

# Cultivation of Innovation and Entrepreneurship Ability of Vocational College Students — Taking the Challenge Cup "Supersonic Curtain Wall" Project as an Example

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**Abstract**—The current call for "mass entrepreneurship and innovation" strengthens the urgent need for college students, especially higher vocational colleges, to develop their entrepreneurial practices and abilities. The cultivation of college students' innovative and entrepreneurial ability is conducive to the realization of college students' entrepreneurial enthusiasm and the promotion of their entrepreneurial ability and management ability. By participating in the "Challenge Cup" competition, the comprehensive ability of the student team will be improved and it will have a very positive effect on the cultivation of students' innovative and entrepreneurial ability. This article uses the "Supersonic Curtain Wall" software project as an example to illustrate the key points and skills of the scientific and technological inventions. By discussing the award-winning examples of the "Challenge Cup" Liaoning University Extracurricular Academic Science and Technology Works Competition, this paper analyzes and studies all aspects of the content to provide guidance for college teachers and reference for students' participation.

**Keywords**—vocational colleges; innovation and entrepreneurship; curtain wall engineering

## I. INTRODUCTION

The cultivation of entrepreneurial practice and ability of vocational college students is a demand of today's society. It is the demand to guide students to combine their own interests and interests in the professional field, fully mobilize and give play to the function of the school's innovation and entrepreneurship incubator base, and stimulate students' innovation and entrepreneurial passion by designing or launching innovative entrepreneurship projects and participating in the University Students Innovation and Entrepreneurship Competition, so that it can further improve students' ability on innovation and entrepreneurship. This article takes the 2019 award-winning project "Supersonic Curtain Wall" as an example to illustrate the key points and techniques of the declaration of scientific and technological inventions, and the declaration of the purpose of the design, the purpose of the invention and the basic ideas. This paper also demonstrates project innovation points,

technical key points and main technical indicators, scientific, advanced, technical characteristics, application prospects, market forecasts, economic benefits, and social benefits analysis. By guiding students to participate in the "Challenge Cup" Liaoning University Extracurricular Academic Science and Technology Works Competition, the professional ability and teamwork spirit of vocational college students are cultivated, which has a good educational effect. Students apply their professional skills to the project, which enhances their ability to innovate and innovate, while fostering student teamwork.

## II. PROJECT RESEARCH BACKGROUND AND APPLICATION FIELD

The so-called curtain wall is the hanging wall talked about usually in daily life. It is mainly composed of two kinds of materials: structural frame and mosaic sheets. It is often used by people on the outer wall of the building. It is hanging like a curtain above the outer wall of the building. It does not bear the weight, nor does it serve as the envelope structure for the main structure and load. Most of the curtain walls are relatively light and strong, and very beautiful, with certain decorative effects and energy efficiency on the building construction.

With the development of the construction industry, the need for curtain wall engineering is also increasing. The building curtain wall organically integrates architectural aesthetics, architectural functions, architectural structures and other elements, which can make the building present different colors from different angles. With the changes of sunlight and lighting, it brings dynamic beauty to people. However, the curtain wall engineering with different shapes and construction drawings is also difficult to increase, and the material processing cycle is also urgent. Therefore, there is an urgent need for a more optimized method for curtain wall construction drawing design.

The project is based on the combination of CAD drawing software and its own Lisp function. It is designed to meet the intelligent and efficient optimization process in curtain wall engineering design through software programming. What is

a "Supersonic Curtain Wall"? The software was redeveloped and programmed to develop optimized software that satisfies the design of the curtain wall, namely the supersonic curtain wall software. The software program has been applied to many practical projects.

### III. KEY POINTS OF THE DECLARATION OF THE PROJECT SCIENCE AND TECHNOLOGY INVENTION PRODUCTION WORKS

#### A. *Design and Invention Purpose*

The curtain wall engineering with different shapes and design drawings has a large volume and difficulty, and the material and production cycle are urgent. Therefore, there is an urgent need for a more optimized method for curtain wall construction drawing design. This project work is mainly used in the curtain wall engineering of architecture, combining CAD drawing software with its own Lisp function, and self-programming to optimize the software for curtain wall engineering design.

The glass curtain wall also has the advantages of light weight, flexible design, strong earthquake resistance, convenient maintenance and so on, and it is one of the indispensable elements of modern architecture. For the curtain wall technology problem, the team can customize efficient and accurate technical solutions for building curtain wall design.

