



2022 BRICS Skills Competition

(BRICS Future Skills Challenge)



TECHNICAL DESCRIPTION

Augmented and Virtual Reality (Offline)

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1 Introduction

1.1 Name and description of skills competition

1.1.1 Name of skills competition

Augmented and Virtual Reality

1.1.2 Description of skills competition

Organized on the competition platform based on the virtual simulation development system, the offline competition of augmented and virtual reality events of BRICS Skills Competition is composed of the application of virtual simulation development engine, 3D modeling software and 3D rendering software. Competitors need to complete the offline task assessment by computer. The offline competition of augmented and virtual reality is a team skills competition, participated by two competitors from each team respectively.

The skills of augmented and virtual reality include four aspects: The virtual module design and production, the virtual module rendering and production, the development of cognitive functions of virtual products, and the development of operational functions of virtual products.

Professionals for augmented and virtual reality need to be equipped with the following job skills:

(1) Able to complete the virtual module design and production with 3D modeling software and reference materials. The data volume of the model shall not exceed the specified value.

(2) Able to process the mapping effect of the virtual model with the design software for model effect, and export an applicable format for application for virtual reality.

(3) Able to realize the development and release of functional demonstration of structural cognitive categories through the VERY platform according to the requirements of the competition.

(4) Able to realize the development and release of functional demonstration of of operation category through the VERY platform according to the requirements of the competition.

1.2 Relevance and importance of the document

The document contains the standards for the skills competition, as well as the evaluation principles, methods and procedures to manage the competition.

Experts and competitors must understand the technical description.

The English version shall prevail in case of any conflict between the technical descriptions in different languages.

2 Skill standards

2.1 General description of skill standards

Skill standards define knowledge, understanding and specific skills as international best practices in technical and professional performance. They reflect the global consensus on the significance of representation of relevant job roles or occupations in industry and enterprises.

The objective of skills competition is to reflect the extent of international best practices for the skill standards. Therefore, the standards play the role as the guide for the training and preparation for skills competition.

The standards are divided into parts with titles and parts with reference numbers.

The percentage of the total score for each part indicates the relative importance in the standards. Sometimes, it is referred to as "weight". The total score of all percentages is 100. Weight determines the distribution of scores in the scoring standard.

The scoring scheme is only used to evaluate the skills listed in the standard through the test items. They reflect the standards comprehensively based on the skills competition.

The scoring scheme is actually applied according to the score distributed in the standard. It can change by 5%, but shall not change the weight distributed by the standard specification.

2.2 Skill standards

S/N	Content	Proportion (%)
1	Organization and management of work	5
	Competitors need to understand: <ul style="list-style-type: none"> – Rules and regulations on safe work – Terms in specific jobs and departments – Methods to plan and manage time and tasks – Habitually save working backups to prevent the file from being damaged – The structure of file management can be easily understood by the team and transferred under different kinds of hardware environment 	
	Competitors shall be able to:	

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	<ul style="list-style-type: none"> – Meet professional standards at all times – Be responsible for the whole process of development – Set up and maintain the file structure – Plan, manage and control the development process – Recover working data from the crash of system – Work with the team, good at communicating and cooperating with others 	
2	Design technology of 3D model	15
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – Principle of 3D modeling – Texture of 3D modeling – Data volume of 3D modeling – Format of 3D modeling 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Design the model through modeling software (Blender, 3DSMax, Maya) – Process UV effects of the model – Optimize the number of surfaces of the model – Export the model to the format required by the VR engine. 	
3	Rendering techniques for 3D model	15
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – Rendering features of target platforms – Light and shadow setting function – Application of texture and materials in rendering engine – Geometric objects and image rendering principles – Post-render processing – Implementation characteristics of light and shadow of rendering engine and target platforms 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Set up static and dynamic lighting in the rendering engine – Set the standard shader – Optimize the rendering process – Set the post-render processing and the view of the final image – Create the program geometry through rendering engine resources – Do program frame rendering 	
4	Application design of VR	20

