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Optimization and Application of Artificial Intelligence in Robotic Automated Distribution Network Overhead Line Engineering

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Abstract

INTRODUCTION: Artificial intelligence is a product of high-end technological development since the 21st century, which has subverted people's traditional cognition in many aspects and greatly enriched and improved people's lives. Artificial intelligence has covered every aspect of life, and the distribution network overhead line project is also one of them. The combination of the two symbolizes the combination of modern technology and infrastructure construction, which is of great significance for modern economic and social development and transformation and upgrading.
OBJECTIVES: In order to solve the practical problems in the design of artificial intelligence and distribution network overhead line engineering, this paper focuses on the practical use of such artificial intelligence as robots in distribution network overhead line engineering.
METHODS: The models of spatial perception, target recognition and automatic calculation are established, and some key technical problems of robots put into actual engineering are simulated and calculated.
RESULTS: In the spatial perception model, the combination of robotic arm and laser device is utilized to solve the problem of direct sunlight, which affects the localization. In the target recognition model, combining the algorithms of minimum spanning tree and maximum critical path, the computational accuracy is improved to 1 mm. in the automatic computation model, the introduction of auxiliary lines and the secondary confirmation of manpower make the error of the work further reduced.
CONCLUSION: This paper's simulation algorithm for the reality of the distribution network overhead line project provides a more detailed solution to improve the technical content of the distribution network overhead line project and the quality of construction management is not a simple task, the need for the relevant distribution network overhead line project enterprises as well as the corresponding distribution network overhead line project personnel to take targeted measures.

Keywords: Artificial intelligence, robotics, automated distribution network, overhead line engineering optimization and application.

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1. Introduction

Artificial intelligence refers to an intelligent machine similar to the human brain [1]. It is well known that the human brain is like an endless treasure trove with unlimited potential within it. Many people are able to use only a part of it, and much brain power is still untapped, and many people are unable to go further in their lifetime. For this reason, many scientists have been developing technology to achieve this breakthrough, hoping to invent a machine similar to the human brain that can think independently and have its own feelings like the human brain. However, this technology has not yet been realized, and all artificial intelligence is an imitation of the human brain, which can only achieve some of the functions of the human brain. With the support of computer technology, although it can work efficiently, it is still inseparable from people's background monitoring and on-site supervision. The distribution network overhead line refers to the line tower, wire, insulators, gold, tie wire, tower foundation, grounding devices, etc., erected above the ground for the transmission of electrical energy between the two points of the system facilities [2]. That is in the common sense of the transmission of electricity in the line.

There are two common types of overhead line projects in the distribution network, namely, the inner line project and the outer line project, both of which install and join the various parts of the lines in the project. In both projects, many of the construction methods are the same, except for the location of the lines. The introduction of automated artificial artificial intelligence into the line project, can save more time and effort than the traditional manual build, has become the preferred means of construction for many infrastructure, such as some large stadiums, cultural squares, parking lots and other nearby more densely populated line laying, has gradually used automated artificial intelligence for laying, both efficient and safe.

And with the continuous development of artificial artificial intelligence as well as modern distribution network overhead lines, the connection between the two has become increasingly close, and has played a role in promoting the progress of modern society. This is mainly reflected in the promotion of artificial intelligence for distribution overhead line erection. On the one hand, artificial intelligence can bring advanced technology to help distribution overhead line erection overcome some design problems; on the other hand, the use of artificial intelligence can create a safety environment that is more in line with production requirements and greatly reduces the construction risks of distribution overhead line erection [4].

