JIANGXI KMAX INDUSTRIAL CO., LTD.

VR Software for Practical Training on Maintenance of Construction Machinery Electrical System

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PRODUCT INTRODUCTION

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1. Product Overview

The Construction Machinery Electrical System Maintenance Training VR Software is a training tool specifically designed for secondary vocational schools,higher vocational colleges, and applied undergraduate institutions to support the teaching of construction machinery. It employs the latest VR virtual simulation technology to replicate the disassembly,assembly,and principles of the electrical system of an excavator. The software is developed based on real data collection and institutional research, and has been completed under the guidance of renowned domestic experts.

Students can learn about the structural principles of the excavator electrical system,as well as practical training on the disassembly and assembly of the alternator and starter,through virtual scenarios.The 3D materials in the software are modeled at a 1:1 scale based on real objects,allowing the relevant structures of the excavator electrical system to be clearly presented to students.

The software perfectly integrates theoretical and practical teaching.It not only enhances students'interest in learning but also reduces the cost of training consumables for schools.

2. Target Audience

The target users of this software are teachers and students in the construction machinery-related majors of community colleges, technical colleges and universities.

3. Compatible Devices

KMAX desktop VR All-In-One machine or PC.

4. Product Value

This VR teaching and training software effectively addresses the following pain points in the educational process:

- The software not only covers theoretical knowledge points found in professional materials but also simulates practical operations such as the disassembly and assembly of alternators and starters.This helps make the training phase of teaching more efficient.

- It strictly follows standardized operating procedures and the maintenance manual processes of manufacturers,ensuring the professionalism and standardization of teaching and training.

- The model resources are based on the LiuGong 922E excavator,with 3D solid modeling carried out at a 1:1 scale according to the dimensions of each component in the overall structure.

- In traditional teaching,a single component can only be used by one person or one group at a time,and cannot cover all students.Real vehicle training is limited to fixed training locations and specific vehicles.However,VR training solves this problem.

