Signal and Image Processing Letters
Vol. 2., No. 1, 2020, pp. 20-26
ISSN 2714-6677
https://simple.ascee.org/



# Separation of the Purpose of Beam Packages with Barcode Based Arduino

Febriyan Fitriyanto [a,1], Mushlihudin [a,2,*]

[a] Department of Electrical Engineering, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
[2] mushlihudin@tif.uad.ac.id
* Corresponding author

ARTICLE INFO

**Keywords**
Barcode Scanner
DC Motor DC
Servo Motor
Conveyor
Arduino Mega2560

ABSTRACT

In modern times it has experienced a very rapid increase. The industrial world is currently growing and has become an important part. from the world as a whole. Developments in the industrial world today have provided many conveniences and advantages for companies in the process. One example of the use of technology in industry is the process of separating beam packages which is still done manually. If the separation process is still using. Human intervention (manual) will spend a lot of time. In this study, a prototype design of beam package separation that can separate goods automatically with the aim of the zip code already listed in the barcode code, aims to facilitate the performance of beam package separation when. Device design. Hard, namely the Arduino Mega 2560 microcontroller as the command logic storage in the system, two dc motors as conveyor drives, a barcode scanner functions as a barcode code reader, and a servo motor as output. Testing this system uses a package of goods from cardboard media, with a package thickness of 0.2 cm. Based on the results of testing the separation of package beams the tool can work well so that it can increase work effectiveness with an accuracy rate of success of the tool in separating goods packages in each first room with an accuracy of 80% for the purpose of Yogyakarta, then separation of parcels for the purpose of Jakarta with an accuracy of 86.6%, and Separation of beam packages with the destination of goods to Surabaya has an accuracy rate of 86.7%.



## 1. Introduction

The development of technology in the modern era is currently experiencing a very rapid increase [1]. Especially the development of the industrial world which provides its own convenience and advantages to companies in the process. This situation has a major impact on all areas of human life, especially in the industrial sector [2]. In the industrial world, such as distribution and production processes, the process of separating goods is still. manually, so it takes quite a long time and is less accurate in packet separation [3]. If done automatically it will be profitable for the company and save human labor. Due to automation in the production and distribution process, the time needed will be shorter, more accurate, and the profits the company will get will be higher [4].

The process of separating goods or packages at the place of delivery [5], when the number of shipments increases, it will experience difficulties because each item will be turned back to be seen and read by the shipping label and separated to be collected into one part in one delivery area, it will take a long time. enough to check every existing packet shipment [6]. In this modern era, the fulfillment of goods needs is carried out with a goods distribution system from producers to consumers that is structured using logistics management [7]. In goods logistics activities there are several stages

that are taken. Among these stages is the first, the production of goods, the second, the distribution of goods, and the last, the goods reach the hands of consumers [8]. At this stage the purpose of separating package destinations is very important, because to make it easier to select goods based on the destination address so that the process of sending goods is faster because the destination address has been separated according to each city and area, all of which require a fast process so that delivery faster [9]. By taking a lot of time, the package delivery hours can be disrupted and can result in package shipments not being able to arrive at the destination according to the time promised. As a result, a technology will be developed to sort parcels using barcodes [10].

## 2. Method

This study aims to create a tool that can help users in the process of separating goods automatically in the form of prototypes and testing is still a simulation and provides convenience so that the process of separating goods is faster and does not require a long time in the process [11].

### 2.1. System Design

The first hardware design used is a barcode scanner as a barcode reader [12]. Furthermore, the USB module is used as a communication intermediary between the barcode scanner and Arduino Mega [13]. The third hardware is Arduino Mega as the brain in the barcode reading system that receives and processes data scanned by a barcode scanner [14]. Hardware design of the Arduino Mega control system which functions as a controller for dc motors and servo motors [15]. System design is presented. In the form of a block diagram that will help in designing a barcode-based beam package separator device with Arduino, using the Arduino Mega as a DC motor drive used to drive the conveyor [16]. After moving the Arduino Mega DC motor, it functions as a barcode scanner data manager, which then data from the barcode scanner is received by Arduino Mega, which drives the servo motor to separate the block packages [17]. The block diagram for designing a beam package separator system with a barcode-based Arduino is shown in the following Fig. 1.