And when it comes to the significance of the use of automated artificial intelligence in distribution overhead line engineering, it can be divided into the following points: firstly, it is conducive to improving the efficiency of electric power engineering, and the application of electrical automation technology can promote the progress of electric power engineering and provide support for electric power engineering in an all-round way. In modern society, power engineering continues to develop, the pursuit of economic benefits is also increasing, from the original focus on the promotion of publicity to the current focus on the core, the overall benefit of the goal will continue to grow. And in some complex links of the engineering power system, such as high-voltage equipment, box transformer equipment, the output ratio of economic benefits will be particularly important, related to the total profit of the project[5]. Based on this background, the use of electrical automation technology can well ensure the output ratio of each link to ensure that the final profit can reach the expected value, compared with the use of traditional technology, the higher the return will be, the higher the efficiency of the entire power project. Therefore, the application of electrical automation technology is conducive to improving the efficiency of electric power engineering[6]. Secondly, it is conducive to improving the stability of the electric power system. The operation of electric power engineering is very complex, especially the electric power system in it, which integrates all aspects of the project, and a slight inadvertence may affect the progress of the whole project[7]. For example, the high-voltage conversion, voltage maintenance and box change management of the power system are all required to maintain stability in the project and not a single mistake. Electrical automation can solve this problem well, through long-term data tracking and testing reports, it can handle the problems that are prone to occur in complex links at any time, and replace and repair them as soon as possible without affecting the project, so as to maintain the stability of the project. In addition, some faults will inevitably occur in the power system, and it will take more time if the maintenance is carried out by human beings alone, and the relevant links will stop running as a result, and the system will be paralyzed, and the whole power project will be difficult to maintain. Therefore, the application of electrical automation technology is conducive to the stability of the power system.

It is conducive to ensuring the safety of power engineering construction. Power engineering is a huge project, involving thousands of jobs and a very large number of staff[8]. In the traditional production, many staff members are carrying out front-line work, directly involved in the production, construction safety faces a relatively large threat, such as the substation box inspection personnel, need to face the huge transformer pressure; power line tower on the security turn and maintenance personnel, need to risk their lives up to work, a careless may be major safety accidents. In the event of a safety accident, the enterprise also needs to bear the corresponding responsibility, giving the injured a certain amount of compensation, the enterprise's reputation will also be affected[9]. Therefore, the introduction of electrical automation technology into electric power engineering can effectively improve the safety of the construction process of electric power engineering, replace some employees to engage in more dangerous work, and issue early warning to the staff in dangerous situations in time to ensure their safety and stay away from risks. Therefore, the application of electrical automation technology helps to ensure the safety of electric power engineering construction. Many enterprises behind distribution overhead line projects will realize the importance of advanced automated artificial intelligence, and after overcoming financial and technical difficulties, automated artificial intelligence is an accessible technology for most enterprises.

2. Research Background

In the current state of development of distribution networks by investigating the current state of overhead line laying in local grids [10], found that people have the highest demand for the stability of power supply in these grids, so many distribution networks are improving in this direction, using tools such as unidirectional metallicity, topological signals, and industrial frequency signals to improve the reliability of power delivery [11].

In the engineering optimization and application of overhead lines, Researchers investigated and analyzed the outage range during overhead line maintenance, starting from the maintenance scheme of overhead lines, and proposed a reasonable arrangement of using the same pole with multiple returns for maintenance, especially for some single radiating lines, which should be paid extra attention during maintenance to ensure the stability of electricity for residents within the maintenance range [12]. The erection of overhead lines requires attention to cable grounding, lightning protection facilities, line maintenance, etc., and a comprehensive erection sequence and construction details need to be considered in the early development of the plan [13].

In the application of robotic automation of artificial intelligence, Researchers argued that the reliability of robotic automation is controllable and can solve problems such as frequent robot downtime and operation errors by grasping conditions such as accuracy [14].

In summary, China's research on distribution network overhead lines is still in the exploration stage and there has not been a more comprehensive in-depth study, especially the application of artificial intelligence to this part of the distribution network overhead lines. It is also necessary to apply the robotics of the modern information society to the erection of overhead lines in a reasonable way.

3. Materials and methods

3.1. Basic Theory

Combined with the previous paper, the overhead line erection in the current distribution network is becoming more and more demanding, and the traditional manual work method gradually can no longer meet the requirements of the process, whether it is installation efficiency, installation accuracy; or safety factor, humanistic care and other requirements, automated robots have greater advantages compared to traditional manual [15]. Therefore, many projects have gradually started to replace manual labor with machines, and will develop strict technical rules for distribution line energized operation in line with machine operation. In general, the following are the main aspects of the current robot automation applications in distribution overhead line engineering [16].

