

# Design of Intelligent Scheduling System for Wine Grape Agricultural Equipment Based on User Requirement

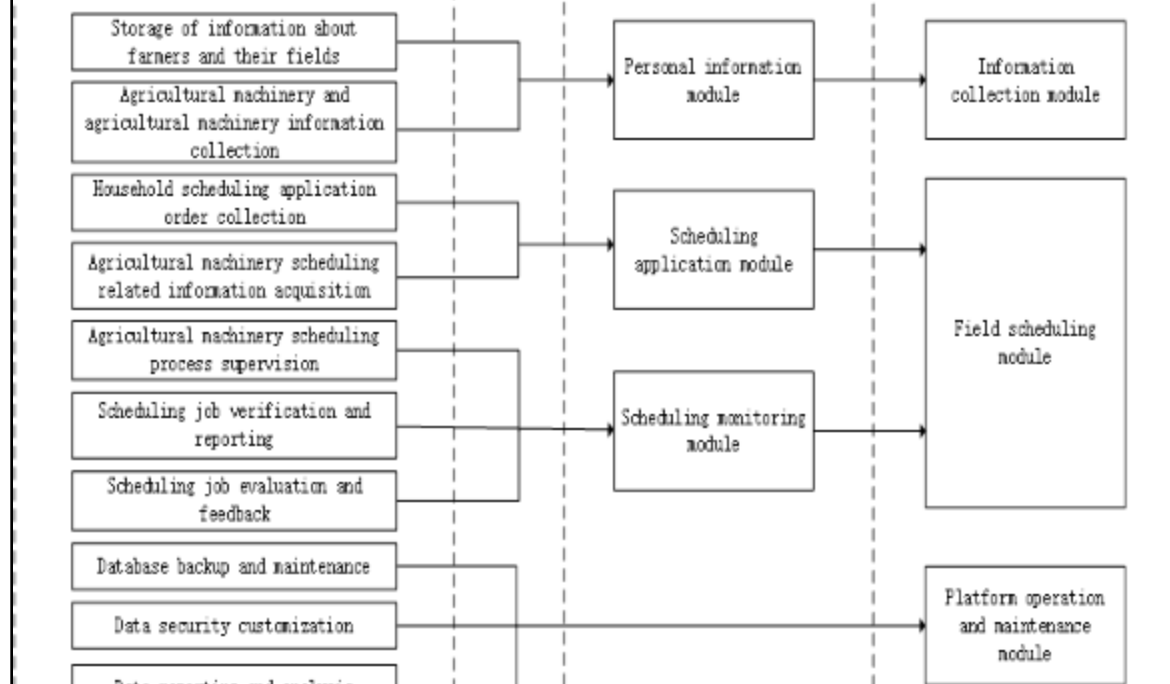
Haoran Huang, Tianlong Hou, Wen Li, Tao Zhang  
School of Management., Jiangsu University, Zhenjiang, Jiangsu, China

Supported by **The National Science and Technology Major Project of China (2019YFD1002500)**