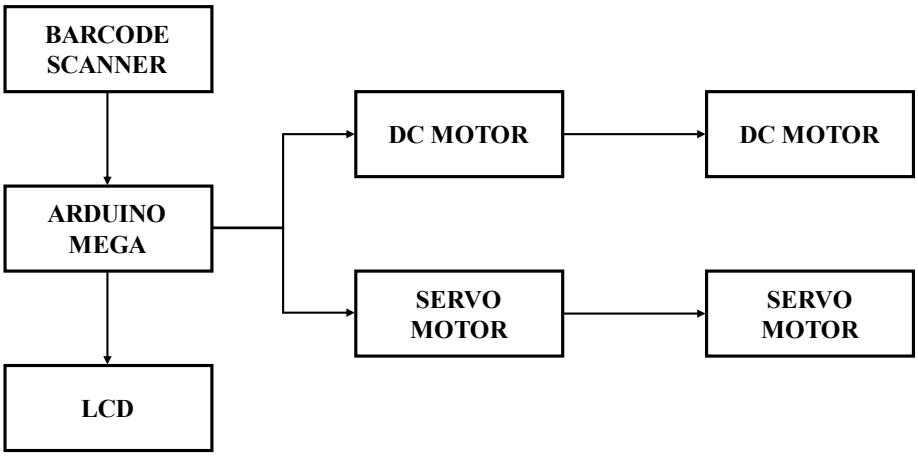


**Fig. 1.** Hardware design block diagram

The first hardware used is a barcode scanner as a barcode reader as previously described. Furthermore, the USB module is used as a communication intermediary between the barcode scanner and the microcontroller after USB and then the LCD as a display for the results of the barcode scanner [18]. The fourth piece of hardware is the Arduino mega as the brain in the barcode reading system that receives and processes data scanned by a barcode scanner. Furthermore, after entering Arduino Mega, it runs a DC motor as a conveyor drive and a servo motor as a block package separator whose barcode label has been scanned by a barcode scanner.

### 2.2. Algorithm

After software design uses the Arduino IDE software which is then downloaded on the Arduino Mega 2560 [19]. The first thing to do is to make a flowchart as a guide for writing programs. The shape of the flowchart can be seen in Fig. 2.

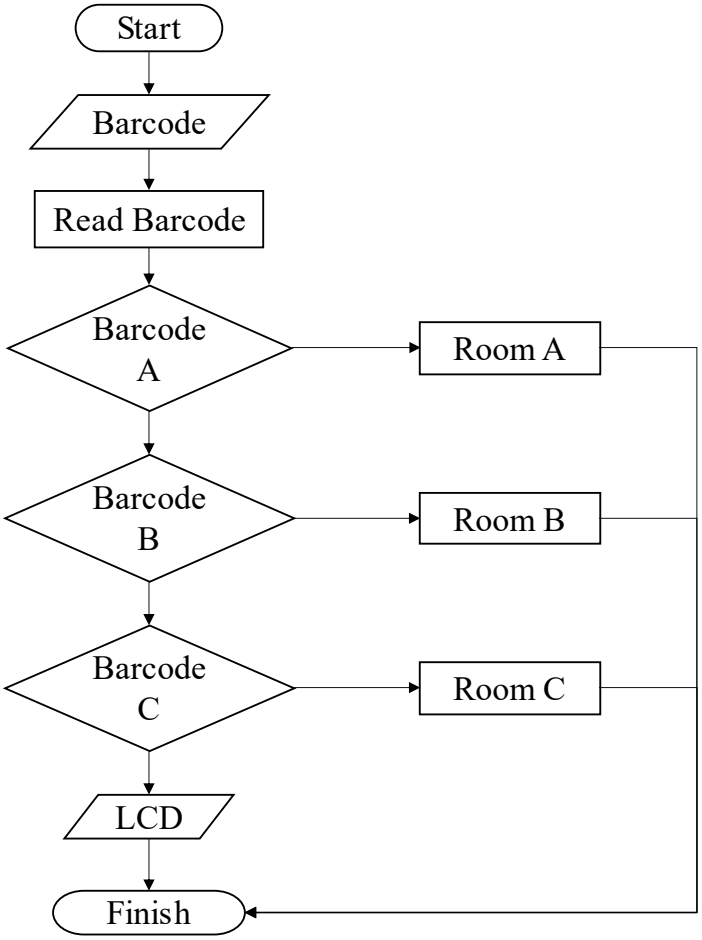


**Fig. 2.** Flowchart of beam package separation system

The explanation of the flowchart above is that when the system is turned on, the DC motor is used to run the conveyor and the LCD screen will light up to display information on the results of barcode readings. Next scan the barcode label on the separation of beam separation if the barcode label is read in city A then the microcontroller will move the servo motor in city A to separate the destination of the beam package. After the execution of the command is complete, the servo motor will return to the position. Initially, it will be like that from cities A, B and C, whereas if the block package barcode label scanner is not listed in cities A, B and C, then the block packages will continue so that there is no destination city.

### 2.3. Equation

From the data that can be generated from the test, the percentage of success will be obtained. to determine whether the tool that has been made is appropriate or not with the purpose of manufacture. The percentage of success of the system for placing goods into an empty space that is designed to carry out orders is calculated by the Equation (1) [20].

$$\sum \frac{Number\ of\ successes}{Number\ of\ tests} \times 100\ \% \quad (1)$$

## 3. Results and Discussion

### 3.1. Separation of Yogyakarta Destination Beam Packages

In the separation of the beam package, 15 times the barcode label reading was carried out on the beam package with the aim of Yogyakarta. Then from the data obtained, the percentage level of success will be calculated. The data on the results of the goods retrieval test can be shown in Table 1.