3.1.1. Bus management

Bus management is one of the sub-projects of distribution network overhead line and belongs to its extension and expansion. The development of electrical automation technology in bus management includes the perfect docking of robot control network and field devices, controllers in distribution overhead line engineering, corresponding actuators, etc. All these classifications have their corresponding management systems. At the same time, the intelligent robot in bus technology can help the electric power system complete the remote supervision and control of the network system, realize the exchange of information in the network purchased in advance, and thus improve the overall control effect of the communication equipment in the control center. Bus management technology is not only capable of networking, but also of decentralized regulation of power control, promoting the successful completion of overhead line projects of electricity.

3.1.2. Information interconnection

The laying of overhead lines in the distribution network overhead line project is a large-scale project with many internal projects and certain gaps between different projects, and the collection and collation of information becomes a tedious task[17]. The use of automation technology makes it possible for information on all projects to be transmitted in a timely manner through intelligent robots and spread unhindered internally. Some enterprises will also use optical fiber to construct internal information systems, use several computers as the core of operation, reorganize internal networks, and use automation to communicate skillfully, giving the advantages of rapid fiber optic transmission, low information loss rate, and good transmission effect, which facilitate staff to access distribution overhead line information and conduct manual review, thus realizing smooth line laying of distribution overhead line projects.

3.1.3. Enterprise monitoring system

Distribution overhead line project as a project of electric power enterprises, by which a series of operations such as fund-raising, program design, implementation, feedback, and summary, requires more effort, manpower, time and energy, and cost consumption will increase. And the application of electrical automation technology can help electrical enterprises to build a complete enterprise monitoring system, to monitor the internal work of the electrical enterprise, collect the data of the usual work, group feedback, and put forward further plans in a timely manner[18]. For complex links such as transformer boxes and overhead line laying, the robotic monitoring system composed of automation technology can also give "special treatment" by adding some supervisors to respond to the problems that arise in a timely manner.

3.1.4. Diagnosing equipment faults

During the installation of overhead lines, due to the robotic automation, it is inevitable that malfunctions will occur due to equipment problems. Therefore, this type of automation will monitor the overhead line in real time according to its operating status, and when the machine finds that there is excessive voltage, overload warning, and foreign objects on the line, it will promptly alert the police and perform simple processing through its own emergency processing procedures, and if it cannot still handle it, it will notify human intervention and promptly cut off part of the line to minimize the harm of equipment failure.

3.2. Basic operation methods

Combined with the basic theory and real-life practical applications, the current operation process of the distribution network strip operation robot splicing leads is mainly divided into three stages: start-preparation-operation, in which there are more steps in operation and less pre-preparation work, and the specific sequence is as follows.

(1) Tool vehicle docking: At the beginning, the operation tools need to be selected, currently commonly used is the insulated bucket arm vehicle, after the confirmation of the operator, the vehicle can only be driven into the delineated safe construction range. At the same time, the body position and arm position are fine-tuned so that they reach the right position.

(2) Selecting the operating area: After fixing the lower plate it is necessary to then fix the position of the upper robotic arm and move it to the appropriate operating area on the assembly line through machine control to provide sufficient movement space for subsequent robot operations.

(3) Installation of auxiliary wiring: When assembling the overhead line, auxiliary wiring is needed to assist, and the operator needs to first fit the robot arm to the position of the auxiliary wiring to guide it to automatically join in the later operation.

(4) Three-dimensional positioning: During operation, the robot will be positioned according to the location of the overhead line, using infrared sensors and other devices to scan the status of nearby points and compare it with the cloud data on the system, while the secondary confirmation will be made by the operator, and it will enter the next step after there is no error.

(5) Wire stripping operation: According to the positioning, the robot needs to carry out the stripping work according to the set program, find the suitable stripping position in a series of translational and rotational movements, and recycle the raw materials and waste in time.

(6) Threading operation: The same as the stripping operation, the robot also moves the stripped wire flexibly to the position to be traversed by the set program, so that the subsequent robot can pick it up again.