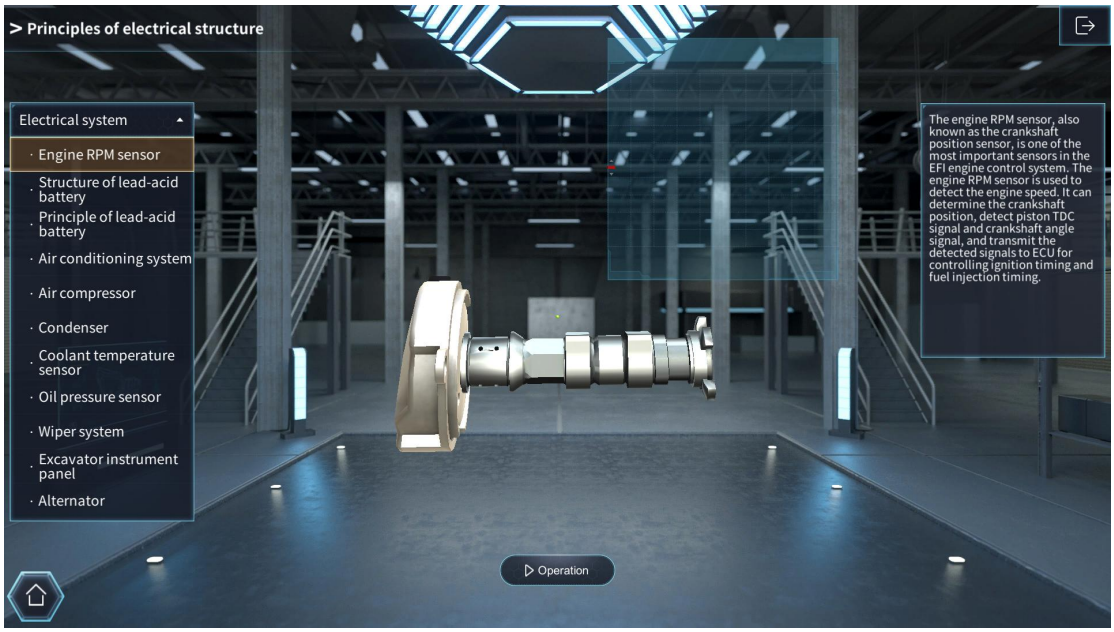
5. Content List

Module	Mode	Specific Content	Presentation Form
Structural Principles	Cognitive Learning	Engine speed sensor, lead-acid battery structure, lead-acid battery principle, air conditioning system, air compressor, condenser, water temperature sensor, oil pressure sensor, wiper system, excavator dashboard, alternator, and starter motor.	Text Description, Model Display, Principle Animation
Disassembly Training	Practical Training	Disassembly of the alternator and disassembly the starter motor	Interactive Practical, Training Exercises
Assembly Training		Assembly of the alternator and , assembly of the starter motor	
Fault Diagnosis		The excavator turns on the work light switch, but the work light does not light up, the excavator engine cannot start normally, the excavator starter cannot start normally, the excavator instrument panel alarms, the fuel water content sensor is faulty, and the air conditioning does not cool while the excavator is working.	

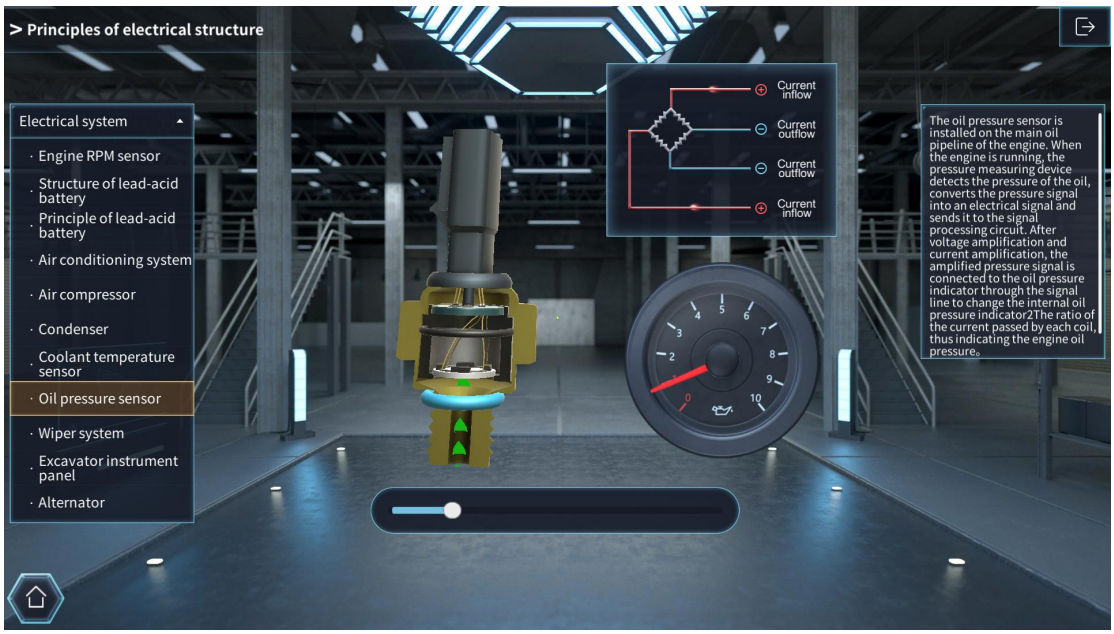
6. Functionality Introduction

6.1. Structural Principles

On the Principles of electrical structure, the left side shows the module classification of the electrical system. Click on the first level menu and scroll down to expand the second level menu. Clicking on a primary menu item will drop down to reveal a secondary menu.The content includes the engine speed sensor, lead-acid battery structure, lead-acid battery principle, air conditioning system, air compressor, condenser, water temperature sensor, oil pressure sensor, wiper system, excavator dashboard, alternator, and starter motor. Clicking the “Back” button at the bottom left corner allows users to go back to the home page. The right-side prompt box displays textual descriptions of the exhibited models. Clicking the “Operation” button on the page will play the corresponding principle animation for the selected model.

