Linear programming in machine building based on KarmarKar improvement algorithm in the context of new engineering

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Abstract

In the context of new engineering, the cultivation of scientific and technological talents should fully consider new technical qualities such as service to the country, innovation and progress, formation of environmental awareness, and formation of international vision. With the rapid development and progress of socialist market economy, the scope of application of scientific and technological revolution has been gradually expanded. The application of mechanical engineering is getting wider and wider. Under the background of new engineering education, in mechanical engineering, many linear programming models can be transformed into standard models using some mathematical methods, which can be used to solve them. In mechanical engineering, there exist not only linear optimization problems with continuous variables, but also linear optimization problems with all or some variables as a set of deterministic values. Linear optimization problems in mechanical engineering often manifest themselves as mixed discrete optimization due to constraints of standardization, serialization, standardization, design, assembly and verification, and objective requirements. This thesis introduces the KarmarKar improvement algorithm and extends the application of the KarmarKar improvement algorithm in mechanical engineering with the example of hybrid linear optimization in mechanical engineering.

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Keywords: New Engineering; Mechanical Engineering; Linear Programming; KarmarKar Improved Algorithm; Mechanical Engineering; Linear Optimization; Planning Models

1INTRODUCTION

In the context of new engineering, the cultivation of scientific and technological talents should fully consider new technical qualities such as serving the country, innovation and progress, formation of environmental awareness, and formation of international vision, as shown in Figure 1.

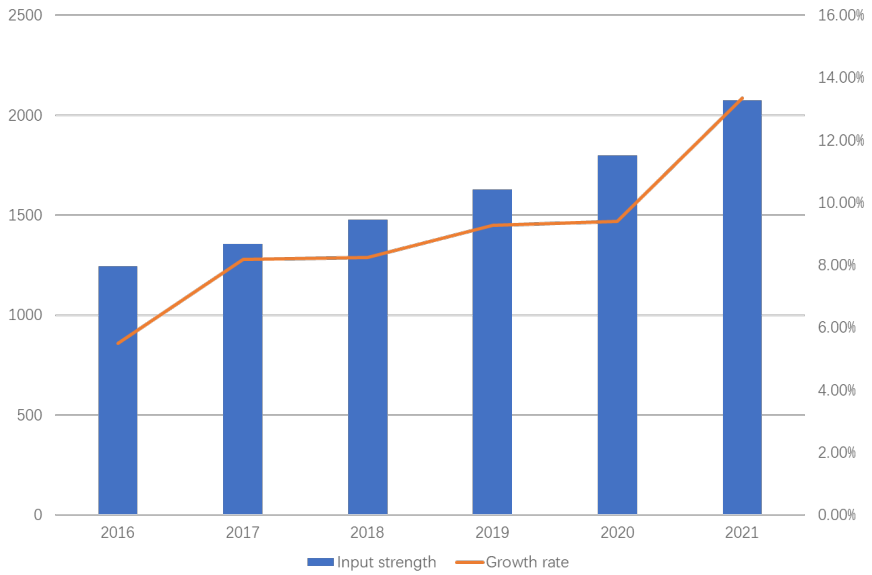

FIGURE 1 The investment in new engineering in China in recent years

This thesis introduces the KarmarKar improvement algorithm and extends it with an example of hybrid linear optimization in mechanical engineering.

2 Research Background

Early mechanical engineering meant that machines and electromechanical components were controlled by computer network systems to perform tasks such as energy flow and motion. [1] With the development of mechanical engineering, the deep integration of mechanical engineering, electronic control, systems thinking, precision engineering and mechanical engineering has deepened. [2] The coordination of multiple disciplines, including mechanical engineering, computer engineering, information technology, microelectronics, sensor recognition technology, software, and interface technology, has resulted in a huge mechanical manufacturing system. [3]The mechanical manufacturing system is shown in Figure 2.

