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# Research on Typical Process Mini Programs for Overhead Distribution Lines based on Non Power Outage Operation Technology in Distribution Network

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## Abstract

**To address the challenges and risks associated with the complex design of distribution network architecture, uneven skill levels of construction personnel, and inadequate training of construction personnel, this article proposes a typical process mini program for overhead distribution lines based on uninterrupted operation of distribution networks. Through requirement analysis, the functions of the mini program were determined, and the front-end and system back-end functions of a typical process mini program for overhead distribution lines based on uninterrupted operation of the distribution network were designed. Based on the development architecture of the mini program and combined with cloud services, a typical process mini program for overhead distribution lines based on uninterrupted operation of the distribution network has been developed. The establishment of a typical process library and knowledge base for overhead distribution lines based on uninterrupted operation of the distribution network has been achieved, making it convenient for users to search, learn, and collect typical processes in a timely manner, and to learn and apply them to maintenance sites anytime, anywhere. The typical process mini program for overhead distribution lines based on uninterrupted operation of distribution network lays the foundation for better leveraging the technical advantages of uninterrupted operation of distribution network, further improving the reliability of distribution network power supply, and ensuring the accuracy of uninterrupted operation of distribution network.**

## Keywords

**Distribution Network Uninterrupted Operation; WeChat Mini Program; Process Library; Overhead Distribution Lines; Knowledge Base.**

## 1. Introduction

China's overall electricity consumption ranks first in the world, but considering the average power outage time per household, there is still a certain gap in the reliability of distribution network power supply compared to developed countries [1-2]. Carrying out uninterrupted power supply operations in the distribution network can achieve continuous power supply to users, which is an effective means to improve the reliability of distribution network power supply[3]. However, the current distribution network structure cannot fully adapt to the implementation of uninterrupted power operations, which are often difficult, risky, and even impossible to carry out. The reasons are as follows [4]:

(1) The typical design of traditional 10 kV overhead lines is based on power outage maintenance operations. Most of the overhead distribution lines designed according to traditional methods are not fully suitable for uninterrupted operation of the distribution network due to various factors such as distribution network structure, pole position path, pole head structure, equipment installation position and installation method, lightning protection

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measures selection, etc., which directly affects the timely elimination of equipment maintenance, defect elimination, and safety hazards of overhead distribution lines;

(2) The construction and installation of 10 kV overhead power lines are often carried out during power outages. Due to limitations in the skill level and sense of responsibility of construction personnel, improper installation and connection of various equipment will directly affect the smooth operation of the distribution network without power outages;

(3) Although relevant units attach great importance to the design and construction of overhead distribution lines based on uninterrupted operation technology for distribution networks, they do not fully grasp the actual design content or cannot learn and apply it on site anytime and anywhere.

In summary, the development of a typical process mini program for overhead distribution lines based on uninterrupted operation technology for distribution networks is aimed at addressing the limitations of time and space for distribution network operation and maintenance personnel to timely obtain and learn the connection relationship and process knowledge of overhead distribution lines. By applying the mini program to learn, master, and apply typical processes, we strive to better leverage the advantages of uninterrupted operation technology for distribution networks in the design, construction, and operation of overhead distribution lines, further improve the reliability of distribution network power supply, and ensure the accuracy of uninterrupted operation for distribution networks.

## 2. Conceptual Design

### 2.1. Requirement Analysis

In response to the existing problems in the current uninterrupted operation of distribution networks, combined with research and analysis of relevant domestic systems, it is determined that the typical process mini program for overhead distribution lines based on uninterrupted operation technology has the following requirements in terms of business and architecture [5-6].

(1) On site operation and maintenance personnel can search for typical design drawings and parameter configurations of 10kV overhead lines in the distribution network based on the line name. By searching for accurate drawings, precise operation point positioning and related switch operations can be carried out during uninterrupted operation of the distribution network.