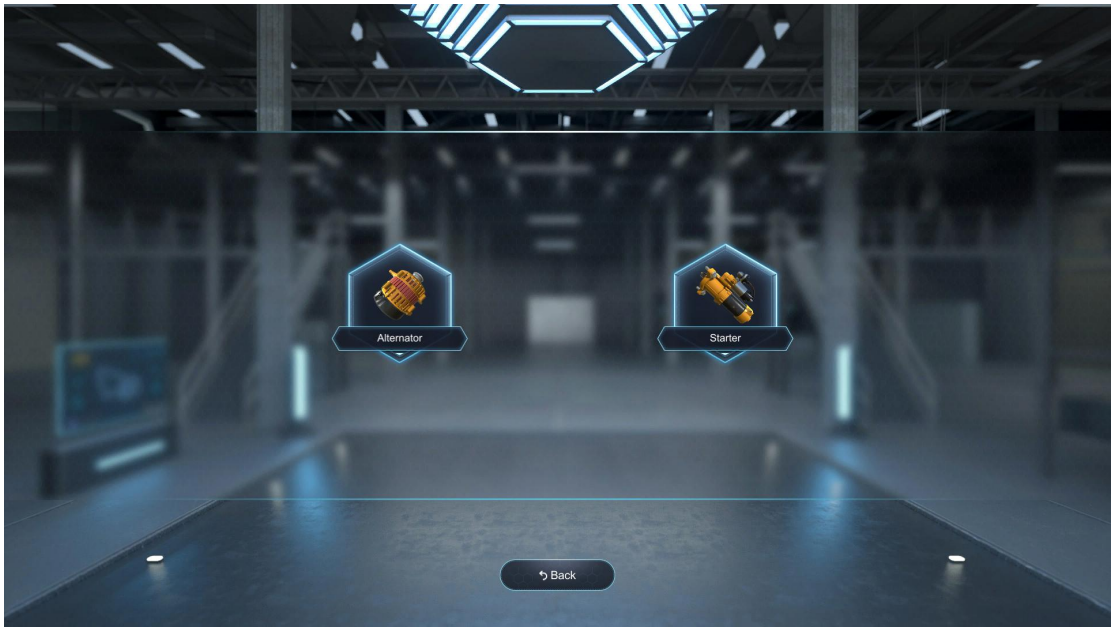


Clicking on the left menu bar allows users to switch between the structural principle displays of different components. Holding the middle button of the stylus enables users to drag the slider at the bottom of the scene, thereby playing the interactive animation between the model and the UI.



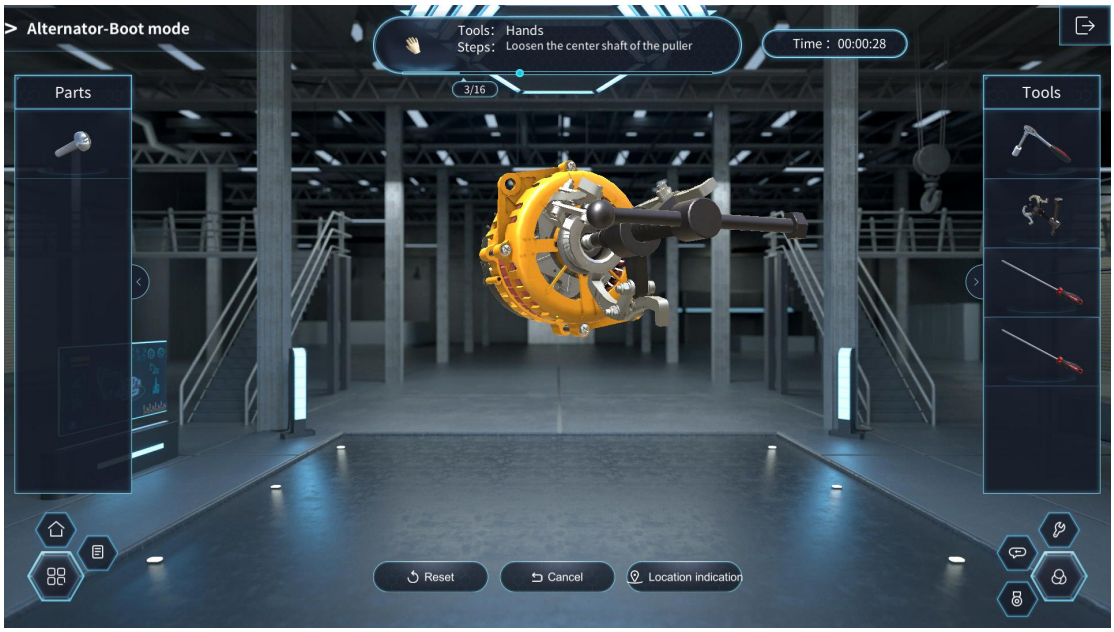
6.2. Disassembly and Assembly Training

After clicking on "Practical Training on Removal" users will enter the transition interface for disassembly training, where users can select disassembly tasks. Clicking the “Back” button will take users back to the homepage.