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	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – Requirements of the current market for VR applications – Design requirements of VR interface – User experience in virtual and augmented reality (UX user experience) – Technical requirements of target platforms 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Draw the interface elements of the application – Select good references – Write documents correctly 	
5	VR Application Program Making	25
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – VR Application Program Function Making – Making of graphical interfaces of VR application programs – Technical requirements of target platforms – VR user experience 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Create the development interface – Develop interaction functions – Utilize object-oriented principles of logic – Check contents and eliminate BUG 	
6	VR Application Program Issuance	10
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – Publishing function suitable for B/S architecture application 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Publish the application programs – Run application on web pages 	
7	Application performance and optimization	5
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> – Optimization of model parameters – Optimization of rendering parameters – Optimization of instruction parameters 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> – Optimize hierarchical geometry 	

	<ul style="list-style-type: none"> - Optimize maps and materials - Optimize development instructions 	
8	Teamwork and soft skills	5
	<p>Competitors need to understand:</p> <ul style="list-style-type: none"> - Team member communication standards - Each competitor's role in the team - Your area of expertise 	
	<p>Competitors shall be able to:</p> <ul style="list-style-type: none"> - Perform duties in the team - Communicate and consult with team members - Perform the time management 	

3 Scoring scheme

3.1 Method of scoring

The competition shall be scored by the referee team offline and on site. If a competitor commits cheating or other violations during the competition, the referee shall deal with it accordingly and cancel the score in serious cases.

3.2 Scoring rules

The chief expert and the acting chief expert shall make a discussion and divide the experts into small groups (at least three in each group) to score. Each team must have at least one experienced expert. Experts shall not evaluate competitors from their units.

1. Process scoring

The on-site judges will score the operation specifications and live performance of each team according to the on-site marking table. The scoring results shall be signed and confirmed by the competitors and judges.

2. Outcome scoring

The competition outcome submitted by the competitors shall be evaluated and scored in accordance with the competition evaluation standards.

3. Points deduction for violation

The competitors involved in the following circumstance shall be subject to points deduction:

A. In case of the damage of equipment in the competition area and pollution of

competition environment, or the behaviors conducted largely not conforming to the profession norm, 5-10% of the total points will be deducted depending on the circumstances, and in severe cases, the competitor will be disqualified from the competition.

B. Disturb the order of competition area and interfere with the judge's work, in these cases, 5-10% of the total points will be deducted depending on the circumstances, and in severe cases, the competitor will be disqualified from the competition.

4. Sampling inspection and review

To ensure the accuracy of the statistical scores, the supervision team shall review the scores of the top 10 participating teams in the total score of the competition; Other scores shall be randomly inspected and reviewed, and the sampling inspection coverage shall be no less than 15%. The supervision team shall inform the head judge of the errors discovered in the process of reinspection in a written form, and the head judge shall get the score adjusted and sign to confirm. In the case that the error rate is over 5%, it shall be recognized as non-small probability event, and the judging team shall review all the scores.

5. Score statistics method

Combining the process scoring with the outcome scoring, each scoring team shall score the respective modules. The data shall not be modified after it is stored. The scoring sheet shall be signed and confirmed by the referees in the evaluation and submitted to and kept by the head judge. The original score sheet, after reviewed and signed by the judges of each group, and after confirmed by the head judge, shall be recorded into the system by the working staff.

6. Same scores

(1) Those with high total scores rank first;

(2) Those with the same total score shall rank first with high module scores in the order of module D, module C, module B and module A.

3.3 Evaluation basis

The evaluation of competition is divided into two types: Objective evaluation and subjective evaluation. For both types of evaluations, using explicit benchmarks to evaluate every aspect is critical for quality assurance.

The judges' subjective evaluations will be made at four levels, i.e. 0-3. Such an evaluation will make a subjective judgment on the quality of the evaluation object, and at least three experts shall participate in the evaluation. Each expert shall make their own evaluation, and the difference between the expert judgments shall not exceed one (1) level under such circumstances. If exceeding one (1) level, the evaluation shall become invalid, and the expert shall consult appropriately.

Every section of such evaluation shall be accompanied by the descriptive information about each evaluation level:

For example:

0 - Meaning the performance is below industry standards or absence from the competition;

1 - Meaning the performance is not up to industry standards;

2 - Meaning the performance is up to industry standards, and individual aspects exceed industry standards;

3 - Meaning the performance has completely exceeded industry standards and is rated as excellent.

Every section will be objectively evaluated by three experts. Except as otherwise noted, only the highest score or zero will be awarded. During evaluation, the benchmarks for part of scoring will be clearly defined in the link framework.