The project work saves labor, optimizes time, and makes material processing more convenient. It can also make data more accurate, process materials more accurate, avoid labor and material waste, and increase the rapid development of curtain wall in order to adapt to social development. This "Supersonic Curtain Wall" software has been developed, which has a lot of code, and the number of programming patterns is numerous. At present, the programming of "Supersonic Curtain Wall" has been perfected.

#### B. *Basic Idea*

In response to the needs of enterprises, the product is creatively designed, using the most widely used CAD drawing software in the construction industry as the main body, and its own Lisp (an early developed table processing language) function as an auxiliary, a set of software has been written, which can quickly design, plot, calculate the required materials and costs in some similar fields such as curtain wall engineering technology.

Based on that the CAD software is widely used in society, based on the CAD software, a "supersonic curtain wall" software is designed, which can directly model and directly export data through Excel. Now, there is no need to use Excel spreadsheet to calculate the stone area and use the material to directly export a piece of data in the CAD drawing. This saves the need to use Excel spreadsheet to calculate the stone area and materials to effectively shorten the engineering cycle.

Modern is the era of data. Artificial intelligence is an inevitable trend in the current era. In the construction

industry, the application of software is indispensable. Drawings are indispensable. The "supersonic curtain wall" software and CAD software complement each other. The "supersonic curtain wall" software is more data-oriented and has great application in modeling. It can directly export the processing drawings in Excel form, which is faster and more accurate than manual mapping and greatly saves labor and improves. At the same time, the accuracy is improved and the area of any quadrilateral can be calculated. It is a complete set of solutions, which has great use in modeling and so on. It can directly draw any quadrilateral in CAD, and solve the technical problems without repeated operations. The complete software is finally accomplished by optimizing the performance processing of the "Supersonic Curtain Wall" software.

The product realization is from the original creative ideas → perfect software function design (such as modeling function, Excel table direct export) → product programming → function realization → enterprise trial → step-by-step optimization, to product production, and finally it forms complete software.

#### C. *Innovation*

Direct modeling in CAD drawings makes it super simple and manpower-saving. People can directly export Excel spreadsheets in drawings and calculate area, which is conducive to the development of the construction industry. Software development has significantly improved compared with tradition.

The effective use of the Lisp function in the CAD drawing software can effectively shorten the engineering cycle and improve work efficiency.

The accuracy of the processed data can be guaranteed.

In terms of construction, it can be able to achieve precise control and improve installation efficiency.

#### D. *Key Technology*

The work can use the Lisp function in CAD drawing software to program by itself, as well as the extended operation of custom functions.

And then it will import the software designed by the CAD drawing software into the Excel table to convert some areas of the stone and other data.

#### E. *Main Technical Indicators*

The work uses CAD drawing software as the main operation panel, and there are different solutions in different curtain wall projects, especially on the curtain wall of the special-shaped. The effect will be very obvious.

When applied to a special-shaped curtain wall, the unique "custom" function can automatically list the same type of stone calculation when the same number of sides and shape are different, which not only saves labor, but also effectively shortens the engineering cycle.

IV. ENGINEERING APPLICATION AND VERIFICATION

A. Scientificity and Advancement of the Work

With the advent of the global information era, advanced information technology represented by big data, Internet, cloud computing, etc. has a major impact on social and economic development and school talents training. However, the role of software in the construction industry can not be said to be too big. The development and application of building software has been recognized by many famous people in the construction industry. CAD is a promising new manufacturing technology in information technology. "Supersonic Curtain Wall" software complements CAD and has an absolute impact on the curtain wall design.

The "Supersonic Curtain Wall" technology plays an important role in the architecture, industrial technology development and education talents training. The CAD software "Supersonic Curtain Wall" software is combined with the cutting-edge information technology to realize the digital product output of the building information modeling. The technology creates a new model for product development that makes it easier for designers than ever before. This modeling software speeds up the manufacture of the curtain wall, allowing constructors to quickly verify and inspect the structure and shape of the product being designed.

Innovation is the driving force for scientific development and civilized progress. Through the advanced technology of modern information technology, it has cultivated the practical innovation ability of higher vocational students and improved the entrepreneurial awareness of students. The "Supersonic Curtain Wall" software features are designed and developed according to the detailed steps, along with detailed video explanations.

Today is the era of data, and artificial intelligence is an inevitable trend in the current era. In the construction industry, the application of software is indispensable, and drawings are indispensable. The "Supersonic Curtain Wall" software complements the CAD software, and the "Supersonic Curtain Wall" software is more data-oriented, as shown in "Fig. 1": The three-dimensional lofted illustration of the hyperbolic building curtain wall.