## Introduction

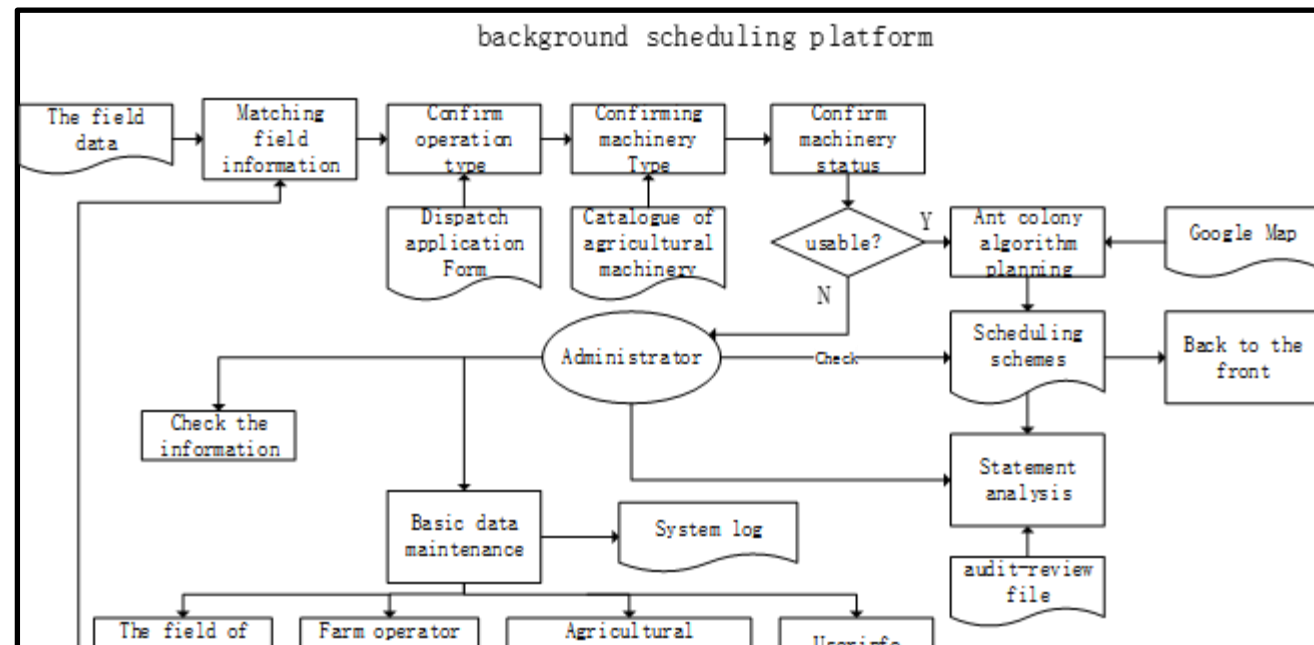
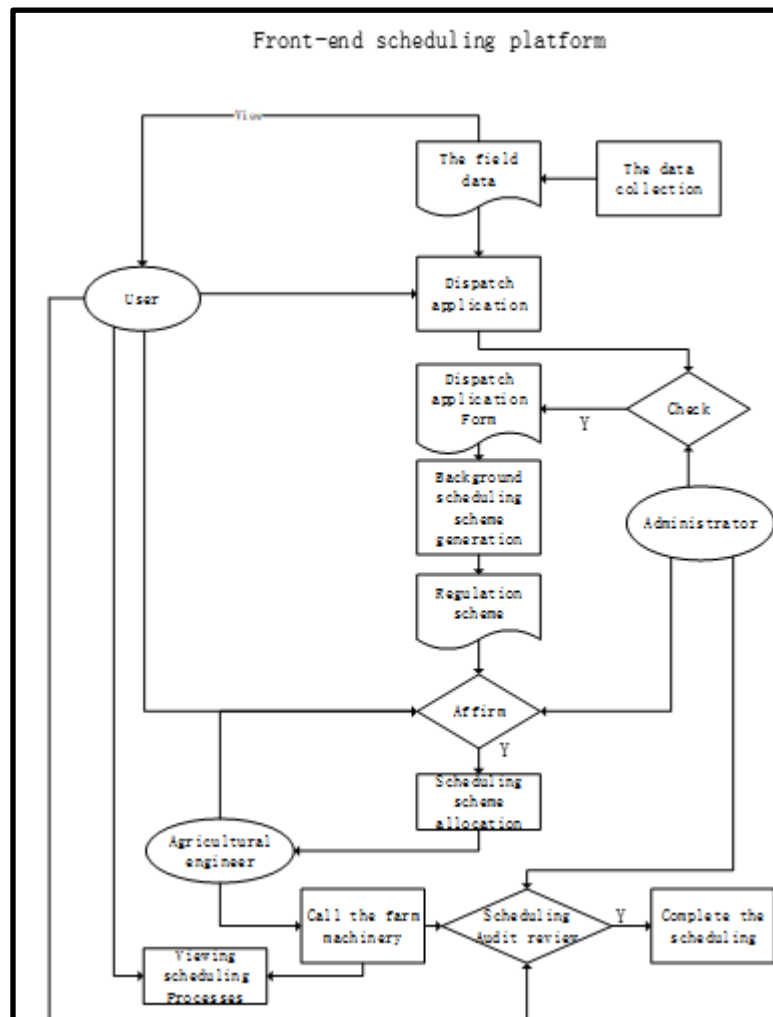
Based on the survey data of farmers' needs and field environment, the design and implementation of intelligent scheduling system for wine grape agricultural equipment, guided by users' orders, can effectively change the current situation of shortage of agricultural equipment in wine grape producing areas in Ningxia. The platform will manage information and data of farmers, farm operators, farm machinery and equipment in an integrated way, and make use of a unified data platform to facilitate data sharing and exchange; The scheduling scheme adopts the method of combining the tripartite confirmation of the scheme with the feedback of post-scheduling evaluation, simultaneously meets the tripartite needs of farmers, agricultural operators and administrators, and ensures the quality of scheduling operations. The intelligent scheduling system of grape-making agricultural machinery equipment can effectively reduce the cost of field scheduling, improve the efficiency of manpower, material resources and financial resources, and enhance the economic benefits of grape-making industry.