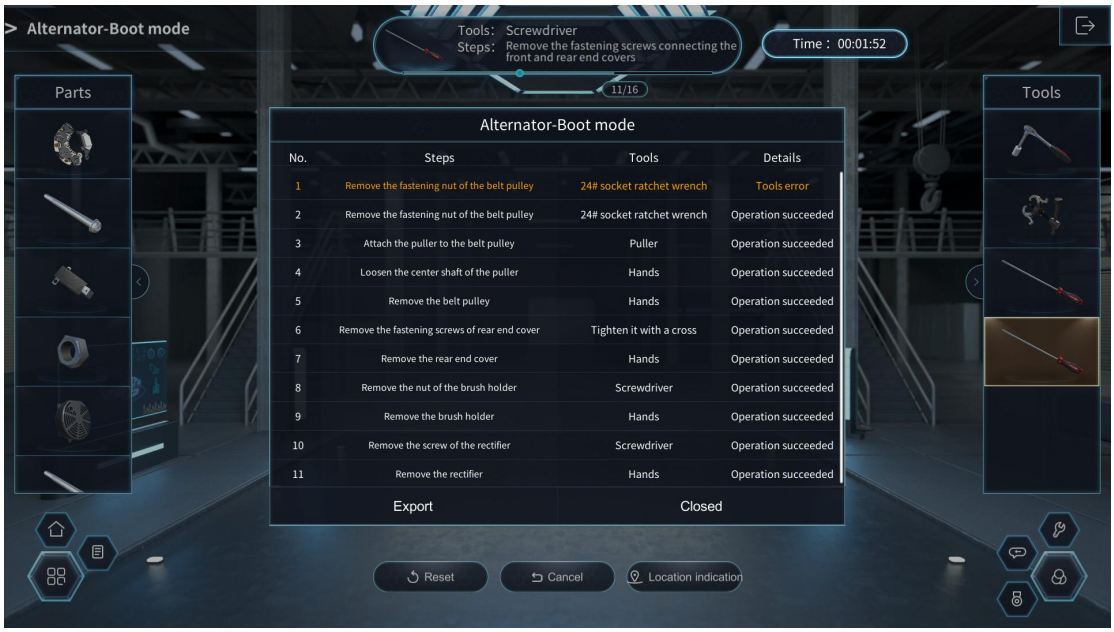


6.2.1. Alternator-Boot Mode

After entering the disassembly training scenario, the top of the page displays text prompts for the operation steps and the number of steps taken. At the bottom of the page are buttons for "Reset", "Cancel", and "Location Indication". Click 'Reset' to return the model to its initial state; Click 'undo' to return to the previous step when disassembling the model; Click on 'Location Tip', and the required tool parts and operating points for this step will be highlighted in the scene. The bottom left corner is expanded into "Back" and "Record" buttons. On the left is the parts column, where you can click to select a part. On the right is the toolbar, where you can click to select the necessary tools for disassembly and assembly. Click on the semi-circular arrows on both sides to control the telescopic parts bar and toolbar; Click the circular button on the progress bar to jump to the next step.