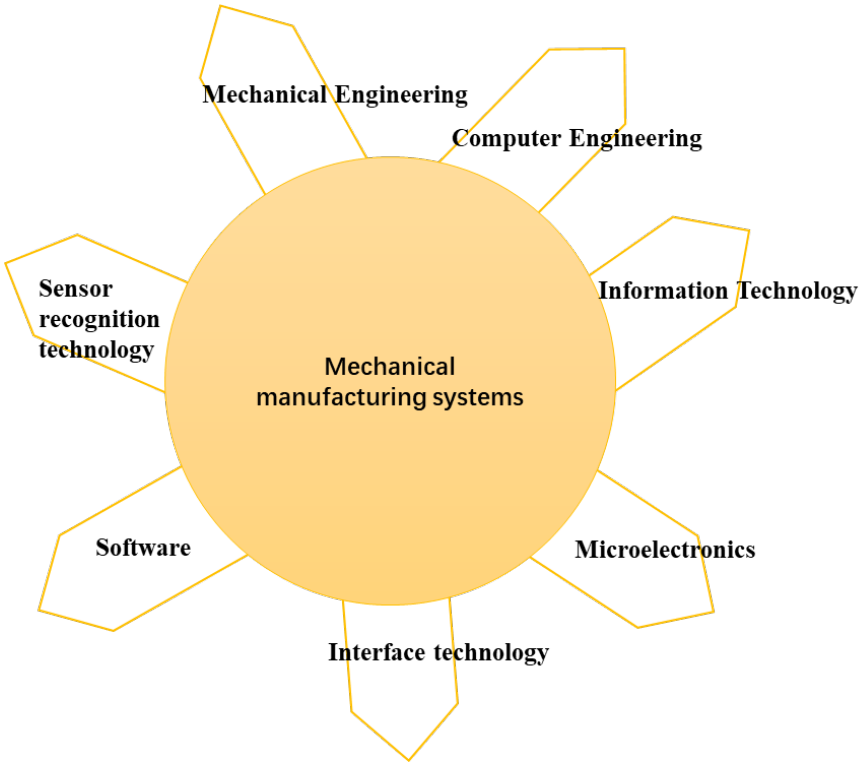

FIGURE 2 Machine building system

The relationship between machine manufacturing accuracy and product quality is proportional, as shown in Figure 3.

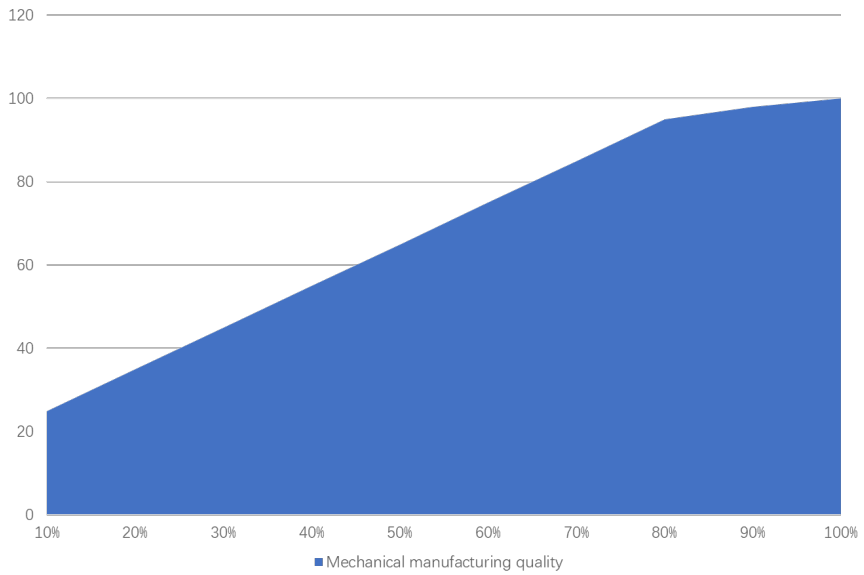

FIGURE 3 Relationship between machine manufacturing accuracy and product quality

The development of our automation has its own characteristics.[4] This is a major contradiction and problem.[5] Only by solving these problems as soon as possible can we further promote the development of China's engineering industry.

3 Research methods and materials

3.1 New engineering

New engineering disciplines can be summarized as engineering disciplines designed or developed to meet the current needs of the industry.[6] The composition of the new engineering disciplines is shown in Figure 4.