## Field Research and User Requirement Analysis

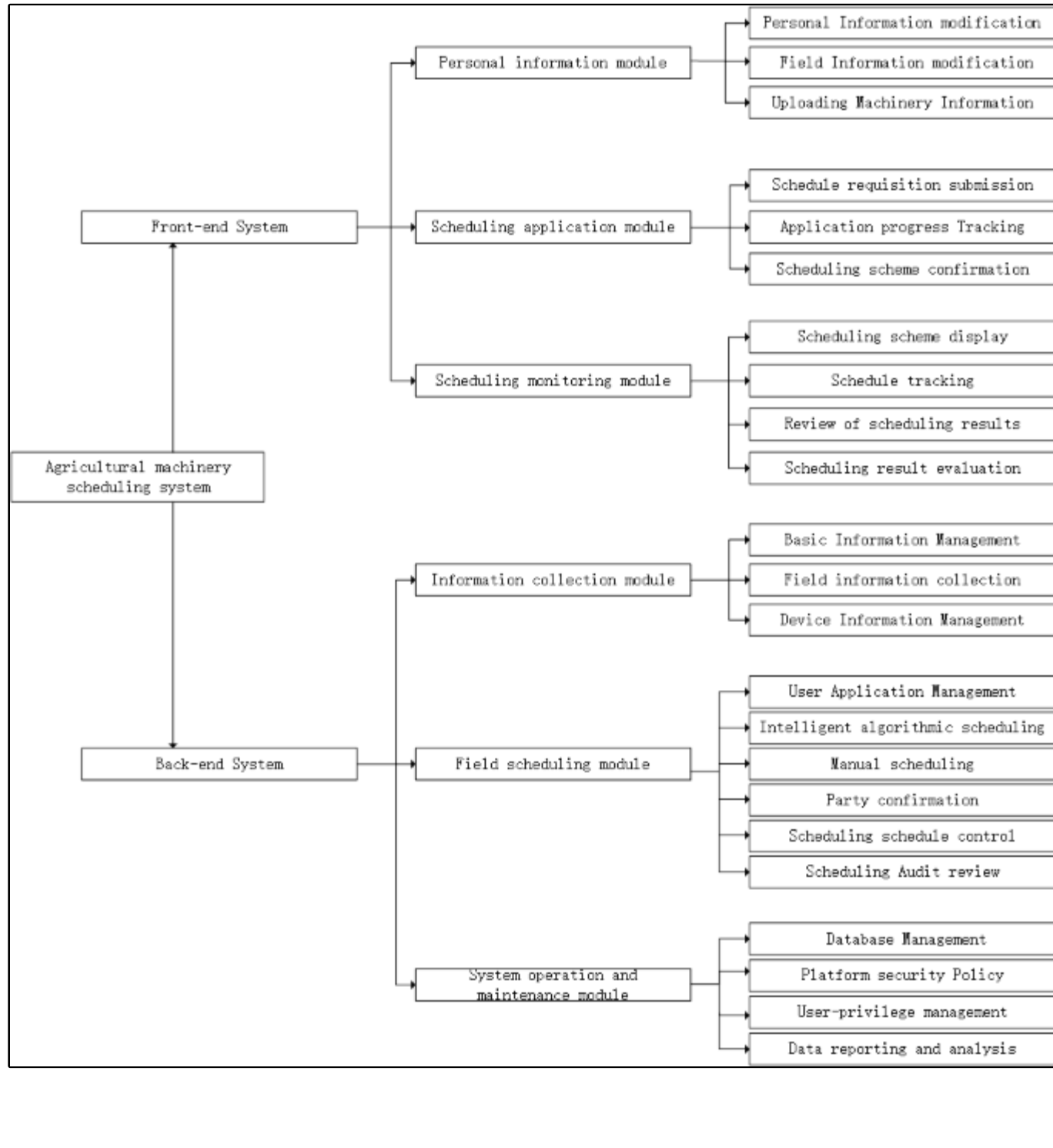


The realization and application of intelligent scheduling system of grape farm machinery equipment can further improve the informatization level of wine grape planting wineries in Ningxia. Promoting the information exchange and resource allocation among **the demand provider** (farmers), **the operator** (agricultural equipment operators) and **the winery manager** (administrators), and rationally distributing the scheduling orders can not only realize the income of agricultural machinery service organizations, but also solve the scheduling problems of agricultural equipment with low cost and high efficiency. Through the demand collection of farmers, farm operators and winery managers, we get the functional demand domain of the intelligent scheduling system of grape wine farm machinery equipment.