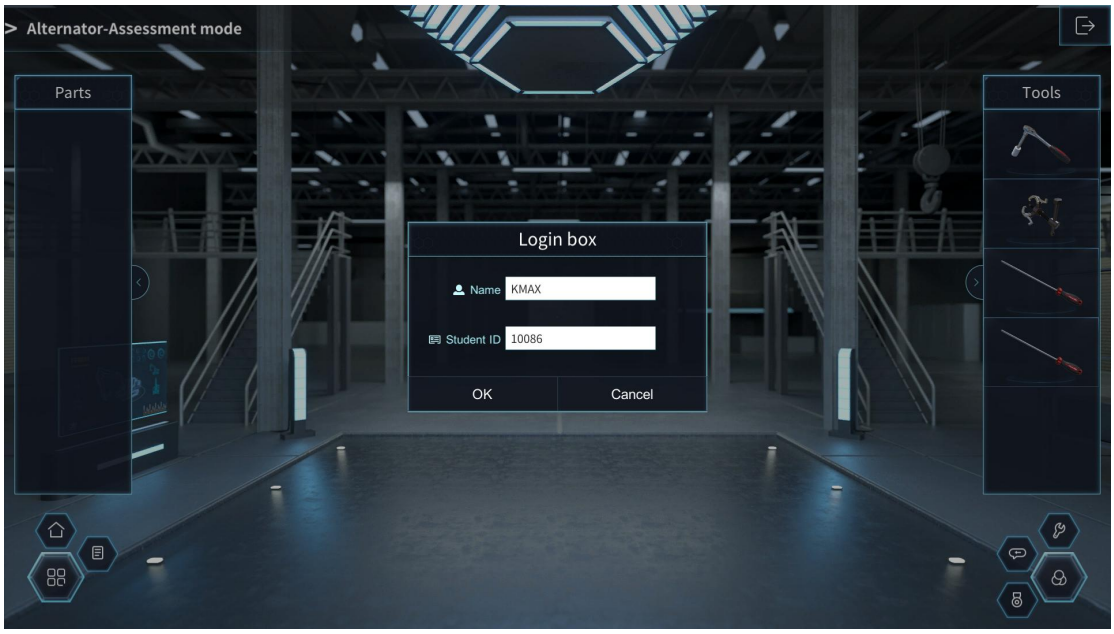


The bottom left corner is expanded into "Back" and "Record" buttons. Click "Closed" to return to the disassembly transition page. Click the "Record" button to pop up the operation record of the current task. Click the "Export" button to export the operation records in PDF format to the local desktop folder.

