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# Analysis and Research of Vehicle Traction Impact Test

**Jiabao Fan, Xiangjun Wu, Ming Liu**

China Faw Co., Ltd, General Research and Development Institute, Jilin 130013, China

**Abstract:** ***Automotive safety is an important index for performance evaluation, the vehicle collision is based on the viewpoint of occupant protection, car body structure, in the whole experiment adopted a more realistic simulation, will maximize the reduction of the authenticity of the accident, the vehicle crash test is for the vehicle collision CAE model calibration and validation of the accuracy analysis results, it is also one of important means to improve the efficiency of analysis. This kind of test will be more convincing, can explain the corresponding problems existing in the vehicle development process, and implement improvement measures. In the vehicle crash test, regulations require the seat, steering wheel and other position and structure adjustment requirements. In order to more effectively and accurately locate the position required by regulations, we studied the corresponding method, which can effectively improve the test accuracy and save a lot of time. However, after a few weeks, the students' attention will be restored, and the embarrassment of losing interest in the middle of the class seems to be accidental, so it can be ignored. not to mention that in any case, some students will participate in learning with full interest in each class. Therefore, these embarrassments of losing interest in the middle of the journey seem to be accidental and need not be putting in mind. However, if the assumption of classroom teaching effect is that all students can learn, or the memory retention rate of all students can reach 50%, we need to first admit the existence of "the embarrassment of losing interest in the middle of vivid teaching", because this embarrassment is inevitable from the perspective of "Dale's Cone of Experience" and "inverted U-shaped attention curve".***

**Keywords:** Collision Test; Occupant Protection; Test Method.

## 1. INTRODUCTION

As the vehicle passive safety technology becomes more and more refined, passive safety technology will become a part of the safety protection system for vehicle occupants and vulnerable road users. In vehicle crash test, we must first consider is the top priority of the occupant safety and passive safety technology under the protection of the state whether the secondary damage to the personal safety, for the development of performance, in order to be able to better to test and improve the vehicle's safety and design problems such as the structure, the traction cable car collision will normally be used for test. But we in order to be able to simulate in the crash test is more conform to the regulations for us in the development stage, in the experiment we studied the corresponding test method, the application of these methods greatly improve the test accuracy. Based on genetic algorithm and variable density method, the lightweight design of swing Angle milling head is presented in this paper. Firstly, SolidWorks is used to build a THREE-DIMENSIONAL model of the milling head. The shape and size of the milling head are optimized preliminarily by the optimization program based on genetic algorithm. Then using ANSYS topological optimization module based on variable density method to further optimize the design of swing Angle milling head [1]. By comparing the finite element analysis before and after optimization, the weight of swing milling head is reduced and the performance is improved [2] Better optimization effect is obtained.

In this way, naturally, the solution is ready to come out: in the 90-minute classroom teaching, teachers' vivid lectures and wonderful comments are indispensable but not the whole. Therefore, what is an effective arrangement of in-class teaching? How will the 18-week teaching be arranged? All of these depends on professional characteristics, curriculum characteristics and teaching purposes.

## 2. VEHICLE TRACTION COLLISION BASED ON RESEARCH AND DEVELOPMENT TEST

As a kind of vehicle impact test with good feasibility and accurate test, the main purpose of vehicle traction impact test is to effectively check the damage value of the vehicle to the occupant and verify the rationality of the internal structure design of the vehicle. the vehicle impact test generally requires two rounds of tests. the first round of test is in the development and calibration stage (also known as DV stage), and the occupant protection system does not have self-diagnosis and protection, so it needs test control. the second round of test OTS stage verification test is to verify and improve the design structure (also known as PV stage). Based on the guiding ideology of "making the

course better, teachers stronger, students busy, management stricter and results more effective" (Ministry, 2019), this paper determines the teaching purpose of taking all students as the center, and uses offline flip mixed teaching method and experiential teaching method to construct the first-class undergraduate course teaching scheme and find out the activation path of course teaching.

