

DESIGN AND IMPLEMENTATION OF LARGE-SCALE PIG FARM BIG DATA ACQUISITION SYSTEM BASED ON IOT

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Introduction

Pig farm environmental factors, such as temperature, humidity, light, harmful gas content like ammonia and carbon dioxide, as well as pig's daily behavioral data, such as its body temperature, duration of sit and walk, feed intake, make up pig farm big data, which is important basis for accurate control of pig's health. The precise acquisition of such data becomes an urgent. Currently data collection in pig farm is of poor real-time performance and persistence, especially for video data in collaborative collection applications.

Materials and methods

A set of intensive pig farm data collection indicators is firstly designed, as shown in figure 1.

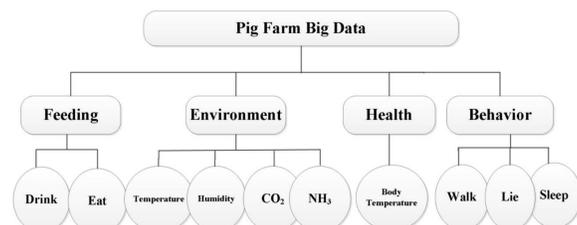


Figure 1. Data collection indicators for large-scale pig farm.

Then, based on Internet of things technology, this paper builds up a pig farm big data acquisition system, designs a detailed IOT topology architecture, a network communication protocol and an intelligent processing gateway system, implements an integrated big data acquisition system for large-scale pig farms. Instead of the traditional centralized monitoring system(as shown in figure 2), a distributed architecture is proposed, as shown in figure 3.

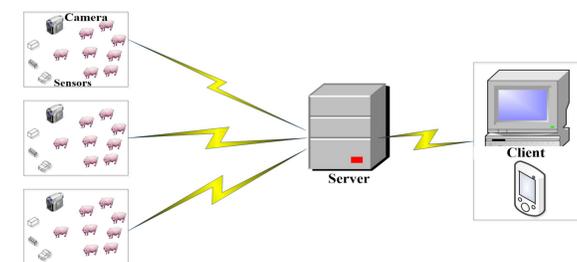


Figure 2. Centralized monitoring system, all the raw data is computed in the server, which will result in a Computational bottleneck.

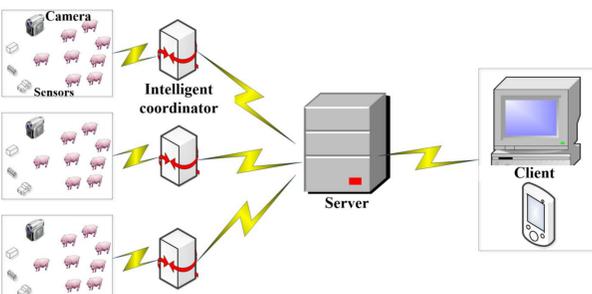


Figure 3. A distributed monitoring architecture proposed by our paper. Raw data is firstly processed in an intelligent coordinator and then transfer the processed data to the server.

Results

Environmental factors, pig's feeding, health and behavior monitoring data can be comprehensively coordinated acquired. The experiment has been carried out in a pig farm in Guangdong province, China. One month consecutive experiment shows that our system can on-line monitor pig farm data as designed. It can catch the changes of pig farm environment and pig's growing status in time. The environment data is shown in figure 4.

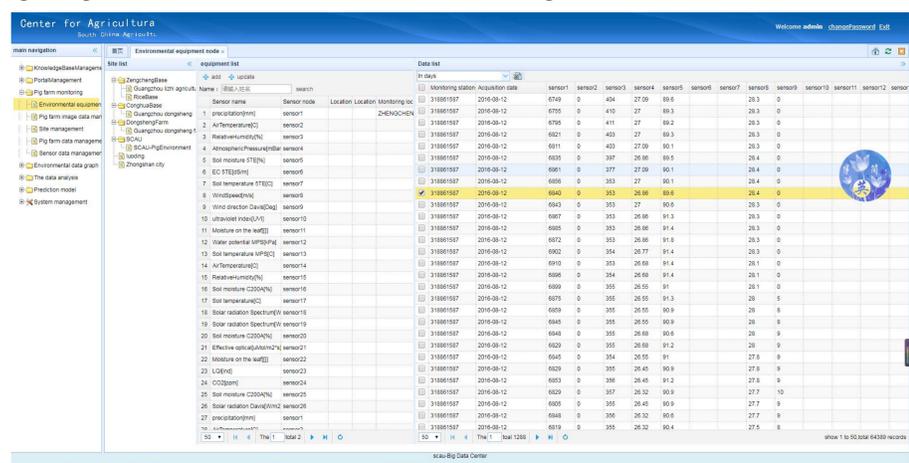


Figure 4. Big Data platform.

Through the video captured in the pig farm, each pig's movement data is computed by an algorithm we designed^{[1][2]}. The result is shown in figure 5.

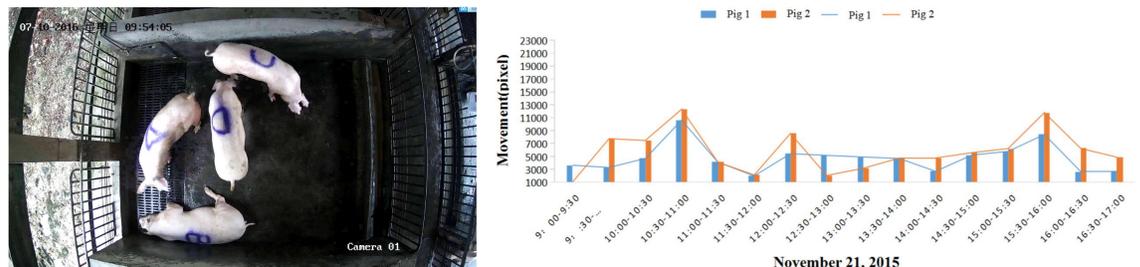


Figure 5. Pig' movement data.

The body temperature of each pig is measured by an ear tag with temperature sensor. The result is shown in figure 6.



Figure 6. Pig' body temperature.

Discussion And Conclusions

The architecture our paper proposed is a designed to gather data from large-scale pig farm. After a long term data collection by our proposal, a big data set can be acquired. The raw data is firstly processed in local and then in server. It is a novelty approach in monitoring system. The big data set can be used to explored the relationship between environment, diet, behavior, and health.

Our system has a broad application prospect. Farmers can take corresponding measures to cope with different scenarios according to the result of real-time monitoring. It is of great significance to the pig production industry.

Literature cited

- [1] Xiao Deqin, Feng Aijing, Yang Qiumei, Liu Jian, Zhang Zhe. Fast Motion Detection for Pigs Based on Video Tracking[J]. Transactions of the Chinese Society for Agricultural Machinery, 2016, 47(10) :351-357.
- [2] Feng Aijing, Xiao Deqin. Motion parameter extraction algorithm for pigs under natural conditions[J]. Journal of Computer Applications, 2016, 36(10):2900-2906.

Acknowledgments

This work was supported by the State's Key Project of Research and Development Program of China (grant number 2017YFD0701601) and Science and Technology Planning Project of Guangdong Province, China (grant number 2015A020209149).