## Design of Intelligent Dispatching System for Wine Grape Agricultural Equipment



Through the field investigation of wine grapes in Ningxia, combined with the demand analysis of applications, the current business process of scheduling agricultural equipment for wine grapes has been reorganized.

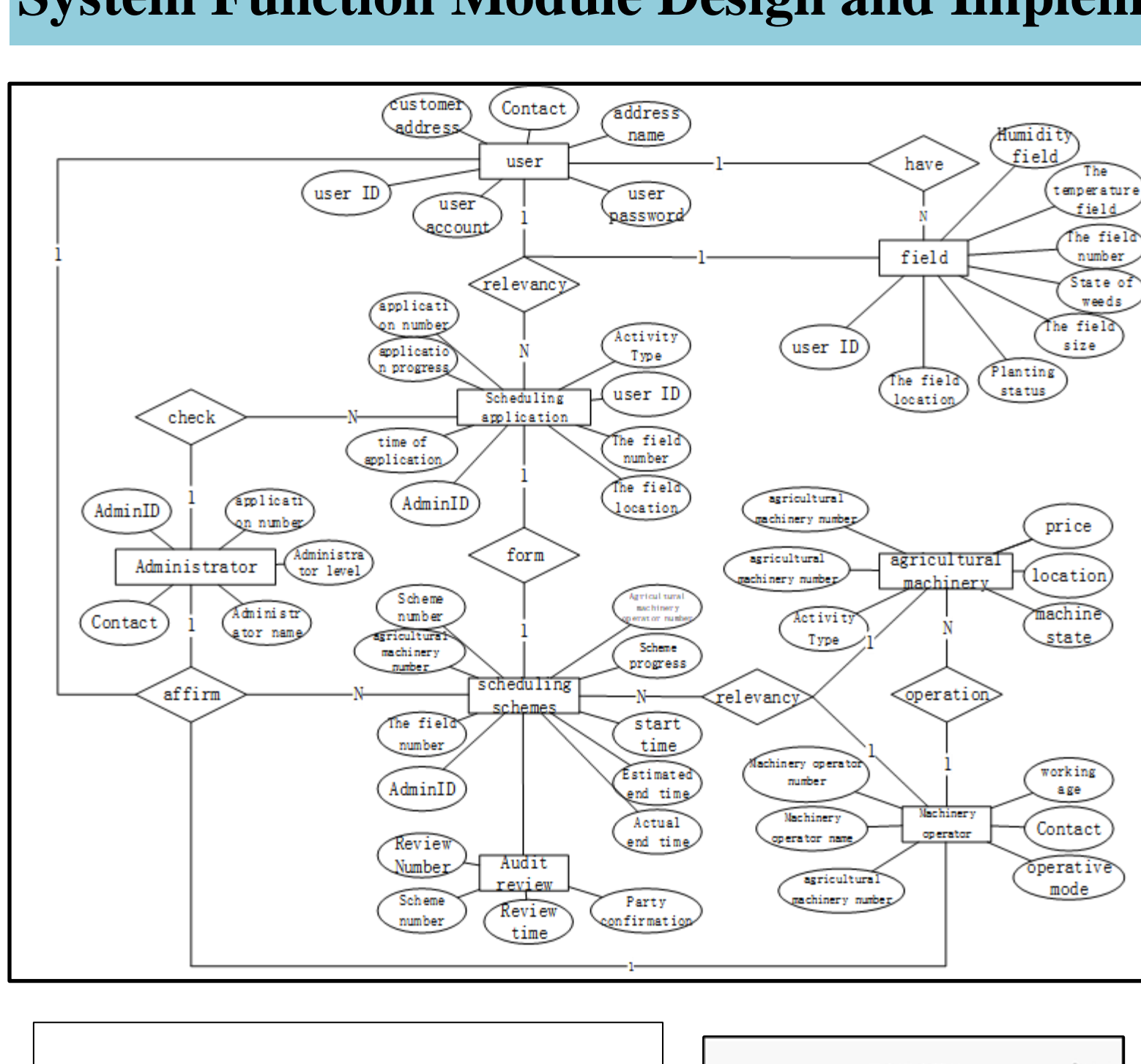


According to the business process analysis of the platform, the functional structure of the platform is divided into front-end function and background function, consisting of 6 modules and 23 sub-modules.