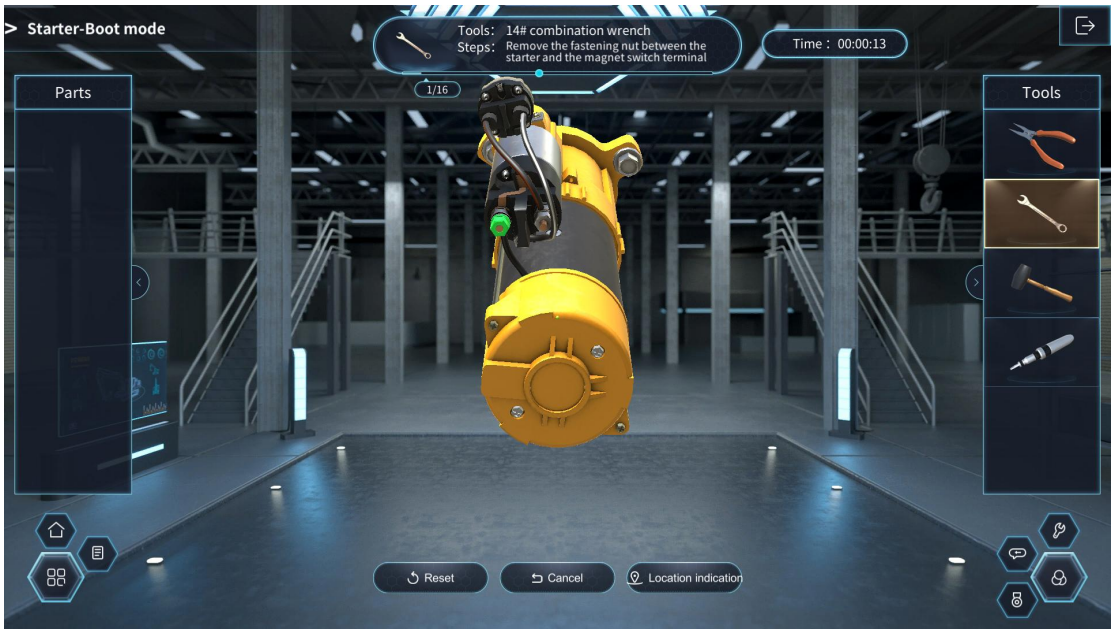


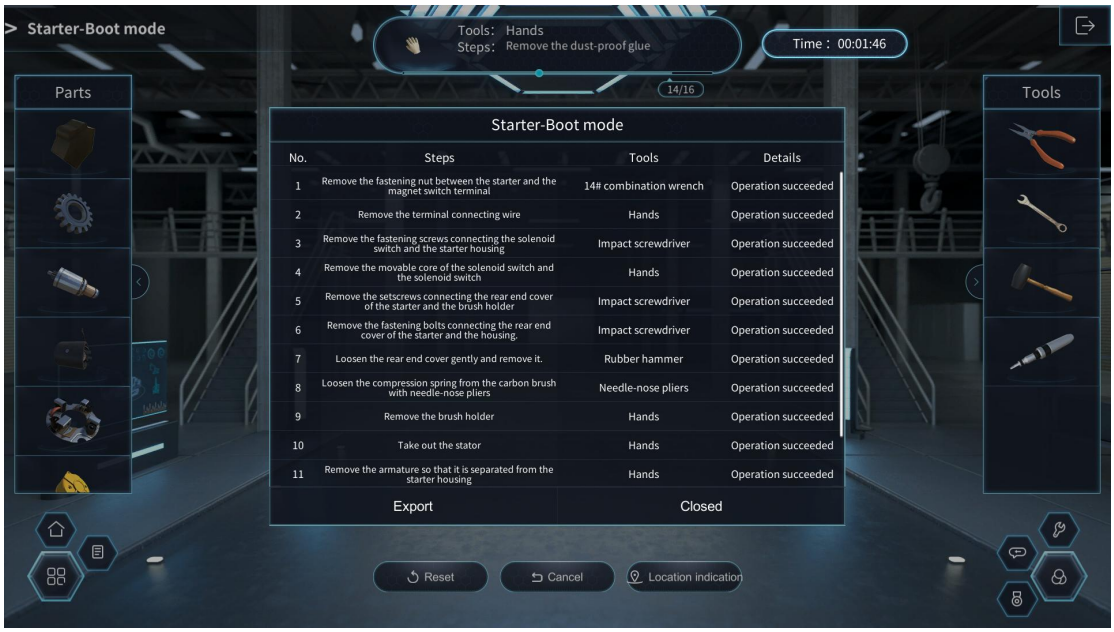
In the lower right corner, there are buttons for "Guide", "Practise", and "Assessment". Click on three buttons to switch between guidance mode, training mode, and assessment mode. Automatically prompt tool parts and operating positions in guidance mode; In the training mode, it is necessary to manually click the "Location Prompt" button to prompt the tool parts and operation positions; In the assessment

mode, the name and student ID of the assessed person need to be entered, and all prompt functions and operation timing functions need to be disabled.