Vehicle traction collision test is one of the trial of passive safety technology is more complicated, and most of the vehicle safety assessment points test, mainly including the vehicle in front of the preparation, data collection and preparation, data extraction and analysis, the four most vehicle dismantling and site recovery. the whole constitutes a complete vehicle crash into the analysis of the steps.

### 2.1 Process introduction of vehicle traction collision

The vehicle collision test is carried out according to the test steps in the overall test operation, which mainly includes the following steps. Transported to the laboratory, the first step, vehicle for vehicle weighing record to quality; the second step, the corresponding test parts for replacement or disassembly, and then again on the vehicle test mass weight; the third step, to prepare a combination of fixed test sensor, paste it to the test required position; the fourth step, combined with the test characteristics of the vehicle, select the appropriate location to install data acquisition equipment on the vehicle; Step 5: Adjust the position of the steering wheel and seat, place the dummy required for the test and conduct the test adjustment; the sixth step, prepare the test collision wall, according to the test requirements of the vehicle or pulley fixed on the traction ropeway; the seventh step is to preprocess the track and lighting equipment and adjust it into camera data acquisition equipment. Step 7: Prepare preheating traction ropeway, lighting system, adjust camera equipment so that it can get video data Step 8: connect sensors and data acquisition equipment and prepare for data acquisition; Step 9, take test photos, and then, the test begins, disconnect the equipment and data mining connection, press the trigger to prepare the test; the tenth step, the end of the test, through the traction equipment to read the actual speed of the test speed, data mining, reconnect the equipment, read the video and data mining data and finally analyze and edit the report; Step 11: Observe the contact position between the dummy and the airbag through post- test video recording, remove the test sensor arranged by the vehicle, and restore the end of the field test.

### 2.2 Basic Principles

Genetic algorithm is a summary and simulation of biological reproduction, individual selection in natural environment and individual evolution process. It was founded by Scholar Holland in 1960s and 1970s. Later, the scholar formally proposed the relevant definition and research of genetic algorithm in his monograph published in 1975 [3]. Its basic principle is to simulate the natural selection and biological inheritance ideas of "natural selection" proposed in the evolution theory. In solving the optimization problem, the initial biological population is optimized and screened for generations until the number of iterations or convergence results are reached. It is an optimization algorithm of search process. Genetic algorithm has many advantages [4], as follows:

It can find the optimal global solution of the optimization problem to be solved;

Initial conditions do not affect the final results;

It has strong robustness;

Can solve complex problems;

## 3. STRONG SCOPE OF APPLICATION.

### 3.3 Basic Operations

The basic operation of genetic algorithm includes coding method, selection method, crossover method and mutation method. In genetic algorithm, in order to make the individual in the population in crossover and mutation operation is more convenient to handle, so we need the solution of problems can be expressed with the Numbers, so we put the projection and corresponding all feasible practical solution for genetic algorithm can operate process known as encoding of the form, and vice operation known as decoding. 1.There are a total of 26,868 schools for high school education; 15.9874 million students are enrolled; 45.9528 million students are in school; the gross enrollment rate for high school is 85.0%. There are 13,509 ordinary high schools; 8.4461 million students, 24.6717

million students, 7.9150 million graduates, 2.4626 million faculty members, 1.595 million full-time teachers, student-teacher ratio 15.47:1, full-time teacher qualification rate 96.44%.

Coding and decoding are the most important steps in the process of genetic algorithm, which only transforms practical problems into problems that can be solved by genetic algorithm. Common encoding methods include binary encoding, real encoding, character encoding and floating point encoding.

The purpose of binary coding operation is to simulate the actual solution into the form of chromosomes in nature. We use "0" and "1" to represent the bases, and use 0 and 1 to form the feasible solution. the chromosome composed of 0 and 1 bases reflects the characteristics of an individual.

The advantages of binary coding are as follows: ① it is easy to encode and decode the problem; ② it is easy to operate the crossover and mutation steps in the genetic algorithm; ③ it is easy to use basic principles to carry out theoretical analysis of the method.