(7) Wiring operation: After completing the threading, the overhead line has a basis for laying, at which time the robot follows the program to plan and quickly connect the overhead line.

(8) Complete the single wire wiring task: After completing the above work, it can enter the rest phase to retrieve and reset the residual objects.

(9) Continue the operation in the order of 2-8 above until the overhead line assembly is completed.

(10) Retrieve the work tool: After the assembly of the overhead line is completed, the robot needs to retrieve it and send it back to the initial position in the same way. The approximate time share can be seen in Figure 1 below.

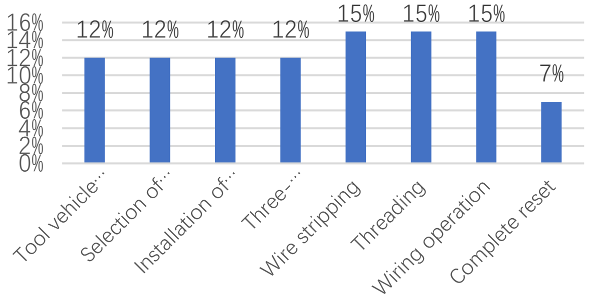

Figure 1. Main process share of robotic automated distribution overhead line

3.2.1. Model setting

In this paper, the main purpose of the overhead line assembly of the distribution network is to consider the use of robots, and the following model will be set up to address the common problems of inaccurate positioning and incorrect identification during the actual use. In combination with the main process of overhead line assembly by robots mentioned above, three main models are set up, namely the spatial positioning model, the target identification model, and the automatic calculation model.

（1） Spatial localization model

In the above steps it was mentioned that the robot needs to be precisely positioned with the help of auxiliary lines to confirm the proper assembly position of the overhead line. Here the model of spatial three-dimensional geometry is involved, firstly a base coordinate system1 (a1, a2, a3) and a rotated coordinate system2 (b1,b2,b3) are set. It is assumed that there exist variables x with coordinates (x1,x2,x3)T in coordinate system 1 and (x1',x2',x3')T in coordinate system 2. After the vector transformation and calculation we get.

$$R=\begin{matrix} b_1Ta_1 & b_1Ta_2 & b_1Ta_3 \\ b_2Ta_1 & b_2Ta_2 & b_2Ta_3 \\ b_3Ta_1 & b_3Ta_2 & b_3Ta_3 \end{matrix} \quad (1)$$

This equation is a rotation matrix, consisting of the vector inner product of coordinate systems 1 and 2, indicating the projection relationship between them, while there are also translational movements between the vectors, and again the equation can be transformed accordingly by multiplying a unit transformation matrix on the left and right sides simultaneously to obtain a new matrix after n translations, which, after merging with the rotation matrix at the beginning, gives the final matrix equation

$$\begin{matrix} x_1' \\ x_2' \\ x_3' \\ 1 \end{matrix} = T_nT_{n-1}\ldots.T_{32}T_{21}\begin{matrix} x_1 \\ x_2 \\ x_3 \\ 1 \end{matrix} \quad (2)$$

（2） Target recognition model

In the process of overhead line assembly, some of the paths need to be identified. Considering the trajectory of the robot hand, a target identification model with minimum spanning tree and maximum critical path is set up here. Firstly, the concept of minimum spanning tree is clarified, which refers to a loop-free subset with the corresponding unique weights. The common calculation methods are Kruskal's algorithm and Prim's algorithm, and the former is used here.

After confirming the concept, 9 points are randomly selected from the model to form a matrix, and then the relationship between the number of interior points and the number of optimal points is expressed in the following equation.

$$k=\frac{\ln（1-p）}{\ln（1-w^m）}(3) \quad (3)$$

where k denotes the number of iterations of the formula, p is the confidence level, and the person utilizes the general value - 0.95; w is the current proportion of internal points; and m is the minimum number of point pairs9 needed to calculate the model.At the same time, in the process of identification of power equipment, the discrete points of the operation line need to be identified to complete accurate positioning, and the approximate flow chart is shown in Figure 2 below.