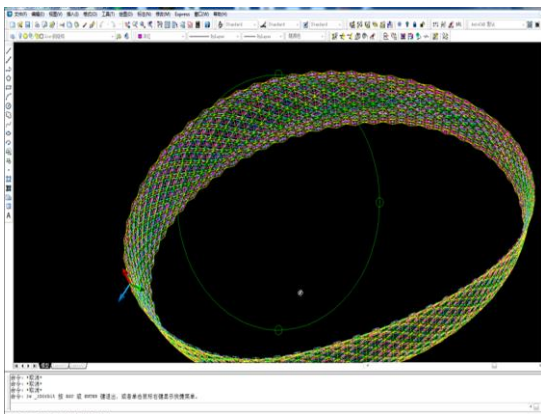


Fig. 1. Three-dimensional lofted illustration of a hyperbolic building curtain wall.

B. Instructions for Use and Technical Features and Advantages

This work combines the most widely used CAD drawing software in modern construction industry with programming, and establishes a new functional software to realize the integrated design, drawing, calculation and rapid modeling of curtain wall engineering.

In this way, it can make the data more accurate, and it is convenient and quick. It can also save labor, optimize time, provide technical support for the curtain wall companies of various professions, and realize the function of combining the professional CAD drawing software used in the building with the Excel table for fast calculation. At the same time, as for the curtain wall companies, this software can save costs and maximize benefits.

This work has great application in modeling. It can directly export the processing drawings in Excel form. It is faster, more accurate and saves labor compared with manual export. At the same time, it improves the accuracy and can calculate any quadrilateral area. It is a complete set of solutions, which has great use in modeling, etc. It can directly draw any quadrilateral in CAD, and solve technical problems without repeated operations, as shown in "Fig. 2": Hyperbolic building curtain wall glass numbering diagram. The performance processing of the "Supersonic Curtain Wall" software can be optimized to obtain a complete set of software, and the artificial intelligence method is used to process the project in the curtain wall field, as shown in "Fig. 3": Software intelligent processing CAD 3D line model diagram.

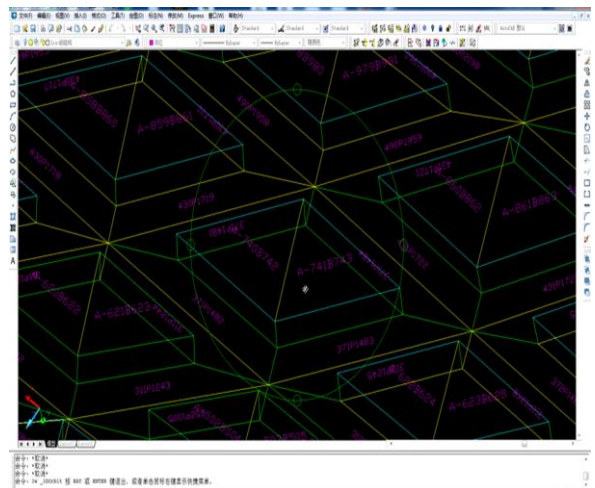


Fig. 2. Hyperbolic building curtain wall glass numbering diagram.



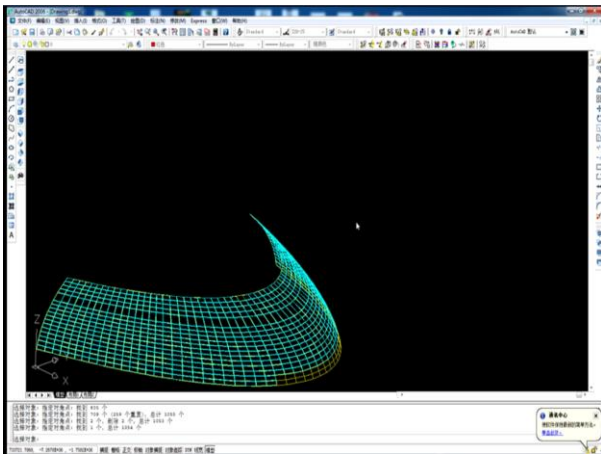


Fig. 3. Software intelligent processing CAD 3D line model diagram.