4 Test items

4.1 Precautions

The application of knowledge, skills and behaviors defined in the Skill Specification can be evaluated in the test items whether it is a single module or a series of independent or associated modules.

The purpose of the test items is to provide comprehensive, balanced and real opportunities for the evaluation and scoring of standards in combination with the scoring scheme. Just like the relationship between standards and actual work performance, the relationship between test items, scoring schemes and standards is a key indicator of quality.

The test items neither include aspects beyond the standards, nor affect the balance of scores within the standards.

The knowledge and understanding is evaluated in the test items through the application in actual work.

4.2 Format / framework of test items

The test items are composed of four relatively independent and related modules:

Module A: Virtual model design and production

Module B: Virtual model rendering and production

Module C: Development of cognitive function of virtual products

Module D: Development of operation function of virtual product

4.3 Time allocation and score weight of test items

Module	Duration (min)	Score weighting (%)
Module A: Virtual model design and production	240	20
Module B: Virtual model rendering and production	240	20
Module C: Development of cognitive functions of virtual product	240	30
Module D: Development of operation function of virtual product	240	30
Total	960	100

4.4 Operation contents and requirements of module

Covering the virtual module design and production, the virtual module rendering and production, the development of cognitive functions of virtual products, and the development of operation functions of virtual products, the competition comprehensively examines the ability of the competitors to apply and develop the VERY engine platform.

Virtual model design and production of module A: Focus on principle of 3D modeling, texture of 3D modeling, data volume of 3D modeling and format of 3D modeling;

Virtual model rendering and production of module B: Focus on the rendering function of the target platform, the setting function of light and shadow, the application of texture and material in VR engine, the principle of geometric object and image rendering, post-processing of rendering, and implementation characteristics of the light and shadow of engine and target platform;

Development of cognitive functions of virtual products of module C: Focus on the production of VR applications, production of structural cognitive functions of virtual products,

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production of demonstration functions of virtual products, and the release of applications;

Development of operational functions of virtual products of module D: Focus on the production of VR applications, the production of demonstration functions of disassembly and assembly of virtual products, the production of practical operation functions of virtual products, and the release of applications.

Module number	Module name	Operation scope
A	Virtual model design and production	<ol style="list-style-type: none"> 1. The model is accurate in size proportion and shape 2. UV is not obviously distorted and deformed, neat and reasonable in division and arrangement 3. The wiring is uniform and reasonable, conforming in the number of polymorphic edges 4. The model needs to be frozen, transformed or collapsed, with double-sided lighting 5. Polygonal technology: Frame display
B	Virtual model rendering and production	<ol style="list-style-type: none"> 1. Complete and authentic material differentiation and complete and correct mapping meet the design requirements 2. Rich details and harmonious color matching meet the design requirements 3. Application of texture and material in engine 4. Conforming map resolution and baking 5. Follow the PBR process, conforming in type and quantity 6. Make particle effects
C	Development of cognitive virtual products	<ol style="list-style-type: none"> 1. Realization of observation function of product 2. Conforming mode for the implementation of function 3. Conforming model quantity involved in the implementation of function

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		<p>4. Conforming naming during the implementation of function</p> <p>5. Good effect and appropriate speed and distance in the implementation of function</p> <p>6. Smooth implementation of function without abnormality</p> <p>7. Reasonable UI layout and good interaction experience</p> <p>8. Issuance and running</p>
D	Development of operation virtual products	<p>1. Realization of disassembly function of product</p> <p>2. Conforming mode for fuction disassembly and the disassembly method in line with the real effect</p> <p>3. Conforming speed and distance of the disassembly method in line with the actual effect</p> <p>4. Smooth switching between functions without abnormality</p> <p>5. The sequence of disassembly function can be switched</p> <p>6. Smooth implementation of function without abnormality</p> <p>7. Reasonable UI layout and good interaction experience</p> <p>8. Reasonable use of sound effects during the realization of function</p> <p>9. The camera is used reasonably, with the angle of view switched and controlled smoothly without abnormalities</p> <p>10. Issuance and running</p>

4.5 Announcement of test items

The test items will be announced on the website.

5 Skill management and communication

5.1 Expert group

Composed of chief expert, deputy chief expert and expert members, the skill expert group is responsible for further revision of the technical documents for the remote finals of the event and daily skill management.