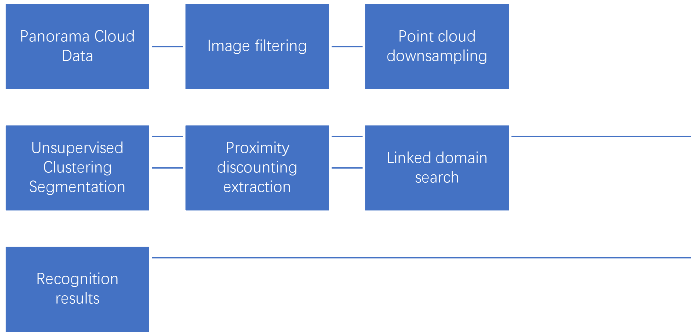

Figure 2. Approximate flow chart of target identification

（3） Automatic calculation model

Finally, the automatic calculation model of the overhead line, after the introduction of robots to replace the manual, the calculation of position and distance will be done by robots, the main workflow is somewhat similar to the target identification above, also to grasp the distance and position of the auxiliary line and assembly line, the specific process can be seen in Figure 3 below.

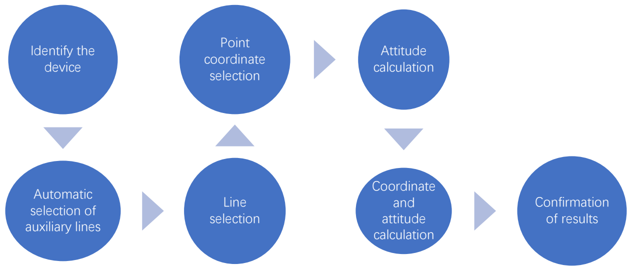

Figure 3. Flowchart of automatic calculation

3.2.2. Data sources

After the identification of the model, suitable experimental data are needed. Since the model is a hypothetical model, an experimental overhead line will be built according to the requirements of national laws and regulations to facilitate the acquisition of key data. The overhead line can not be built without the installation and setting of electrical lines. This paper also takes note of this point and controls the construction technology of the line during the construction process. Under the basic premise of ensuring safety, the quality of the model's electrical lines is pursued. In the model constructed in the laboratory, the cable protection pipe is made of galvanized welded steel pipe, the steel pipe connection is made of threaded connection, the steel pipe bracket is made of a combination of sections and U-bolts, etc. The electrical piping and cable bridges are constructed strictly in accordance with the provisions of the national standard

"Code of Acceptance for the Construction Quality of Electrical Engineering of Distribution Overhead Lines" and the requirements of the design drawings, and the specific process is shown in Figure 5 below to ensure that the distribution overhead line object is always in the electrical Line safety operation, so as to obtain real and effective data.

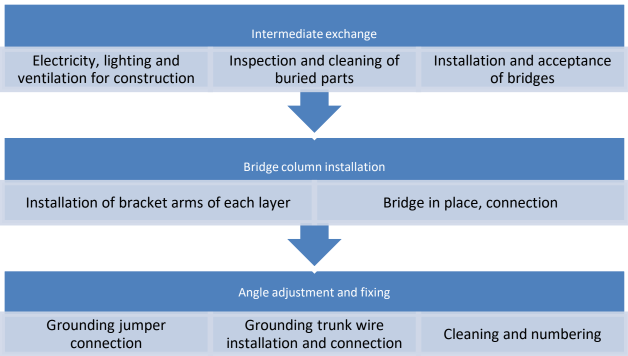

Figure 4. Construction quality acceptance specification for electrical engineering of distribution overhead line

3.2.3. Verification method

After the model is set, the accuracy of the results needs to be verified. For this reason, in this paper, after the completion of modeling in the laboratory, the results of each model will also be compared to verify the test. The automatic work of the machine is carried out by using the horizontal arrangement and vertical arrangement in the simulation machine to restore the scene in the real construction as much as possible, and at the same time, different inspections are carried out at different stages according to the different steps of each model, so as to complete the verification of the calculation results of the three models[18].