(2) According to the specifications for uninterrupted power operation in distribution networks, a manual for uninterrupted power operation in distribution networks has been developed. Operation and maintenance personnel can search for the manual based on the type of operation, ensuring the safety of personnel and equipment on site, and standardizing the installation and connection of various equipment.

(3) To train personnel from relevant units, master the knowledge base related to the design and construction of overhead distribution lines based on uninterrupted operation technology of distribution networks, develop a training knowledge base, and provide online training on uninterrupted operation knowledge of distribution networks for operation and maintenance personnel of relevant units.

(4) The system should have scalability, and with the update of power outage operation technology in the distribution network, users can easily and quickly update the typical process, operation specifications, and training knowledge of overhead distribution lines for power outage operation in the distribution network.

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(5) Annotate personnel at different management levels and implement hierarchical management, granting different permissions to personnel in different roles to facilitate personalized learning.

## 2.2. Mini Program Development Architecture

Mini program is a cloud service based on WeChat and Tencent Cloud that does not rely on servers [7-9]. Developers only need to focus on developing system functions and business logic, without the tedious construction of backend service areas, data interfaces, and other development work unrelated to the business itself. System functions can be quickly implemented and run online, improving system development efficiency. A typical process mini program for overhead distribution lines based on uninterrupted operation of distribution network is systematically developed through cloud based databases, storage, and functions. The development architecture is shown in Figure 1.

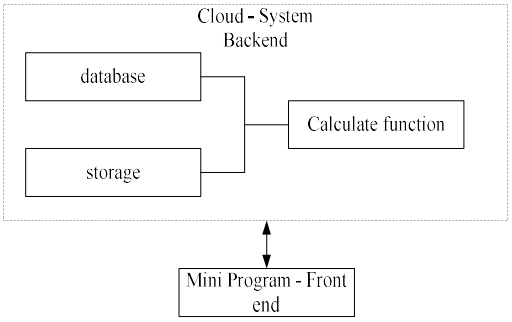


**Figure 1.** Mini Program Development Architecture

## 2.3. System Design

Taking into account the business and functional requirements of the mini program, as well as the overall design principles of the software development system, a typical process mini program for overhead distribution lines based on uninterrupted power operation technology for distribution network is composed of two parts: the front-end of the mini program and the back-end of the system. The system architecture is shown in Figure 2.

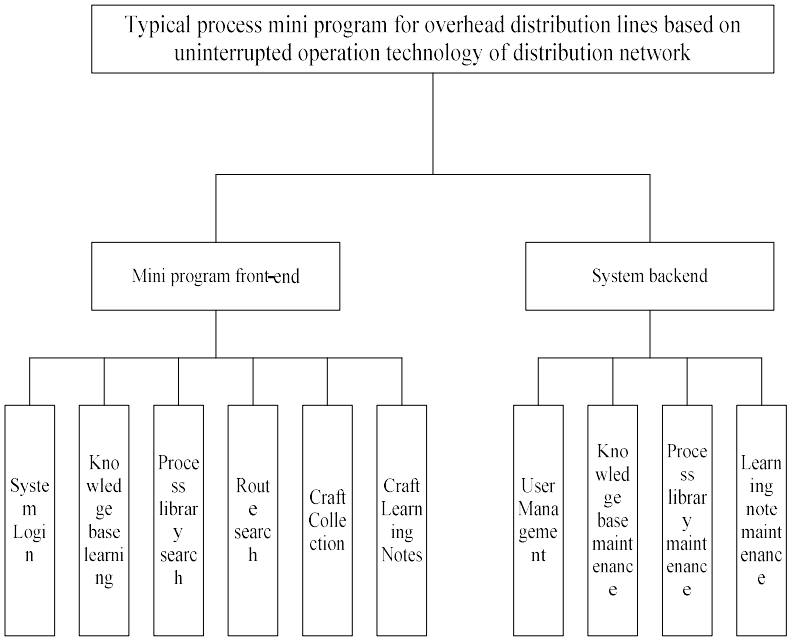


**Figure 2.** Mini Program Function Structure Diagram

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The frontend of the mini program includes a system login module, a knowledge base learning module, a process library search module, a circuit search module, a process collection module, and a process learning note. The system login module allows users to register and log in. The knowledge base learning module provides users with knowledge base learning content, and can update the learning content by linking to the backend. The process library search module provides users with key content index search. The line search module provides users with a line name index to search for the architecture, design drawings, and key parameters of related lines through the line name. The process learning note module can provide users with learning records, which can be recorded at any time during the learning process to improve learning efficiency.