5.2 Discussion forum

The competition assignment can be downloaded and the competition results can be uploaded on the Xuebei cloud platform. The competitors can organize a meeting through instant messaging for feedback and exchange before the competition about the preparation of software and hardware and the deployment of examination environment. Competitorss can communicate through instant messaging group chat about the training for the event.

Instant messaging tool WeChat International (optional: WhatsApp) and conference tool Tencent Conference International (optional: Zoom) shall be adopted for online communication. The organizing committee shall uniformly announce the time for the offline discussion forum.

6 Safety requirements

6.1 Safety training

Before competition, the equipment management personnel shall provide the safety operation training for the competitors, and the competitors shall operate the equipment in strict accordance with the safety use instructions. In the event that a competitor is found to operate the equipment in violation of regulations, the judge and examination administrators shall promptly notify the head judge and suspend the competition. The competitor shall, once finding the equipment has encountered operation safety problems, notify the examination administrators and the head judge promptly for safe handling.

6.2 Safety facilities

There must be safety passageways must be set up in the competition area. Before competition, competitors and judges must be clearly informed of the positions of safety passageways and safety gates. The competition area must be equipped with the fire-fighting equipment to be placed in a prominent position.

6.3 Management and restriction of toxic and hazardous substances

Competitors and all competitors shall be prohibited from bringing any toxic and hazardous substances into the competition area.

6.4 Medical equipment and measures

Corresponding medical personnel and first-aid personnel shall be put into place in the competition area, and corresponding first-aid facilities must be available for use.

6.5 Epidemic prevention and control

(1) The competition area shall implement the strategy of "preventing foreign input and preventing internal spread", and take timely and effective preventive measures to prevent and control the novel coronavirus infection in accordance with the law, and in a scientific and standardized manner, while guarantee the action of "early detection, early reporting, and early isolation" to ensure the health and safety of competitors, judges and working staff.

(2) All competitors, judges and working staff must fully understand the severity and complexity of the epidemic, and must attach great importance to the prevention and control of novel coronavirus pneumonia and other infectious diseases, and shall follow the management principles, while paying attention to the changes of the epidemic. They shall strengthen public awareness of the disease, promptly launch contingency plans, implement prevention and control measures and make all-out efforts to prevent the spread of the epidemic.

(3) All personnel must wear protective articles (masks) at all times in public places except during competition and over dinner.