4. Results and Discussion

4.1. Statistical results analysis-robots automatically carry out distribution network overhead line works

4.1.1. Fixed Position Imaging

When the robot performs prior positioning, it will arrange the robotic arm to carry out the rotation of the optical path, and with the point cloud generation node generates the rotation translation matrix of each scan data according to the rotation table angle, and transforms the point cloud data coordinates to the robotic arm coordinate system by matrix multiplication, followed by merging all the point cloud scan data into the operating site attraction cloud. And the results showed that the presented images were facing the sunlight, and the collected data did not meet the experimental requirements and needed to be improved. The specific percentage of non-conforming data is shown in Figure 5 below.

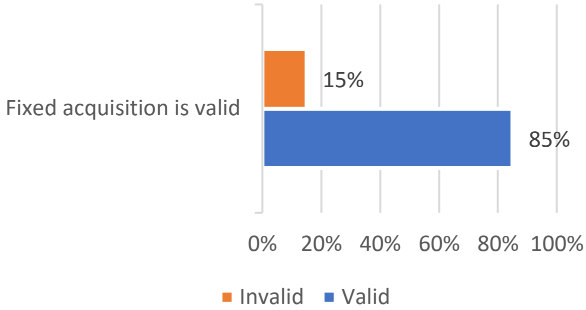

Figure 5. Fixed position imaging percentage map

Calculation by simulation. Among the 20 virtual operations, 17 times of the data are satisfied with the valid degree of fixed acquisition, and the remaining three are not satisfied for various reasons, and the overall valid degree is high.
Relative to fixed position imaging, the spatial three-dimensional perception is more flexible, using a variety of ways such as rotation translation or even symmetry for the movement of the manipulator, while installing a laser detection device at the end of the manipulator, which can scan most of the points in the overhead line assembly process, covering a larger area and satisfying a higher degree than the first method.

4.1.2. Discrete data points

In the process of supporting the car movement, there will be subtle movements of jitter, thus producing deviations, which are part of the data of discrete relationships for the operation of the manipulator[19]. As mentioned earlier, the target identification method will be used to locate these discrete data for human intervention to meet the operation requirements of the robot hand, but too many error points cannot be corrected in an artificial way, so it is necessary to count whether it is worth to correct, and the specific discrete data composition is shown in Figure 6 below.

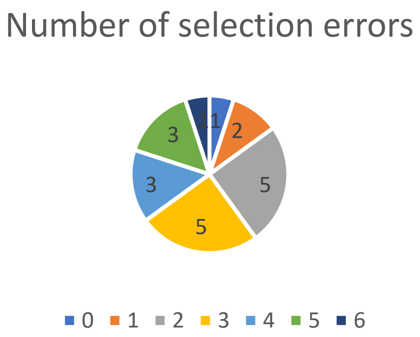

Figure 6. Discrete data distribution

This discrete data is derived from 20 simulations of sampling, all consisting of manual errors.

4.1.3. Flexible data points

The last one is for the flexible composition of the overhead lines in the distribution process. The overhead lines of different distribution networks will be different, and it is not enough for all the distribution networks to apply to the automation level of robot grasping materials for building adopted in this paper, so the applicability range of such data points will be projected based on the existing model as a way to make the subsequent adjustment of the overhead lines for distribution network assembly. The specific data are shown in Figure 7 below.

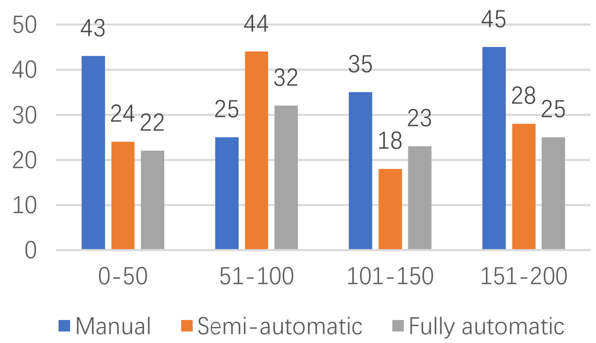

Figure 7. Map of the applicable range of data points

And this discrete data is also derived after 20 sampling sessions, mostly with human error.