## 4. TEST CONDITIONS REQUIRED BY REGULATIONS

In the vehicle traction collision regulations, vehicle state, dummy placement, vehicle steering wheel seat and other adjustments and position requirements will be carried out, the main purpose of which is to better simulate the actual collision effect. At present, in the domestic safety research and development test Chinese standard, C-NCAP and other as the main evaluation basis, NCAP is extremely strict test requirements, in order to ensure that the test can be more suitable for the actual situation. In NACP regulations, if the steering wheel is adjustable, it is placed in the middle, including any direction that can be adjusted; Seat requirements can be adjusted on the seat manufacturer design height to production or the lowest, seat tilt Angle can be adjusted to the design position or the middle; the front and rear movable travel of the seat should be adjusted to the middle position or the middle backward position and locked. First of all, we must strengthen the construction of new infrastructure. Promote the application of new generation information technologies such as 5G, big data, cloud computing, artificial intelligence and other new generation information technologies at the regional and school levels, establish educational big data warehouses, promote the integration and sharing of educational data, build educational brains, and promote data integration as a whole Integrate and establish data application and analysis models for students, teachers and schools. Secondly, cultivate new capabilities based on digital capabilities; in order to adapt to social digital reforms and adapt to a rapidly changing world, it is key to innovate the talent training model and cultivate the digital capabilities of new students. Finally, establish a sustainable development culture and multi-sectoral cooperation mechanism. The digital transformation of education is a process of all elements, the whole process, the whole business, and the whole field of digitalization. It is necessary to establish a continuous improvement culture, coordinate the relationship between planning, construction and maintenance and updating, establish a continuous attention and investment mechanism, and promote organizations and schools to establish a continuous improvement awareness. To sum up, to solve the key problems of basic education in China mainly through the evaluation policy to guide the evaluation of education in the new era, a series of policies for public-funded normal students to promote the construction of teachers, and the digital transformation of education to improve the quality of basic education.

### 4.1 Flipped Classroom

Lu Xiao et al. (2016), after field research, combined with mastering the learning theory and the principle of difference, analyzed that the flip classroom, which is different from the traditional classroom, should have the following five learning concepts: limited flipped to unlimited to focus on the entirety of the learning subject, presupposition flipped to innovation to focus on the generation of learning content, passive flipped to initiative to focus on the self-motivation of learning, individual flipped to team-work to focus on The self-organization of cooperative learning, results flipped to courses to focus on the multi-evaluation of learning. And he pointed out that "the fundamental goal of flipping the class should be to realize the original care of knowledge in the process of learning".

### 4.2 Mixed Teaching

Meng Junzhen (2020) summed up from teaching practice that "mixed teaching method is an online+offline

teaching method that combines the advantages of online teaching and traditional teaching. Through the organic combination of the two teaching organizations, learners' learning can be led from shallow to deep learning. "

Feng Xiaoying et al. (2018) clarified that the new connotation of mixed teaching under the background of "Internet+education" has gradually evolved from "the mixture of online teaching and face-to-face teaching" to "a teaching situation based on the combination of mobile communication devices, network learning environment and classroom discussion", "creating a truly highly participatory and personalized learning experience for students".

### 4.3 Experiential Teaching Method

hang Jinhua et al. (2010) explained from the aspects of origin, development and concept that the connotation of experiential teaching method lies in students' perception, understanding and verification of knowledge and theory through activities, which can stimulate students to study deeply and even create development.

Shen Jian (2001) put forward that "the all-round and harmonious development of human beings is, first of all, a kind of perceptual and experiential enrichment and development".

To sum up, the two dimensions of student participation-acceptance participation+experience participation-are accompanied and supported by each other. Generate knowledge and skills in accepting participation, and generate values and ideas in experiencing participation. Under the background of "Internet+Education", the organic integration of online and offline learning and in-class and out-of-class learning maximizes acceptance and participation. Experiential teaching method makes the education deviation brought by technology back to the all-round and harmonious development of people. 5G mobile internet technology puts wings on the flip classroom. Whether it's real-time multi-evaluation, self-motivation or self-organized learning, it makes consciousness construction within reach, and content generation, understanding and creation are always online.