The front-end function of the system is mainly aimed at farmers' information collection and feedback of scheduling situation, which is composed of three main parts: **personal information module**, **scheduling application module** and **job monitoring module**.

Back-end system functions include intelligent generation of scheduling scheme and operation and maintenance of information by administrators, which are three main parts: **information collection module**, **field scheduling module** and **system operation and maintenance module**.

## System Function Module Design and Implementation

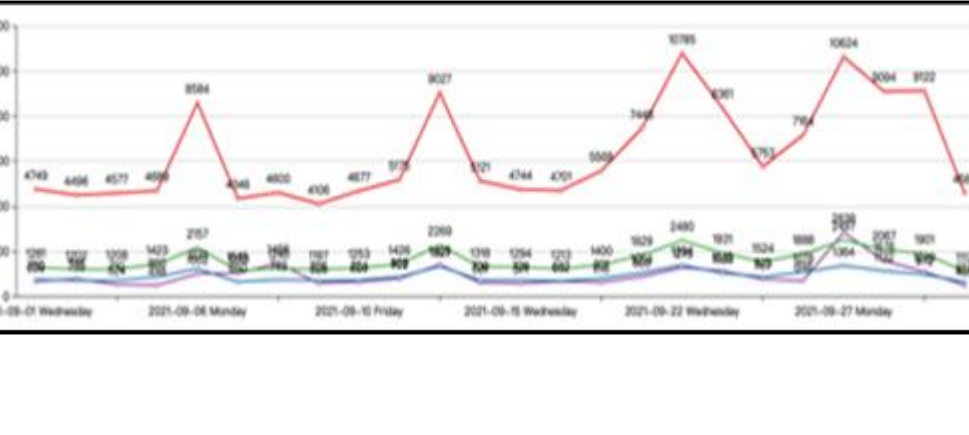


The overall relationship diagram of the system database can be obtained according to the entities involved in the platform and their dependencies. The entities involved in the entity relationship diagram mainly include users, fields, scheduling applications, administrators, scheduling schemes, agricultural machinery operators, agricultural machinery equipment and audit and evaluation, and the platform database is built according to these entities and their attributes, which is deployed on Alibaba cloud.

The information acquisition module is mainly responsible for the basic information management functions of the platform, which can complete user management, farmer management, agricultural equipment management, field information management, scheduling scheme management, scheduling evaluation management and role authority management, and can add, modify and delete information.



After the agreement of the farmers, dispatchers and agricultural operators, the instructions will be given to the corresponding agricultural operators, and the specific contents of the scheme will be notified to the farmers, allowing them to master the scheduling process.



The system operation and maintenance module is mainly responsible for maintaining the daily functions of the platform, monitoring abnormal data to improve the security of the platform, and protecting the reliability of user data; The platform also analyzes and summarizes the data of previous scheduling schemes, and obtains the daily scheduling frequency, which helps wineries purchase agricultural equipment in a targeted manner.

## References

- [1] Fengjie Sun, Xianchang Wang, Rui Zhang. Task scheduling system for UAV operations in agricultural plant protection environment[J]. Journal of Ambient Intelligence and Humanized Computing, 2020(prepublish).
- [2] Haotian Yang, Shuming Xiong, Samuel Akwasi Frimpong, Mingzheng Zhang. A Consortium Blockchain-Based Agricultural Machinery Scheduling System[J]. Sensors, 2020, 20(9).
- [3] Bochtis D D, Sørensen C G. The vehicle routing problem in field logistics: Part II.[J]. Biosystems Engineering, 2010, 104(4): 447-457.
- [4] Baio F H R, Rodrigues A D, Dos Santos G S, et al. Mathematical Modeling To Select Mechanized Agricultural Systems by the Lowest Operational Cost[J]. Engenharia Agricola, 2013, 33(2): 402-410.
- [5] Zhu X M, Ding Y S, Cai X, et al. Optimal Schedule for Agricultural Machinery Using an Improved Immune-Tabu Search Algorithm[J]. Proceedings of the 36th Chinese Control Conference (Ccc 2017), 2017: 2824-2829.