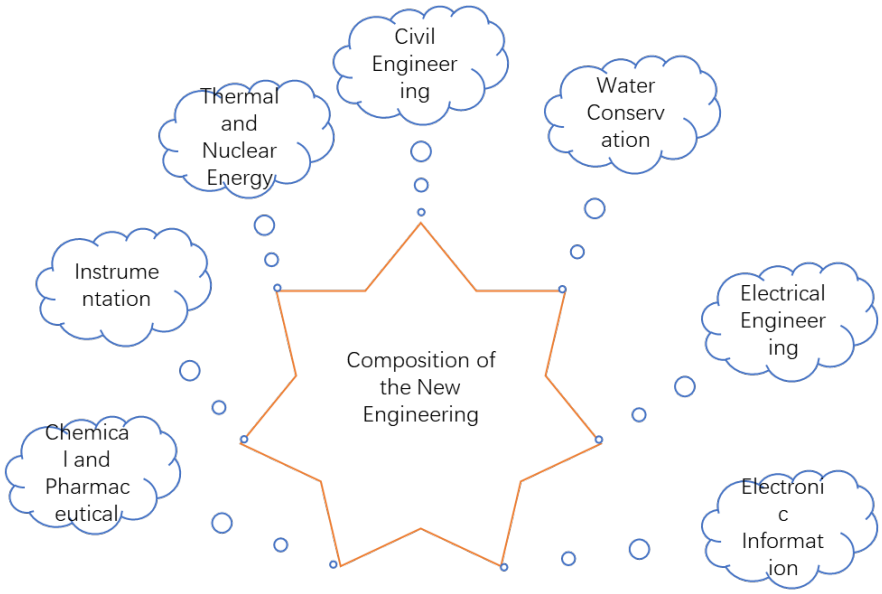

FIGURE 4 Composition of new engineering disciplines

When discussing the issue of professional development in the context of new projects, it should be soberly recognized that the impact of the new economic development has led to an increasing number of interdisciplinary applications, which has opened new prospects for the integration of different disciplines in universities.[7] The development direction of new engineering disciplines is shown in Figure 5.

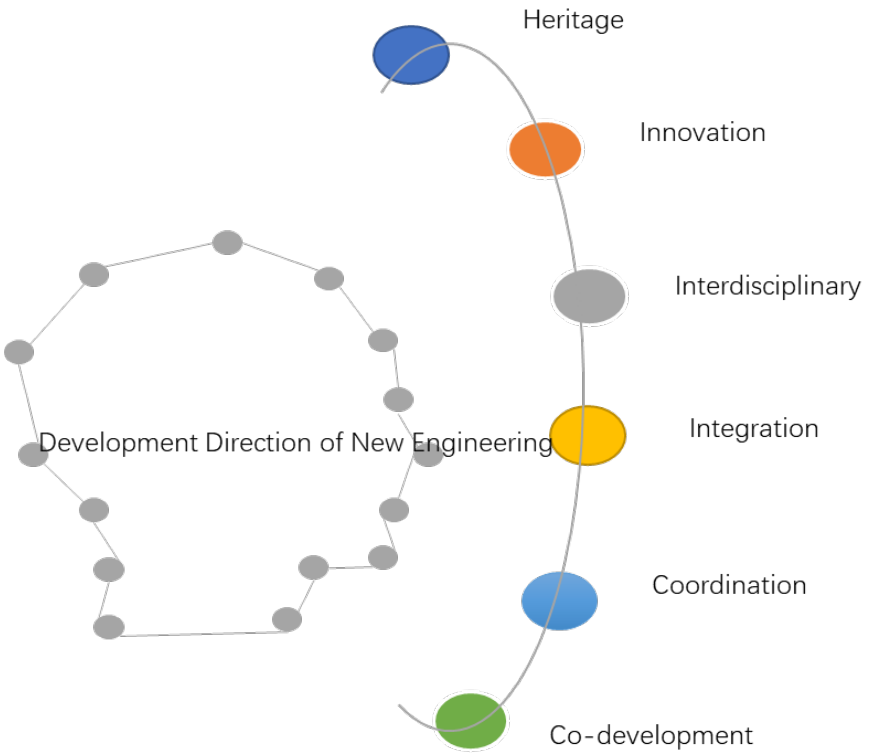

FIGURE 5 Development direction of new engineering disciplines

3.2 KarmarKar improvement algorithm

In this paper, a new method for solving the problem is proposed in combination with linear programming; first, an integrated planning model is developed, according to which the problem is divided into two parts: combinatorial (machine sequencing) and sequential (machine pinpointing). An inferior machine design is designed, and a linear programming-based method is proposed to construct a set of consecutive unsolved solutions matching any inferior machine design. [8] Finally, a Pareto is formed in the sequence of all successive unsolved solutions. The algorithm flow is shown in Figure 6.