6.2.2. Starter-Boot Mode





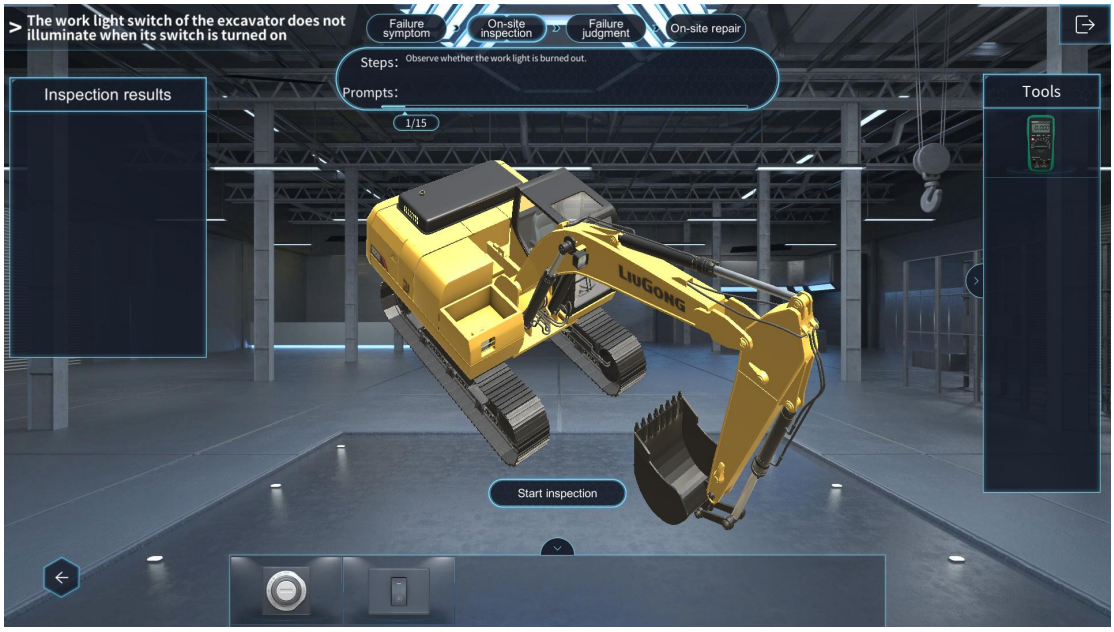
6.3. Fault Training

After clicking on "Fault Diagnosis", you will enter the transition interface for fault diagnosis, where you can select fault diagnosis tasks. The software contains a total of 5 fault points. Click the "Back" button to return to the homepage.

6.3.1. The work lights switch of the excavator does not illuminate when its switch is turned on

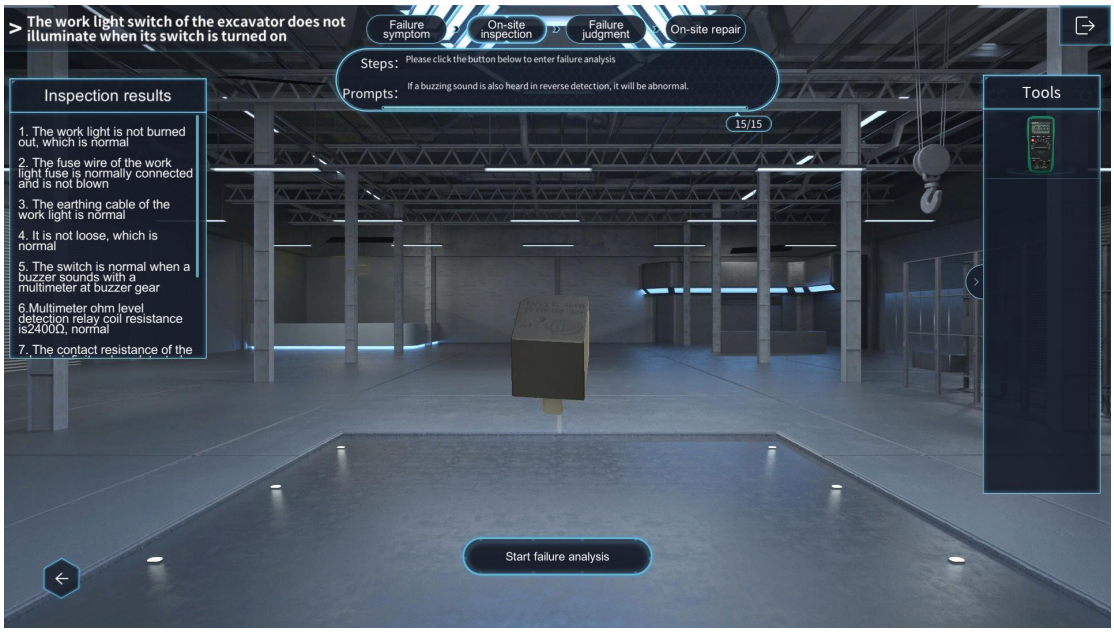
After entering the fault phenomenon scenario, the top of the page shows the current process position, the middle displays the fault phenomenon, the text box on the right displays the fault phenomenon and the overall condition of the machine, the bottom left corner of the page is the return button, which can return to the fault diagnosis transition interface, and there is a "Start Inspection" button at the bottom right of the page, which can be clicked to enter the next step.

