

tation costs, long transportation cycle, horizontal and vertical level of the lack of problems, will seriously limit the further development of cross-border e-commerce logistics. The solution to the problem is to set up warehouses in China and Belarus, which can significantly reduce the logistics cost, help shorten the transportation and distribution cycle, and avoid the exchange rate, political and other risks.

#### 4. The construction of cross-border logistics information platform.

Cross-border logistics involves a large number of subjects, each subject's style of action, attitude, information technology is different, cross-border logistics there is poor communication, information delay. Therefore, the establishment of an international circulation of logistics information platform is very necessary, the use of current advanced technology, the realization of information flow, at anytime and anywhere to be able to track the logistics information of goods, in order to maximize the maintenance of healthy development of logistics.

#### 5. Cultivate professional talents

The shortage of international logistics professionals and the lack of logistics personnel today is one of the factors that restrict the development of the logistics industry. Especially in today's high-tech development, more comprehensive and professional personnel are needed to develop modern logistics industry, better promote the upgrading of logistics industry and improve the competitiveness of international logistics industry in Belarus. First of all, the introduction of international talented people, focusing on the interface between domestic and foreign. Secondly, to strengthen the training of logistics personnel in universities and train the special talents needed by logistics companies. Finally, strengthen the exchange and cooperation with international logistics enterprises, and send personnel to international enterprises for study and further training.

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### MONOCULAR 3D RECONSTRUCTION ON LOW-COST EQUIPMENT IN REAL TIME

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**Summary.** *In recent years, 3D reconstruction has been widely used in various fields. However, high-quality data acquisition equipment is expensive in these application fields. This paper proposes a 3D reconstruction solution on the basis of low-cost equipment, which uses low-cost monocular camera to collect a series of images of real-world scenarios, thereby reconstructing the real-world scenarios (3D model of the scenes) in real time.*

At present, in the fields of Google, Baidu, Yandex's high-precision map construction [1] and reconstruction of ancient buildings, the 3D reconstruction is the core part. High-precision map construction that based on 3D reconstruction technology can improve the accuracy of autonomous driving, and 3D reconstruction of ancient buildings plays a significant role in cultural protection. However, there are many limitations in these applications, 3D reconstruction techniques in these applications always use high-quality, expensive data acquisition equipment such as lidar, radar locators, multi-eyes cameras, etc. For ordinary consumers and low-cost consumer-level products, such applications are too bulky to be deployed on consumer-level products for consumers to experience the technological portability.

Based on the classic SLAM technologies [2], we have successfully implemented a 3D reconstruction solution, which uses the low-cost equipment and easier to be achieved. The proposed reconstruction solution makes it possible for common consumers to experience 3D reconstruction technology. The traditional 3D reconstruction technology consists of two steps: camera parameter calibration and 3D model reconstruction. It needs to prepare standard checkerboard images in advance to correct the parameters of the camera, but for consumers, preparing checkerboard images in advance reduces the user experience. For solving the problems, two methods are provided in our solution:

1. Integrated hardware and software solution (fig. 1). In this solution, the monocular lens parameters are locked and the specific software application is developed for the defined hardware. This customized solution gets rid of the traditional technology's dependence on checkerboard images, and has achieved stable 3D reconstruction under the condition of a variety of low-cost monocular lenses.

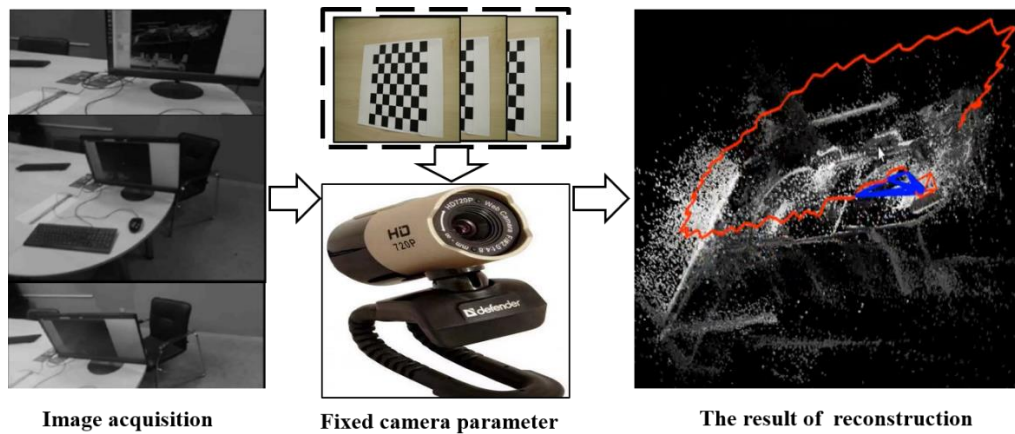


Figure 1 – Integrated hardware and software solution

2. Universal consumer-level solution (fig. 2). In this solution, the monocular camera collects images in real time on site, and then the internal parameters of the camera can be fitted based on machine learning [3], which simplifies the preparation process of camera parameters. The solution adopts independent configuration, and common users do not need to pay attention to the configuration of various cameras at all, so as to realize one-step 3D reconstruction.