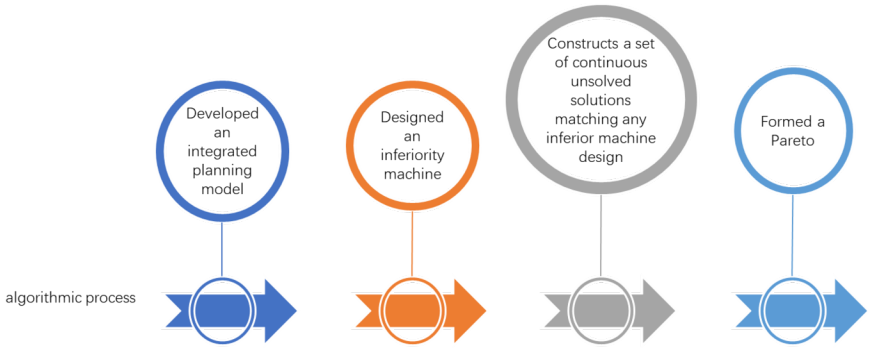

FIGURE 6 Algorithm flow

4 Results and Discussion

4.1 Design Process and Methodology

In this paper, an improved algorithm is derived and its theory is proved based on the idea of Karmarkar's algorithm. The method eliminates some assumptions of the squid algorithm and removes some defects of the squid algorithm to make it more practical. The algorithm example shows that the algorithm outperforms the KarmarKarr algorithm in terms of speed and accuracy. [9] This example solves two linear programming problems in mechanical engineering and comes to the right conclusion with good economic benefits. In mechanical engineering, there are various linear programming models, but they can be transformed into the following standard form by some mathematical methods.[10]

In the above equation x\y\z denotes the accuracy, quality, and appearance of the machine made, and n denotes the number of experiments.

The main problem of this method is the complexity of the computational algorithm, which is an index function and easily degenerates. Before fabricating the part, make sure the part is in the correct position in the fixture or rotor. This reference should not only be fixed, but accurate. Then tighten the part and secure it to the base. This connection is the key to the tension. These two links are interconnected and in the field of mechanical engineering, the scientific tightening of the part can directly improve the quality of the part and directly affect the safety, efficiency and production costs of the part. In general, the most common and useful local fastening method in machine construction should be formally and directly marked.

4.2 Research on the factors influencing linear programming in mechanical engineering

For a long time, machinery manufacturing enterprises in the process of processing and activities of mechanical products, only focus on the accuracy of mechanical products, little attention to product appearance, usually the appearance of mechanical products is not very good, so the need to vigorously carry out the corresponding optimization activities. In the process of manufacturing mechanical products, the working environment of some companies is not good enough, and there is a lot of dust in the workplace, which has a negative impact on the health of workers. The production process activities have the problem of products not being stacked as needed and stacked as required. As a result, the processing and production activities are easily worn out after the products are completed. In order to successfully complete the verification, secondary processing must be performed, which requires additional manpower and material resources. The impact of mechanical manufacturing product appearance and finished product protection on product sales is shown in Figure 7.