## 5. ADJUSTMENT AND IMPROVEMENT MEASURES OF TEST METHODS

Is adjusted to the above requirements, to the steering wheel, steering wheel position, according to the regulations place false front, we need to on the steering wheel, with the continuous upgrading of technology the vehicle's steering wheel has two dimensions adjustable direction, compared to the early technology of steering wheel can adjust one-way, difficult and time-consuming to two direction adjustment, Can not achieve the desired effect. To solve this problem, the invention proposes a method of finding points and drawing intersecting points by infrared laser with crosshairs. the specific operation is as follows: First adjust the steering wheel to a limit position, make a small square cardboard, use double-sided adhesive, stick it under the left side of the steering wheel, after fixing, so that it can not move. the second Aim the infrared laser with reticle small board, and in a small cardboard pen marked, adjust the steering wheel to make it to the corresponding limit position, in a small cardboard infrared laser marked the reticle, limit position before and after the first set of adjusted to adjust the second dimension limit position, each time the laser pen marked the reticle. Finally, the front and back dimensions and the upper and lower dimensions are connected. the intersection point of the connection is the middle position of the steering wheel. the position of the steering wheel is adjusted to make the infrared laser cross point coincide with the intersection point of the connection, which is the middle position of the steering wheel, greatly improving the test efficiency.

As for the seat adjustment, we used the three-coordinate construction system to adjust the seat position in the early stage, and it was very difficult to adjust the seat position of the dummy in the experiment. the three-coordinate construction method was adopted to adjust the seat position of the dummy, although it could greatly improve the data accuracy of the vehicle in the test. To make the following adjustments: using infrared laser with reticle to find point, to adjust the position of the vehicle seat first to the last position, using infrared laser with reticle in seat selection of lateral marked, secondly keep the laser from mobile case, the vehicle is going to adjust the seat to move forward to the front, mark point of infrared laser with reticle. At the same time, on the basis of ensuring that the initial laser position is not moving, the seat position is adjusted to make the point of the infrared laser with a cross line coincide with the point of the middle distance between the two points by using the measuring tool. the overlap point is even the middle point of the seat. This adjustment not only ensures the original accuracy but also improves the test efficiency.

### 5.1 The mutation step in genetic algorithm

It is to imitate the phenomenon of "gene mutation" in nature, and to simulate the mutation of base fragment on

chromosome to form new chromosomes. The function of mutation is ① to expand the diversity of the whole population ② to increase the local searching ability of genetic algorithm. Common mutation methods include: ① basic mutation ② uniform mutation ③ boundary mutation ④ non- uniform mutation. In college education, teachers as the guide of students to learn their own ability to improve the ability of students has a very important role in the development of social economy and science and technology in our country's educational cause has carried out a variety of changes. Up to now, there are clear requirements to improve students' practical ability and quality ability. In order to achieve good development of students through professional education, teachers should have strong professional ability. the ability and experience of teachers are the source of practical knowledge, which is realized through reflection on experience. Therefore, in order to realize the effective improvement of teaching quality and efficiency in the education of colleges and universities, teachers' professional ability should be improved from the practice-guidance-reflection orientation. This article mainly analyzes and studies the professional development path of university teachers with the orientation of practice- guiding-reflection.

### 5.2 Base-bit mutation

It is the most convenient and common mutation method, which is to reverse a certain base fragment or multiple base fragments specified on individual chromosomes with a certain probability, so as to obtain new chromosomes, as shown in Figure 1. As can be seen from the table, the first three order modes of the pendulum milling head after twice optimization are basically the same as before optimization, and the mass is reduced by 9.648%, the maximum stress is reduced by 7.766%, and the maximum deformation is reduced by 9.324%.