The typical process mini program system for overhead distribution lines based on uninterrupted operation of distribution network includes user management module, knowledge base maintenance module, process library maintenance module, and learning note maintenance module. The user management module classifies and stores different users, and sets different operating permissions for the system. The knowledge base maintenance module is maintained by the system administrator, including operations such as adding, deleting, and modifying the knowledge base. The operation module of the process library is maintained by the system administrator, including operations such as adding, deleting, and modifying the process library. The learning note maintenance module allows users to modify, download, and synchronize their own learning notes.

## 3. System Function Implementation

### 3.1. Knowledge Base Learning

The knowledge base of the mini program consists of typical process instructions, overhead distribution line wiring drawings and parameter configuration instructions, and typical operation instructions for overhead distribution lines during uninterrupted power distribution operations. The typical process description is excerpted from various operational standards and specifications for overhead power lines, with the aim of improving the standard construction process of on-site operation and maintenance personnel. The wiring drawings and parameter configuration instructions for overhead distribution lines include electronic standard drawings and photos of outdated drawings, and are named according to the naming conventions of overhead distribution lines, which facilitates on-site personnel to search and improve construction efficiency. The typical operation instructions for overhead distribution lines without power outage in the distribution network include pre construction preparation, construction procedures, safety standards, operation procedures, etc., which facilitate the standardized implementation and inspection of on-site construction by construction management personnel.

### 3.2. Search and Collection of Process Library

The mini program can perform precise and fuzzy retrieval based on the line name and number, making it convenient for on-site personnel to search. To meet the personalized learning needs and maintenance work requirements of users, users can collect typical and interesting construction processes in the near future, and quickly find them in their personal collection list, saving users time in searching.

### 3.3. Process Library Learning Notes

Mini program configuration learning notes, summarizing the knowledge base of interest within the mini program for easy review by users. Learning notes can be modified and saved at any time, and can also be viewed and downloaded on the computer, making it easy for users to print paper versions for learning. Learning notes can be shared through WeChat, making it

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convenient for individuals with similar work and study needs to learn and improve their own abilities.

### 3.4. Backend Functions

The system backend is managed by two levels of permissions: users and administrators. Users can modify their study notes and favorite content. Administrators can also manage different user permissions and modify the content of the knowledge base to ensure that it complies with the latest version of standard specifications.

## 4. Summary

Due to the complex design of the distribution network architecture, uneven levels of construction personnel, and inadequate training for construction personnel, it is difficult and risky to carry out uninterrupted operation of the distribution network. To solve these problems, this article designs a typical process mini program for overhead distribution lines based on uninterrupted operation of the distribution network. Through requirement analysis, the functions of the mini program were determined, and the front-end and system back-end functions of a typical process mini program for overhead distribution lines based on uninterrupted operation of the distribution network were designed. Based on the development architecture of the mini program and combined with cloud services, a typical process mini program for overhead distribution lines based on uninterrupted operation of the distribution network has been developed. The establishment of a typical process library and knowledge base for overhead distribution lines based on uninterrupted operation of the distribution network has been achieved, making it convenient for users to search, learn, and collect typical processes in a timely manner, and to learn and apply them to maintenance sites anytime, anywhere. The typical process mini program for overhead distribution lines based on uninterrupted operation of distribution network lays the foundation for better leveraging the technical advantages of uninterrupted operation of distribution network, further improving the reliability of distribution network power supply, and ensuring the accuracy of uninterrupted operation of distribution network.

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