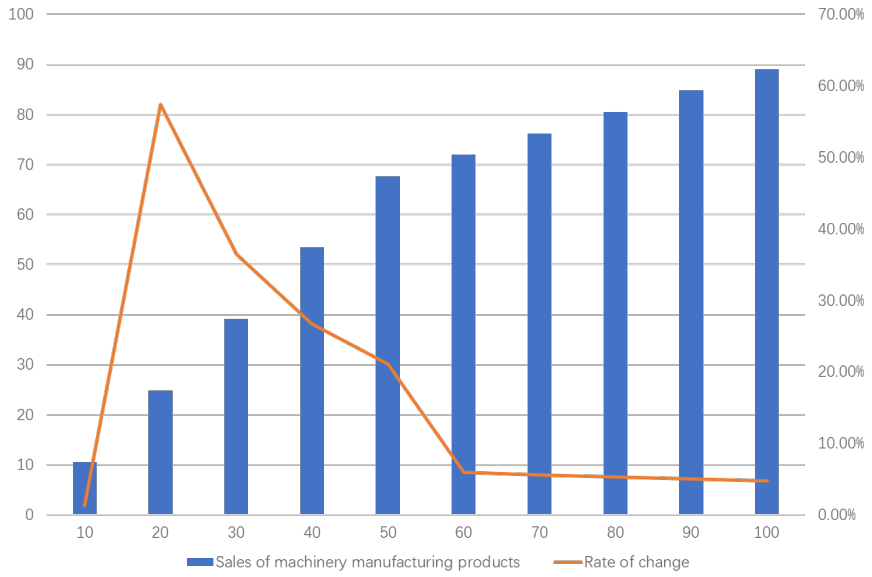

FIGURE 7 Impact of mechanical manufacturing product appearance and finished product protection on product sales

The impact of product quality on machinery manufacturing sales, as shown in Figure 8.

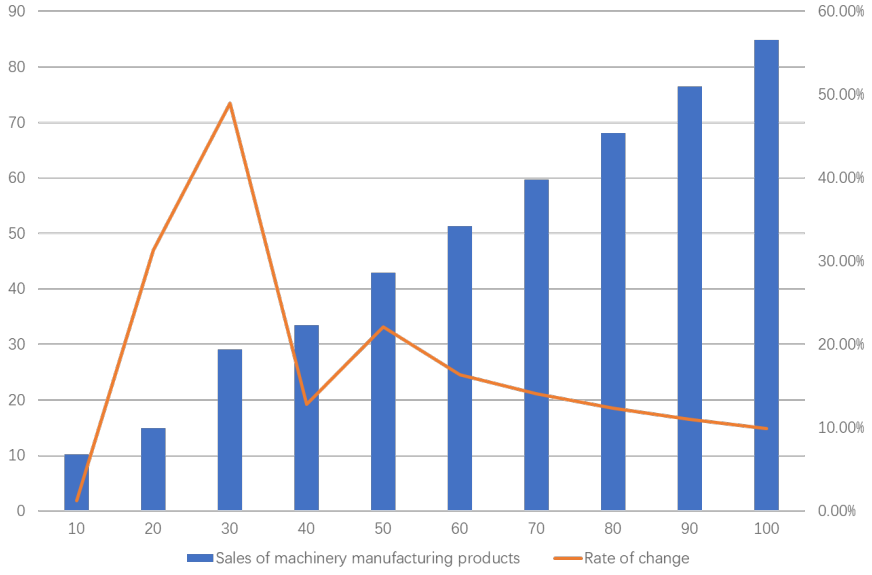

FIGURE 8 Product quality on machinery manufacturing sales impact

Virtual automation is an important part of mechanical engineering. This project aims to reduce the complex processes in machine manufacturing, save unnecessary investment and effectively reduce the cost of machine manufacturing through new information technology such as artificial intelligence, computer graphics and multimedia. For example, virtual automation of machine manufacturing can perform various drafting tasks in a short period of time. Paperless virtual automation also saves a lot of paper resources. During the design,

processing and manufacturing of the machine, the production of the machine must be effectively controlled to ensure that the design parameters meet the specified requirements.

5 CONCLUSION

Machine manufacturing is increasingly being used. In the new context of mechanical engineering, many linear programming models can be mathematically converted into standard models and can be used to solve problems. In engineering, there is not only linear optimization with continuous variables, but also linear optimization where all or some of the variables are fixed. Due to standardization, serialization, standardization, design, assembly and certification as well as objective requirements, linear optimization problems are usually characterized by hybrid discrete optimization. In this paper, we propose an improved KarmarKar algorithm for linear optimization of hybrid machine technology as an example, and extend the application of the improved KarmarKar algorithm in in mechanical engineering. The continuous and rapid development of information technology not only provides a broad strategic platform and development prospects for countries around the world, but also the wide application and development of mechanical automation systems in the global machinery industry has undoubtedly brought new vitality and valuable blood to them. Promote the competition and cooperation of the whole manufacturing industry in the field of machinery manufacturing and intelligent manufacturing.

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