Design of express delivery equipment based on STM32

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Abstract. This paper introduces the current situation of campus express service points, points out the problems existing in campus express service points and the working situation of express delivery personnel. Through the design of an automatic courier processor. In the hope of automation as a solution to find ways to improve the efficiency of express delivery and solve the pain points in the development of campus express service points. This scheme not only provides a solution to the low efficiency of express processing in campus express service points, but also improves the automation level of express terminal processing in the express industry

1. Introduction
According to forward-looking industry institute released "express industry market foresight strategic planning and investment analysis report" the latest statistics show that with the development of electronic commerce. In the first half of 2018, national express service enterprise business the total 22.08 billion, up 27.5% from a year earlier.12% of the delivery. Wuhu county, according to data from the postal service in 2017, the city's express delivery business than in the past made breakthrough progress. Wuhu county express industry is particularly strong, the indicators Wuhu county express delivery business in 2017, 13.46 million, up 28.16% from a year earlier, in four counties. Express delivery business express rise underscores the Wuhu county rapid development of Anhui Institute of Information Technology as the only undergraduate course colleges and universities to Wuhu county in Anhui, the school teachers and students and more than 9000 people, according to the novice parcel, sent to Anhui information work.

2. Current situation and problems of campus delivery point

2.1. The present situation of campus express
Anhui Institute of Information Technology at present only a Courier service point, a Courier personnel solely responsible for processing. Express handlers usually collect and numbering express delivery in class time, and send delivery short messages after school. Because of the huge workload, these simple tasks will consume most of the time of express handlers. In some special festivals, such as Taobao "double eleven" and "double twelve", express packages rush to the express service center. Because of the limited storage shelves, express handlers will eventually pile up a large number of items in a corner of the site entrance or form a campus outdoor express stand. And because of the excessive number of
express delivery, the processing efficiency of express delivery processors has been greatly reduced. It has been shown that the signed express delivery has been delayed while the students have not received the pick-up message.

2.2. Problems in the Course of Campus Express Delivery

2.2.1. Express deposit. Due to the restriction of objective factors of the school, the courier service site of Anhui Institute of Information Technology is limited, and it is still slightly inadequate after one expansion. The average number of couriers approaching 1400 pieces per day, together with the untimely pick-up of College students, can easily lead to the accumulation of couriers, which can easily cause damage to goods. In addition, the manual processing efficiency of express delivery personnel is limited, and the processing efficiency of express delivery will decrease with the increase of processing time, which makes the accumulation problem of express delivery more serious.

2.2.2. Packet Loss and Packet Error. Because of the limited personnel of express delivery in Anhui Institute of Information Technology, and only manual package and number, in the high-intensity working environment, express delivery personnel will inevitably make mistakes, so the probability of students mistakenly taking and losing packages is extremely high, which not only brings troubles to students and economic losses, but also brings troubles to express delivery points. According to the results of random survey, 12.4% of the students have encountered the situation of courier lost, 8.5% of the students have encountered the situation of courier damaged.

2.2.3. Information leaks easily. In the information age, people always pay no attention to personal information leaked. As far as Anhui Institute of Information Technology is concerned, students often receive spam messages, which have an impact on their lives and even enter some illegal phishing websites under the guidance of short message content. Especially in express delivery, personal information leakage rate is very high. When online shopping arrives at express delivery point, express delivery personnel often let students find express delivery by sending their own text messages according to express delivery point due to shortage of manpower. At this time, the buyer's name, mobile phone number, family address and other private information are easy to be obtained by illegal elements, resulting in the phenomenon of illegal elements fraudulent according to the information leaked by the buyer. In addition, students usually throw away the express package directly after receiving the express, without paying attention to tearing up the express bill on the express package, which leads to the leakage of personal information.