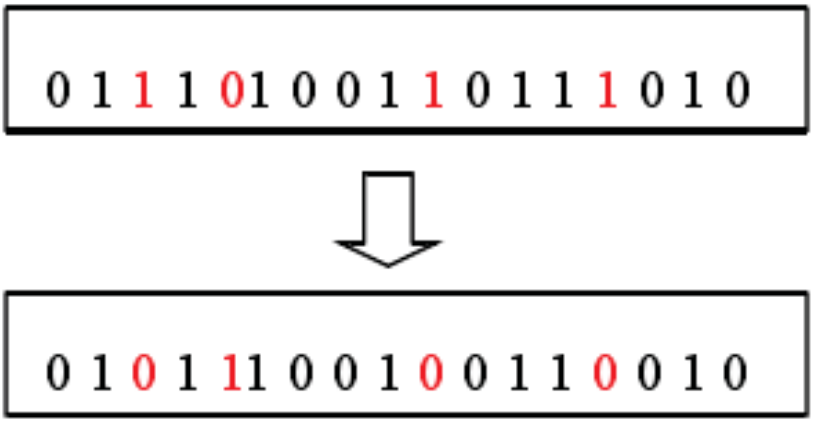


**Figure 1:** Basic bitmap variation

### 5.3 Basic process

For the whole genetic algorithm, the basic steps include coding, defining adaptation function, selection, crossover and variation, as shown in Figure 2. The swing milling head with lightweight design was analyzed by modal analysis and statics analysis. The results are shown in Figures 20 and 21. It can be seen that the maximum deformation occurs in the bottom measurement of the box body, reaching 1.9615e-007m, and the maximum stress is located near the axle hole, reaching 8.64e+005Pa.

**Table 1:** Percentage Distribution of the Respondents' Profile

| Sex | Frequenc | Percentage |
|---|---|---|
| Male | 201 | 56.5 |
| Femal | 155 | 43.5 |
| Grade | | |
| Freshman | 220 | 61.8 |
| Sophomore | 136 | 38.2 |
| Major | | |
| Liberal arts | 162 | 45.5 |
| Scienc | 194 | 54.5 |

