five different areas: data processing, fault detection, energy consumption, and security.

## Prerequisites

The wireless sensors are always deployed in Industrial process system, shop floor and factories, office circumstance and natural environment. Sensors are used to detect the temperature, pressure, force and so on. Sometimes, the surrounding condition towards the sensor are harsh. The quality of data acquiring may be impacted in the sensor. On

ss expensive than the energy which used for transmission[2].

## Initialization

Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx that if sensors process the data before transmission to sink node rather than directly transmit all raw measurements.

## Prediction:

Fault detection problem has been an active field of research for the past decades because of the ever increasing demand for higher performance, higher safety, and reliability standardsxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxave been addressed in wireless sensor networks and a number of results about the distributed fault detection and fault tolerance have been published in the literature[3].

## Exceptions

The nature of smart wireless sensor networks leads to several critical security issues that need to be addressed. Sucxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

# Cyprss Platform introduction

Cyress xxxxxxxxxn engineering and science applications comparable to Fourier a

## Hardware

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## Software

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A sample vector can be projected on the PCS and RS respectively,



# Prediction-based transmission for WSN energy saving

## Prediction based on Kalman Filter

Xxxxxxxxx

Xxxxxxxxxx

Xxxxxxxxxx

and Hyperbolic Hopfield Neural Network (HHNN) as predictor. This method provides an efficient and adaptive preprocessing of WSNs streaming data.

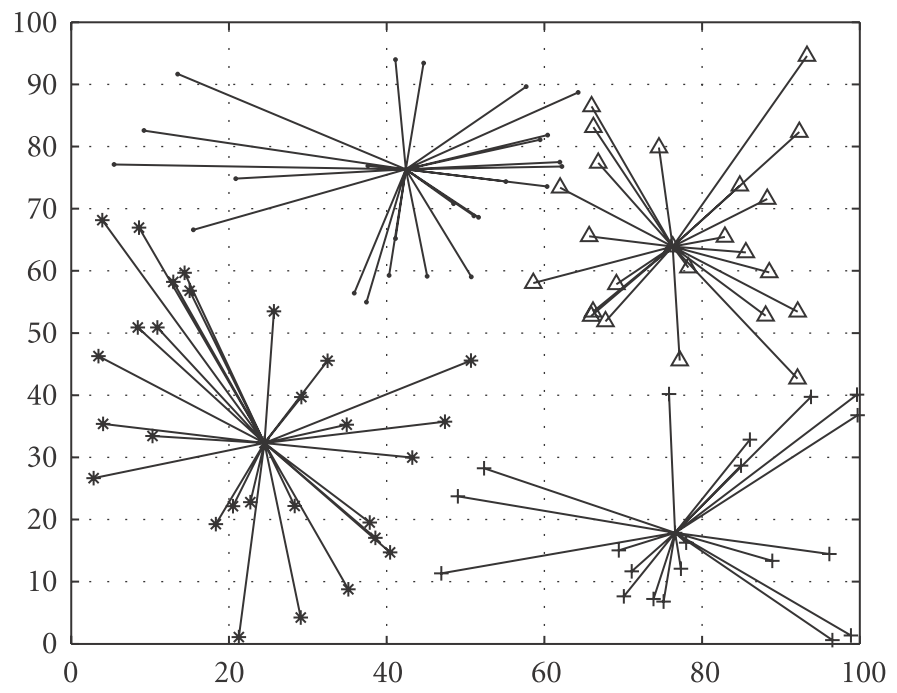


Figure 1. Propose Mechanism of PCA Anomaly Detection

## Prediction based on Grey Model

(PC) of the neighboring cluster heads. This algorithm also efficiently improve the data compression ratio under the premise of ensuring the data reconstruction accuracy. Though this algorithm, it can get better compression ratio and reduce the energy consumption of sensor nodes.

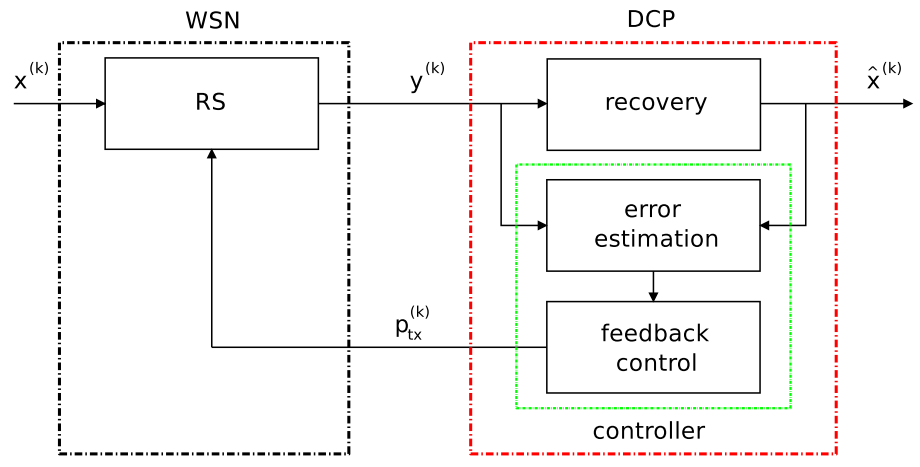


Figure 2. Diagram of the proposed sensing, compression and recovery scheme. Note that the *Controller*, which includes the *Error* estimator and the *Feedback Control* blocks, represents the core of *SCoRe1*.

## Prediction Combination for WSN Energy Saving

WSNs consist of battery powered nodes which inherit sensing, computation, and wireless communication capabilities. Although there have been signiﬁcant improvements in processor design and computing issues, limitations in battery provision still exist. This brings energy

sult, an intermediate node merely sends a packet instead of relaying all the incoming packets to reduce data transmission

# Experiment and performance evaluation

## Matlab Result from Kalman Filter Prediction

WSNs are applied to various applications, ranging from military to civilian fields. Due to the critical nature of such applications, security issues are of significant importance. WSNs are vulnerable to different types of attacks since they

## Matlab Result from Grey Model

. The design and development of a home security system, based on human face recognition technology and remotely monitoring technology has became popular. [4] implement a wireless be used as face recognition in smart home security application.

## Cypress BLE implementation

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dgsdfgsfghshfhshsf

# Summary and Conclusion

In this paper, we introduce a dimensionality reduction techaaaaaaaaaaaaaaaaSome details of survey aaaaaaaaaugh this survey, we aaaaaaaaaaaaaa is one of most suitable algorithms used in WSNs.

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