4.2. Analysis of the model mechanism of robot automated assembly overhead line

4.2.1. Fixed radar point cloud acquisition

The robotic arm is fixed with a single-line LIDAR, and the realization of spatial three-dimensional scene modeling needs to be driven by the turntable to rotate it. Firstly, the turntable drives the radar to rotate, and the LIDAR data and the rotation angle of the turntable are released through ROS messages; the point cloud generation node generates the rotation translation matrix of each scan data according to the turntable angle, and transforms the point cloud data coordinates to the robot arm coordinate system through matrix multiplication, and then merges all the point cloud scan data into the operating site point cloud. There is a light interference generated by the operation scene, in the direction of the LIDAR is facing the sunlight, the sensor acquisition data is invalid, resulting in missing point cloud scan data, and the human-machine interaction interface shows the data of the area as vacant, which does not meet the subsequent operation requirements.

4.2.2. Spatial stereo perception point cloud acquisition

Compared with the scene reconstruction method of fixed LIDAR turntable rotating scanning, the spatial stereo sensing algorithm uses the characteristics of flexible movement and free rotation at the end of the robotic arm to design a mobile LIDAR device, which provides the sensing method of robotic arm carrying radar for moving and rotating scanning [20]. The method effectively collects the point cloud data of the missing area, which is a good solution to the influence of external scenes on the laser sensor.

4.2.3. Experimental analysis of the effects of bucket-arm truck vibration and data dispersion on localization

The bucket-arm truck vibration and discrete data collection bring difficulties to the effective selection of operating points. In order to improve the positioning accuracy, this paper proposes a method of equipment object target identification, based on the point cloud library (PCL) function development, which extracts the lines and leads of the distribution network from the three-dimensional space to achieve accurate identification, and realizes the folding line local breakpoint connection through the point cloud connectivity domain search to provide sampling Vacant area selection points to provide data interpolation, reduce the error of bucket arm truck jitter and point cloud sampling dispersion.

4.2.4. Experimental analysis of the effects of bucket-arm truck vibration and data dispersion on localization

In view of the variable operating scenarios, this paper proposes a semantic positioning method of equipment using the semantic information of the position of the grabbing arm and the length of the lead as input to complete the automatic and accurate positioning method of the lead connection operation with electricity. This method replaces manual selection by device position input, reduces human-machine interaction links, realizes automatic position selection and verification, and improves robot efficiency and automation level.

5. Conclusion

In this paper, in view of the current trend of automation of overhead line engineering in distribution networks, the feasibility of robots for automated work is studied and analyzed, and models for spatial perception, target identification and automatic calculation are established respectively, and some key technical problems of robots put into actual engineering are simulated and calculated. In the spatial perception model, the combination of robotic arm and laser device is used to solve the problem of direct sunlight, which affects the positioning. In the target recognition model, the calculation accuracy is improved to 1mm by combining the algorithms of minimum spanning tree and maximum critical path. In the automatic calculation model, the introduction of auxiliary lines and the manual secondary confirmation make the error of the work further reduced. Taken together, the simulation algorithm in this paper provides a more detailed solution for realistic distribution network overhead line projects. A few more specific countermeasures for optimizing and applying robotic automated distribution overhead lines are highlighted here.

5.1 To standardize the distribution network overhead line engineering management system

A perfect system is the basic element for the smooth operation of distribution overhead line engineering. Even in the modern era where robots are used to replace manual labor, a complete management system is needed to make automation truly realize its advantages. Only with good preparation in advance can construction be organized, and all kinds of unexpected situations can be dealt with and completed more efficiently. Therefore, the distribution engineering company is required to formulate a standardized overhead line project management system in advance, detailing each process, subdividing it into individual projects and reasonably assigning tasks, including engineering program design, program feasibility analysis, program benefits, etc. Each project needs a special supporting system, and arrange special personnel for implementation and supervision. In addition, the project management system also needs an appropriate degree of risk prevention content, will be possible in the construction process of the risk are informed in advance of the relevant responsible personnel, requiring them to do a good job of responding to measures to prevent problems before they occur, such as site water and electricity supply, escape routes, fire escapes, and so on. Finally, the overhead line project management system should also have a corresponding reward and punishment system, completed ahead of schedule, completed on time, quality assurance, over-achievement and other different degrees of project completion to different degrees of reward, to encourage staff to continue to work hard; for those who are not completed, completed over time, completed poor quality staff should be the corresponding criticism and education, serious cases should also be the necessary punishment, such as Deduction of performance pay, etc. Only in this way can the necessary support be given to the overhead line project in the system specification.