The next step is the on-site inspection scenario, as shown in the following figure:



The middle of the page displays the entire machine or related components; At the top of the page are text prompts and step count displays for the operation steps. At the bottom of the page is the

"Location Indication" button, as well as the switch operation bar. Clicking the "Location Indication" button displays the best perspective for the current operation. Clicking the switch component in the switch operation bar opens the corresponding switch UI for further operation; The text box on the left side of the page displays the inspection results, which can summarize and display the inspection text results of all previous inspection steps; On the right side of the page is the toolbar, where you can click to use the tool to further inspect the components. After completing all the inspection steps, the "Start Failure Analysis" button will appear. Click to enter the fault analysis scenario, as shown below:

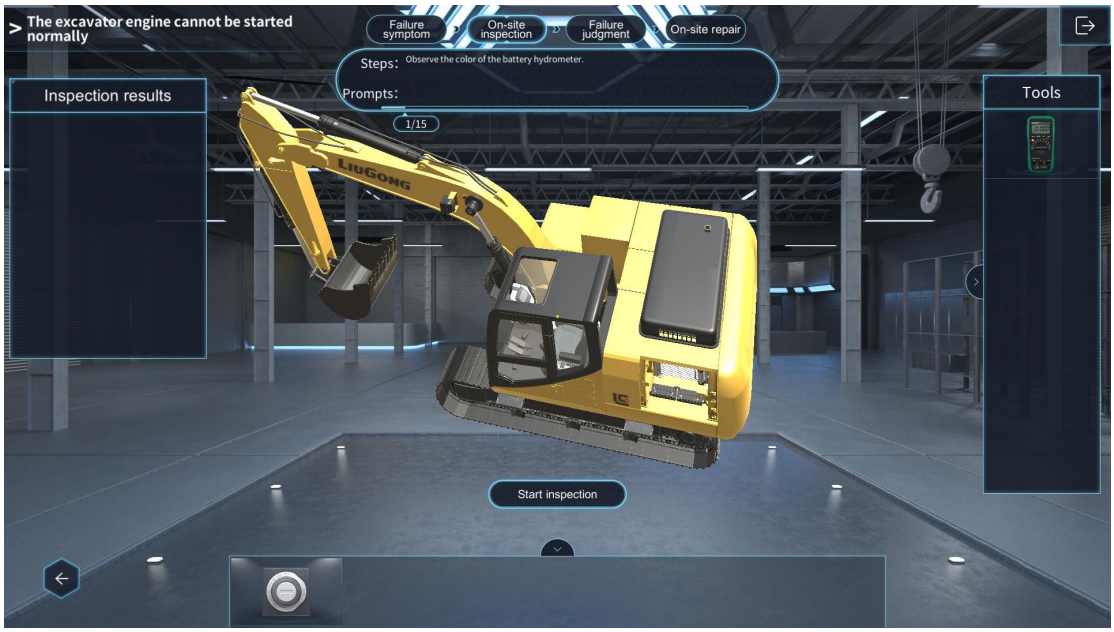


After entering the fault diagnosis scenario, the middle of the page displays possible

fault causes and text descriptions. There is a "View Schematics" button in the upper right corner, which can be clicked to view relevant schematic diagrams; On the left side of the page is the selection of possible causes of faults. Click to switch between possible fault causes. After viewing all fault causes, the "Start Maintenance" button will appear at the bottom of the page. Click to enter the on-site repair scenario.

After entering the on-site maintenance scenario, the middle of the page displays models of the relevant complete machine or components; On the left side of the page is the parts column, where you can click to select parts for maintenance operations; At the top of the page are text prompts and step count displays for the operation steps. At the bottom of the page are the "Location Indication" button and the switch operation bar. Clicking the "Location Indication" button displays the best perspective for the current operation. Clicking the switch component in the switch operation bar opens the corresponding switch UI for further operation; On the right side of the page is the toolbar, where you can click to use the tool to check and confirm the status of the repaired component.

6.3.2. The excavator engine cannot be started



6.3.3. The excavator starter cannot start normally

6.3.4. The instrument of the excavator make an alarm that the water in fuel sensor fails

6.3.5. The air conditioner fails to cool when the excavator is working

7. Feature Highlights

- The software is a teaching software developed for engineering machinery electrical systems. From disassembly training to installation training, it can freely switch between guidance mode, training mode, and assessment mode, record training operation steps and duration, and comprehensively and effectively improve students' practical hands-on operation ability.
- The structural principle module allows for arbitrary dragging, free rotation, and scaling of the model; Clear and intuitive structure and principle analysis support operations such as pausing, replaying, and model explosion.
- The product can be installed on the world's leading KMAX desktop VR All-In-One Machine, and can also be used on a PC for better interactive operation experience and stronger display effect.

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