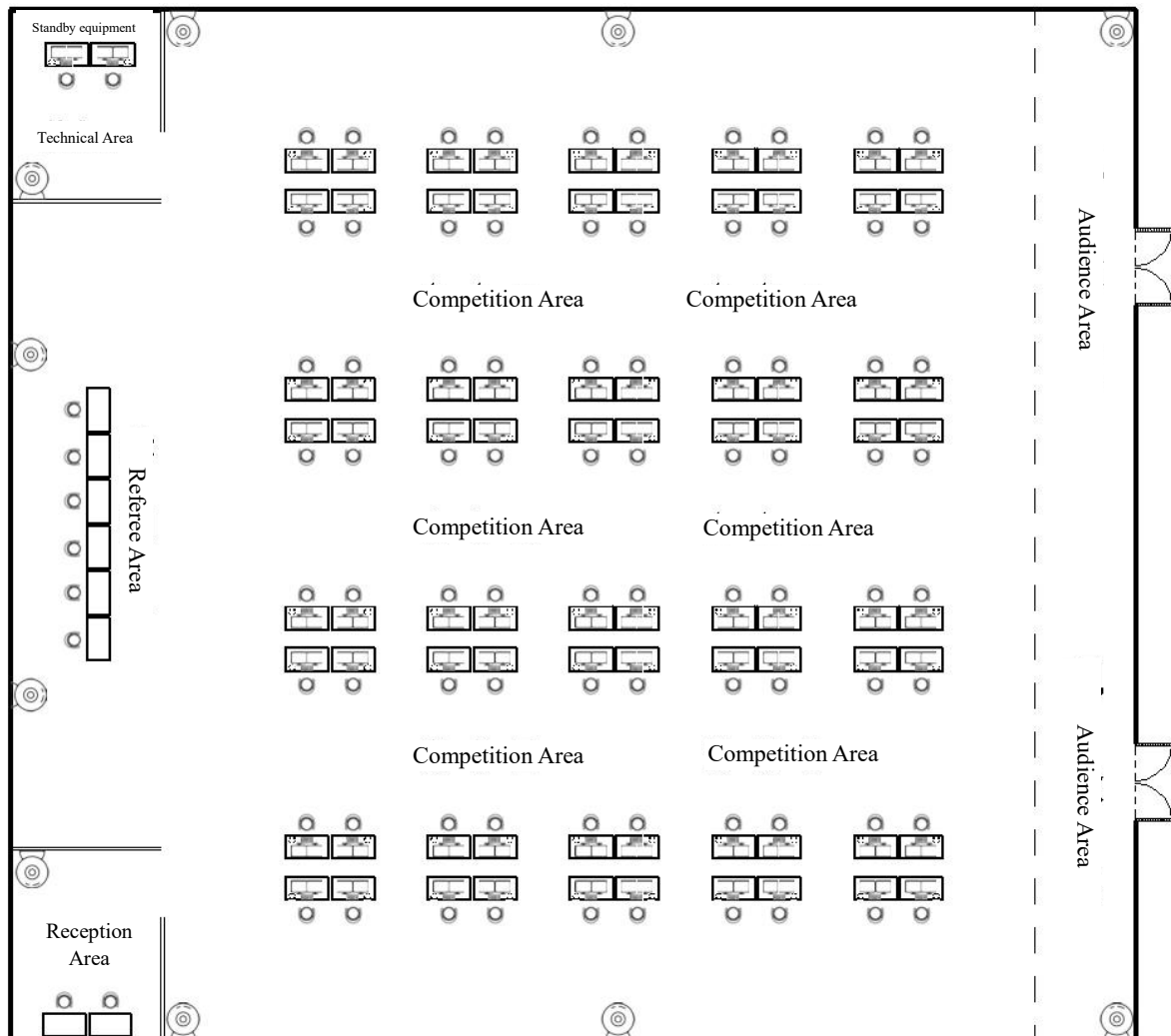
(4) The whole process must be supervised, and the isolation area must be set up, while a green channel for emergencies shall be established. In case of emergencies such as injuries and abnormal body temperature, it should be able to form a seamless connection with the hospital immediately. All personnel shall strengthen public awareness of the disease, promptly launch contingency plans, implement prevention and control measures and make all-out efforts to prevent the spread of the epidemic.

7 Materials and equipment

7.1 List of infrastructure

The list of infrastructure lists in detail the equipment and facilities competitors need to prepare. Refer to "List of facilities for offline final of augmented and virtual reality events of 2022 BRICS Skills Competition.

7.2 Layout of competition areas and workstations as proposed



8 Specific rules for skills

Specific rules for skills shall not conflict with or take precedence over the competition rules. They shall provide specific details and clear explanation from different aspects, which are different due to skills competition. They include, but not limited to, personal computing devices, data storage devices, Internet access, work procedures, and document management and distribution.

Topic / task	Specific rules for skills
Technology - USB, memory stick	<ol style="list-style-type: none"> 1) Competitors can only use the storage devices provided by the competition organizer. 2) It is forbidden to take out of the examination room the memory

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	<p>card or any other portable storage device.</p> <p>3) Memory cards or other portable storage devices must be handed over to and kept by the chief expert or deputy chief expert after the competition.</p>
Technologies: Laptops, tablet PCs and mobile phones	<p>1) Experts and interpreters can use laptops, tablet PCs and mobile phones.</p> <p>2) Competitors shall not bring laptops, tablet PCs or mobile phones into the examination room.</p>
Technology - personal camera	Competitors, experts and interpreters can use personal equipment for photography and video in the examination room only after the completion of the test project or with the consent of the chief expert.
Evaluation of test items	<p>1) A team formed by three experts shall evaluate the completion or unfinished status of task point at workstation (module) during the demonstration of the competitors. The expert group is fully responsible for fair evaluation of competitors.</p> <p>2) Competitors and experts shall not come from the same organization in the evaluation process.</p>
In case of technical problems to competitors during the completion of the task	<p>1) In case of technical problems during the implementation of the test project (not due to competitors), competitors will get additional time equal to the period from the discovery of defects to the complete elimination of defects.</p> <p>2) In case of technical problems due to competitors, competitors will not get additional time.</p>