5.2 Improve the infrastructure of the overhead line project

Distribution overhead line engineering in the process of automation, still can not be separated from the supply of raw materials, even high towers also need a piece of cement and steel to build. A well-equipped infrastructure can save the time of the overhead line project, put the advanced technology into practice better, and make the staff devote themselves to the construction without worrying about the raw materials. In addition, the infrastructure also includes qualified construction sites. Different scale of distribution overhead line projects require different construction sites, which need to consider the quantity of raw materials, project type, surrounding environment and other factors. And the distribution overhead line project in the vicinity of residential areas need to install sound and noise reduction equipment to reduce interference with the surrounding environment and avoid complaints from residents. Only in this way can the infrastructure of the distribution overhead line project be improved so that it can be better "armed to the teeth" and provide material support for the smooth implementation of the distribution overhead line project.

5.3 Improve the comprehensive quality of construction personnel

Although the technological progress of modern society is getting faster and faster, such as robot automation construction of advanced engineering construction technology has been officially used, but the role of people in engineering construction still can not be ignored. As an energetic subject, people have self-awareness, will have diverse ideas about engineering construction, and have certain influence on the actual engineering construction. In such a complex project as distribution network overhead line, although advanced machines will be used, but still need staff for parameter setting and real-time monitoring. In this regard, the engineering unit should pay attention to the comprehensive quality training of construction personnel, pay attention to the comprehensive quality of candidates when recruiting, and try to introduce high-quality talents; after the introduction of talents to carry out timely training of newcomers, and constantly improve the comprehensive quality of new entrants' abilities, and cultivate their responsibility and love for the distribution network overhead line project. Enterprises can also carry out team building activities from time to time to provide employees with the opportunity to communicate and understand each other, improve their teamwork ability and sense of cooperation, so as to better apply to the construction of distribution overhead line projects and improve the quality of construction of distribution overhead line projects.

5.4 Strengthen the acceptance of the distribution overhead line project

To determine whether a distribution overhead line construction project is successfully completed, the most direct is the final project acceptance stage, through the field exploration of each location on site, you can have a general understanding of the overall degree of completion. In this regard, the distribution network overhead line engineering unit should be equipped with professional distribution network overhead line engineering experts to the site acceptance, carefully check all corners of the distribution network overhead line project, and according to the accumulation of professional knowledge to assess and analyze, to make a professional judgment. Specifically, you can accept the construction details as well as the contracted program. The former refers to whether the details of the construction site are in line with the distribution network overhead line specifications, whether it will form a safety hazard, whether it can meet the actual demand, etc.; the latter is whether the distribution network overhead line project is built in accordance with the contract signed by the consensus of both parties, and whether there are disputes over data processing and cost allocation. These are the issues that need extra attention when the distribution network overhead line engineering unit conducts field acceptance, and requires professionals to conduct a professional survey so as to successfully complete the acceptance of the distribution network overhead line project.

In summary, the high-rise housing distribution network overhead line project involves many things, not only involves a variety of advanced technology, but also involves the construction management of the project. Want to improve the technical content and construction management quality of the distribution network overhead line project is not a simple task, the need for relevant distribution network overhead line engineering enterprises and the corresponding distribution network overhead line engineering personnel to take targeted measures, the former to improve the management system of the distribution network overhead line project, equipped with a full range of basic facilities, improve the overall quality of engineering personnel and strengthen the acceptance stage; the latter to continuously improve their own professional level, distribution network overhead line engineering awareness and teamwork of collaborative communication. Only with this two-pronged approach, the technical nature of distribution overhead line engineering and construction management quality can be better developed to promote the progress of distribution overhead line engineering and society as a whole.

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