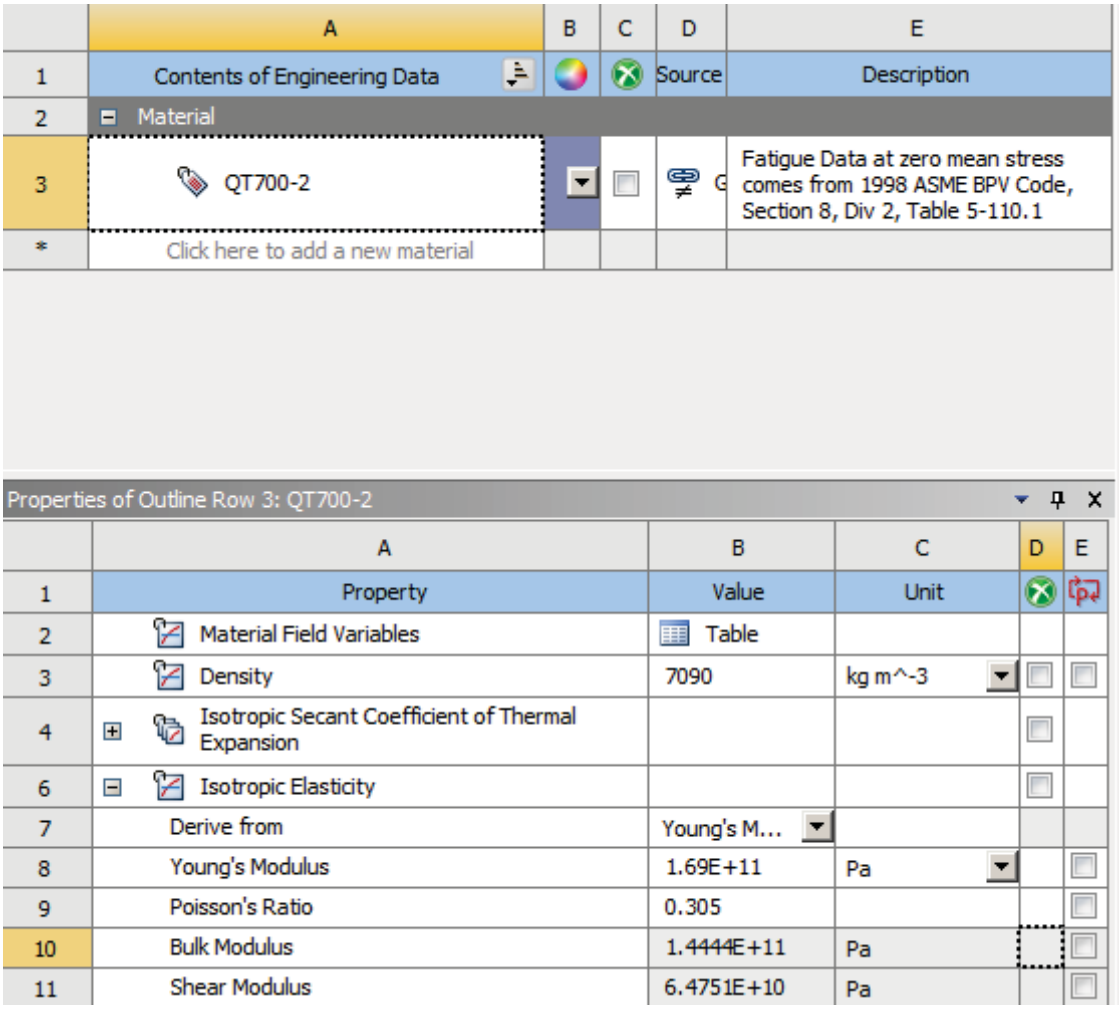


**Figure 2:** Selected material data

**Table 2:** Descriptive Statistics for Online English Learning Anxiety

| Indicators | Weighted | Verbal | Rank |
|---|---|---|---|
| 1. Communication Apprehension | 2.72 | Agree | 2 |
| 2. Test Anxiety | 2.73 | Agree | 1 |
| 3. Fear of Negative Evaluation | 2.56 | Agree | 4 |
| 4. General Anxiety | 2.64 | Agree | 3 |
| Composite Mean | 2.66 | Agree | |

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 - 1.49 = Strongly Disagree

The main teaching task of colleges and universities is to cultivate high-quality and high-skilled talents for the society, and the quality of teaching plays an important role in the effective realization of talent training. Therefore, colleges and universities must have a first-class team of teachers if they want to achieve better development. According to the research on the current higher education in our country, there are great limitations in the way of professional practice work of teachers in the development of colleges and universities. There are three main ways to carry out the work, namely, expert teaching, experience flow and listening and evaluating. In the late Qing Dynasty, Western painting techniques and artistic concepts were gradually introduced into China, which had a profound influence on the development of watercolor painting. This paper will discuss the western influence of watercolor painting in the late Qing Dynasty, including the introduction of Western painting techniques, the promotion of watercolor painting by missionaries and diplomatic missions, and the influence of western artistic concepts on watercolor painters in the late Qing Dynasty. By studying these aspects in depth, we can better

understand the background and characteristics of the development of watercolor painting in the late Qing Dynasty.

## 6. CONCLUSION

Vehicle crash test is the most intuitive test method for the safety of automobile products, and its results will have a great impact on consumers' car purchase. With the continuous improvement of China's laws and regulations, the development of vehicle safety in China is obvious. It has certain research significance on how to improve the vehicle crash test method, improve the test efficiency, and improve the evaluation method as the vehicle safety performance verification stage. CNCAP and at the same time as the present stage more perfect China's new car safety assessment procedures for safety test has played a certain constraints. Based on genetic algorithm and variable density method, the weight of the swing milling head is reduced by 9.648%, the maximum stress is reduced by 7.766%, and the maximum deformation is reduced by 9.324%. the performance of the swing milling head is improved while the material is saved. The ability of teachers in colleges and universities also have important impact on the development of colleges and universities, according to the research on the current majority of colleges and universities development in our country, the development of colleges and universities teacher activity form more, based on expert professor theory is given priority to, this way will the teacher on the position of passive learning, also cannot effectively will be improve the initiative of the teachers. Since reflection is an important way to improve teachers' professional ability, when reflective guidance is ignored in teachers' daily activities, teachers' own experience and ability will grow slowly. Therefore, the quality and efficiency of teaching cannot be guaranteed in the process of education. In order to effectively improve the situation, teachers should promote their own growth from the way of practice-guiding-reflection.

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