In response to the requirements of modern development and the situation that either progress or lag behind, the most widely used CAD drawing software in the construction industry is taken as the main body, and its own Lisp (an early

developed table processing language) function is used as an auxiliary to carry out innovative development. It can use the Lisp function in the CAD drawing software to program by itself, and the extended operation of the custom function, as shown in "Fig. 4": Directly export the Excel table processing data in the CAD drawing. And then it will import the software designed by the CAD drawing software into the Excel table to convert some areas of the stone and other data. The CAD software "Supersonic Curtain Wall" software is combined with the cutting-edge information technology to realize the digital product output of the building information modeling. The technology creates a new model for product development that allows construction personnel to quickly verify and inspect the structure and shape of the product being designed. Direct modeling in CAD drawings makes it super simple and manpower-saving. People can directly export Excel spreadsheets in drawings and calculate area, which is conducive to the development of the construction industry. Software development has significantly improved compared with tradition.

Number of glass				
号	L1	L2	L3	面积
0B2	1015.14	1006.98	538.38	262310
1B3	538.38	1008.61	1031.77	264640
2B4	998.43	985.59	515.56	246860
3B5	515.56	982.71	1003.26	247000
4B6	987.51	974.34	505.96	239680
5B7	505.96	971.95	991.12	239750
6B8	981.23	967.39	500.26	235450
7B9	500.26	965.71	983.89	235510
8B10	978.11	963.7	497.19	233220
9B11	497.19	962.57	980	233270
10B12	976.9	962	495.73	232200
11B13	495.73	961.28	978.15	232240
12B14	976.66	961.34	495.16	231830
13B15	495.16	960.95	977.38	231850
14B16	976.8	961.1	494.98	231730
15B17	494.98	960.98	977.02	231740
16B18	977	960.94	494.97	231730
17B19	494.97	961.08	976.76	231720

Fig. 4. Directly exporting the Excel table processing data in the CAD drawing.

C. Technical Description of the Scope of Use and Promotion Prospects

The entire building industry's curtain wall can use this software. The technology is simple to operate, and there are video explanations on the software platform. When developed this "Supersonic Curtain Wall" software, it has a lot of code, and the number of programming patterns is numerous. The programming of the "Supersonic Curtain Wall" has been perfected.

At present, the curtain wall company and its similar industries are blank in this aspect of technology. They can

make a certain market and then conduct marketing, which can be customized according to the different needs of customers. In addition, if a company buys on a large scale, specialized technicians for installation and training can be provided.

D. Market Analysis and Economic Benefit Prediction of the Work

"Supersonic Curtain Wall" has its own exclusive platform, there are videos in the network, there are technicians to provide on-site training, and the "Supersonic Curtain Wall" software has a one-week application period. If

people don't understand this software, they can try it for a while to be familiar with this "Supersonic Curtain Wall" software.

People can draw any quadrilateral directly in CAD, without repeated operations. The advantages of modeling software are reflected in the modeling process as quick and accurate. The project, which can only be done in a few days or even half a month or a few months in the past time, now it can be done in a few hours with this software, which greatly shortens the construction period and saves time. When others use the same time to design drawings, with this software, dozens of pieces of drawings can be designed while others can only design one. In this way, the economic benefits will inevitably be good. In terms of quantity and quality, it is enough to crush others. Once such software is put into the market, it will definitely attract attention from all aspects. It is believed that it will definitely cause a storm in the construction industry. If a company buys in bulk, specialized technicians can be provided for installation and training.

## V. CONCLUSION

This article takes the 2019 award-winning project "Supersonic Curtain Wall" as an example to illustrate the key points and techniques of the declaration of scientific and technological inventions, and the declaration of the purpose of the design, the purpose of the invention and the basic ideas. The cultivation of college students' innovative and entrepreneurial ability is conducive to the realization of college students' entrepreneurial enthusiasm and the promotion of their entrepreneurial ability and management ability. By participating in various innovation and entrepreneurial competitions, the comprehensive ability of students in vocational colleges is improved, which has a very positive effect and significance for the cultivation of students' innovative and entrepreneurial ability.

The software in the field of curtain wall engineering developed in this project demonstrates the innovation, technical key and main technical indicators of the project through engineering application and verification. It also demonstrates the scientific, advanced, technical characteristics and advantages of the works. What's more, it analyzes the application prospects, market forecast, economic benefits, and social benefits. Through the award-winning examples of the "Challenge Cup" Liaoning University Extracurricular Academic Science and Technology Works Competition, the contents of all aspects of the competition program are elaborated for the guidance of college teachers to guide innovation and entrepreneurship projects and provide reference for the students' participation.

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