3. Thought of scheme design

3.1. Overall design
As shown in Fig. 1, in order to realize the functions of automatic reading information, coding and labeling, and sending short messages automatically, the system of the express automatic processing machine is composed of four zones, namely, the photosensitive ranging area, the express single scanning area, the number labeling area and the GSM short message notification area. The information acquired by the photosensitive ranging area is used as the standard for determining the position of the scanner and the labeling machine.
3.2. Mechanical structure design
A conveyor belt is arranged at the bottom of the box body and the bottom of the box body. The conveyor belt is connected with the control parts that can control the start and stop of the conveyor belt. A guide rail is arranged at both ends of the conveyor belt, a movable orthodontic door is arranged on the bracket, and a photosensitive component, a scanner is arranged at the top of the conveyor belt. The gluing component, a printer and a labeling machine are connected with the box body respectively. The box body includes the entry side and the exit side, the photosensitive component, The instrument, printer and labeling machine are arranged sequentially from one end of the entrance side to the exit side. The express automatic processing machine also includes a storage rack, which is set at the exit side of the box body. The conveyor belt, photosensitive components, glue coating components, printers and scanners are respectively connected with the control components, and the scanner is connected with the communication components.

3.3. Process design
As shown in Figure 2, when the express package enters from the entrance, it is first identified by the photosensitive components, then the corrective doors on both sides of the conveyor belt block the express package. The scanner identifies the original information on the express list, and feeds the information back to the storage module and communication module of the control unit. Then the printer prints out a two-dimensional code with a number, which is glued by the gluing parts and pressed by the labeling machine. The retractable part attaches it to the courier list, covers the original courier list, and then calls the recipient's contact information and numbering information from the storage module. Finally, the delivery information is automatically sent to the recipient's mobile phone through the communication module.
3.4. Hardware design
The control system of the express Automation Processor described in the solution is mainly controlled by STM32, which integrates the conveyor belt module, scanner module, labeling machine module, tooling module and wireless communication module. The block diagram of the control system is shown in Figure 3.

4. Feasibility analysis
4.1. Market analysis
Compared with the current manual delivery mode, the equipment has not only made great breakthroughs in the field of application, greatly improved work efficiency, reduced the work intensity of the express delivery personnel, but also changed the delivery mode of the express delivery point from manual to automated. College students often encounter the problem of mistaken delivery and unable to get the express delivery, and this equipment ingeniously solves the problem. These advantages will make the equipment widely promoted in the field of express automatic processing, and will also win the favor of the majority of express companies, with broad market prospects.

4.2. Analysis of Scientific Advancement
1. After the package is put in, it is identified by the photosensitive parts, which is convenient for the control parts to adjust the height of the labeling machine and improve the accuracy of labeling.
2. Correction doors block packages, so that packages and conveyor belts are relatively parallel, reducing the misplacement of labeling.

3. In today’s information age, the protection of personal information is particularly important. The equipment retrieves the courier bill information and prints a two-dimensional code to cover the original information, so as to prevent information leakage and make the illegal elements lose the opportunity to take advantage of it.

4. Automatically sending pick-up information greatly reduces the workload of express handling personnel. Intelligent operation also avoids the mistake of sending information, and further avoids the mistake of taking parcels.

5. Express is linearly arranged on the conveyor belt, one by one identifying the number pasted one by one, avoiding the situation of packet loss and mistake.

6. The equipment has high availability, and can be used with express storage cabinet only, which further improves the intelligence of express terminal service.

5. Conclusion
The equipment in this paper is designed to solve the problems of low efficiency, high error rate and high intensity of manual handling in the package problem of express service centers in Colleges and universities. Compared with the past full manpower express handling methods, the equipment first achieves a breakthrough in the field of use, avoids the phenomenon of accumulation of express delivery in the peak period of express delivery, and reduces the labor of express handling personnel. The strength fills the gap in the field of automation of express terminal in express delivery process. With the rapid development of express industry and the continuous improvement of College Students’ purchasing power, express automation processors used in terminal stations, as an important part of logistics system to achieve automation and intellectualization, will gradually play a larger role and have a higher application prospect.

Acknowledgments
This work is financially supported by Natural Science Fund of Education Department of Anhui province.(KJ2018ZD056).

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