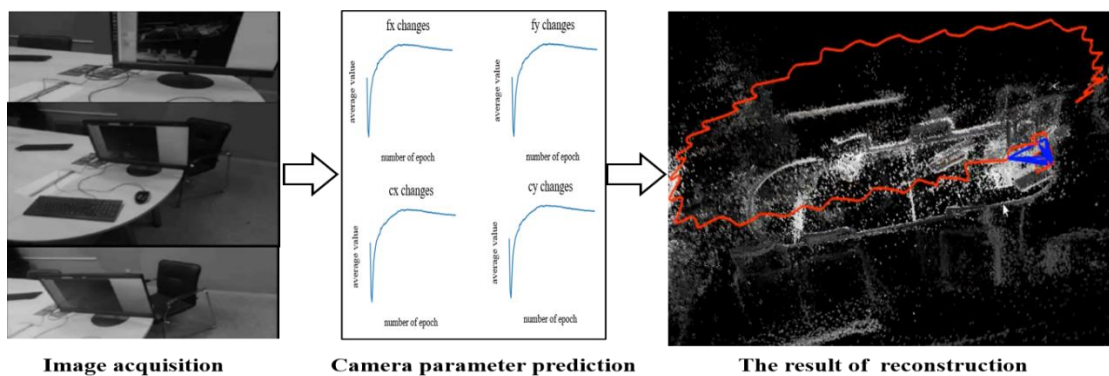


Figure 2 – Universal consumer-level solution

We conducted a series of experiments on low-cost devices, such as monocular camera (defender G-LENS 2577 HD720P), mobile phones with monocular camera (Huawei P10, Samsung Galaxy A5). In the experimental results, the average delay time from the acquisition of live images by the device to 3D reconstruction is not more than 90 ms (real time).

Overall, our proposed 3D reconstruction technique has the following advantages: firstly, simplify the camera calibration process. In the process of 3D reconstruction, it's not necessary to prepare

checkerboard images in advance to meet the needs of inaccurate reconstruction on civilian non-professional equipment; secondly, get rid of the limitation of communication distance. Consumers can use civilian wireless communication network control to achieve 3D scenario reconstruction real-time; thirdly, convenience for use and portability. We also improved the generality of 3D reconstruction solutions. The solutions can be portably migrated to any moving body platform (human, vehicle, aircraft, robot, etc.).

Based on above mentioned advantages, it allows ordinary consumers to experience the technology brought by 3D reconstruction on non-professional equipment with simple cameras. The proposed 3D reconstruction solutions have great practical value in various fields, such as constructing 3D models for buildings to achieve architectural acceptance, constructing 3D models of the interior in human body for monitoring metrics of human health, and so on.

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### TALK ABOUT THE DEVELOPMENT OF 5G MOBILE COMMUNICATION TECHNOLOGY IN BELARUS

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**Summary.** *With the rapid development of the mobile Internet, the emergence of new services and services, and the explosive growth of mobile data service traffic, 4G mobile communication systems are difficult to meet the soaring needs of mobile data traffic in the future, and we urgently need to develop the next generation of mobile communication (5G) systems*

The fifth generation of mobile communication technology (5th Generation Mobile Communication Technology, referred to as 5G) is a new generation of broadband mobile communication technology with high speed, low latency and large connection characteristics, 5G communication facilities are the network infrastructure to realize the interconnection of human machines and things, mainly to serve the communication needs between “things and things” and “people and things”. That is to say, for the first time, human beings have elevated the “Internet of Things” to the same level as the “Internet of People”, or even higher than the “Internet of People”. This means that human cognition of communication has undergone fundamental changes. The purpose of communication has changed, and the technology and architecture of communication have also changed. Simply put, the emergence of 5G has changed our life mode, strictly speaking, mobile data and human life have a higher degree of adhesion, and it will revolutionize the working mode and lifestyle of various industries. At present, 5G has brought breakthroughs to the following five areas:

1. The network speed is fast, and more secure, efficient and low energy consumption.
2. The Internet with the emergence of 5G network, with the support of its strong transmission speed, the development of Internet technology will have new breakthroughs in the next few years.