**Table 1.** The results of the beam package separation

| No | Code on Beam Package | Reading Barcode Scanners | Explanation |
|---|---|---|---|
| 1 | 55288 | 55288 | √ |
| 2 | 55288 | 55288 | √ |
| 3 | 55288 | 55288 | × |
| 4 | 55288 | 55288 | √ |
| 5 | 55288 | 55288 | √ |
| 6 | 55288 | 55288 | √ |
| 7 | 55288 | 55288 | √ |
| 8 | 55288 | 55288 | √ |
| 9 | 55288 | 55288 | × |
| 10 | 55288 | 55288 | √ |
| 11 | 55288 | 55288 | √ |
| 12 | 55288 | 55288 | √ |
| 13 | 55288 | 55288 | √ |
| 14 | 55288 | 55288 | √ |
| 15 | 55288 | 55288 | √ |

Explanation:

√ = Success to separate the beam package

× = Failed to separate the beam package

The percentage of success of the tool in carrying out the order to separate the bundles of beams is calculated by Equation (1) and produces Equation (2).

$$\frac{Number\ of\ successes}{Number\ of\ tests} \times 100\ \% = \frac{12}{15} \times 100\ \% = 80\ \% \quad (2)$$

### 3.2. Separation of Beam Packages with the Purpose of Jakarta

In the separation of the beam package, 15 times the barcode label reading was carried out on the beam package with the aim of Jakarta. Then from the data obtained, the percentage level of success will be calculated. The data on the results of the goods retrieval test are shown in Table 2.

**Table 2.** The results of the beam package separation

| No | Code on Beam Package | Reading Barcode Scanners | Explanation |
|---|---|---|---|
| 1 | 11110 | 11110 | √ |
| 2 | 11110 | 11110 | √ |
| 3 | 11110 | 11110 | √ |
| 4 | 11110 | 11110 | √ |
| 5 | 11110 | 11110 | √ |
| 6 | 11110 | 11110 | √ |
| 7 | 11110 | 11110 | √ |
| 8 | 11110 | 11110 | × |
| 9 | 11110 | 11110 | √ |
| 10 | 11110 | 11110 | √ |
| 11 | 11110 | 11110 | × |
| 12 | 11110 | 11110 | √ |
| 13 | 11110 | 11110 | √ |
| 14 | 11110 | 11110 | √ |
| 15 | 11110 | 11110 | √ |

Explanation:

√ = Success to separate the beam package

× = Failed to separate the beam package

The percentage of success of the tool in carrying out the order to separate the bundles of beams is calculated by equation (1) and produces equation (3).

$$\frac{Number\ of\ successes}{Number\ of\ tests} \times 100\ \% = \frac{13}{15} \times 100\ \% = 86.6\ \% \quad (3)$$

### 3.3. Separation of Beam Packages with the Purpose of Surabaya

In the separation of the beam package, 15 times the barcode label was read on the beam package with the destination of Surabaya. Then from the data obtained, the percentage level of success will be calculated. The data on the results of the goods retrieval test are shown in Table 3.

**Table 3.** The results of the beam package separation

| No | Code on Beam Package | Reading Barcode Scanners | Explanation |
|---|---|---|---|
| 1 | 60199 | 60199 | √ |
| 2 | 60199 | 60199 | √ |
| 3 | 60199 | 60199 | √ |
| 4 | 60199 | 60199 | √ |
| 5 | 60199 | 60199 | √ |
| 6 | 60199 | 60199 | √ |
| 7 | 60199 | 60199 | √ |
| 8 | 60199 | 60199 | √ |
| 9 | 60199 | 60199 | √ |
| 10 | 60199 | 60199 | √ |
| 11 | 60199 | 60199 | √ |
| 12 | 60199 | 60199 | √ |
| 13 | 60199 | 60199 | × |
| 14 | 60199 | 60199 | √ |
| 15 | 60199 | 60199 | √ |

Explanation:

√ = Success to separate the beam package

× = Failed to separate the beam package

The percentage of success of the tool in carrying out the order to separate the bundles of beams is calculated by Equation (1) and produces Equation (4).

$$\frac{Number\ of\ successes}{Number\ of\ tests} \times 100\ \% = \frac{14}{15} \times 100\ \% = 93.3\ \% \quad (4)$$

## 4. Conclusion

Creating a system that can perform beam package separation by designing and manufacturing several hardware components that have different functions and program coding so that they become one unified system. Based on the results of testing the beam package destination separator regularly the system succeeds in separating the beam packages with the destination zip code percentage of success 80% without any failure. Based on the results of testing the ability of the tool, the results show that the tool can work effectively to separate the beam package objectives. After testing the design and. Making a block package separation system with Arduino, can the system run. Block parcel splitting orders based on the zip code of a city with 86% success accuracy.

## References

[1] B. M. Popkin, C. Corvalan, L. M. Grummer-Strawn, "Dynamics of the double burden of malnutrition and the changing nutrition reality," *The Lancet*, vol. 395, no. 1021, pp. 65-74, 2020.

[2] K. A. Demir, G. Döven, B. Sezen, "Industry 5.0 and human-robot co-working," *Procedia computer science*, vol. 158, pp. 688-695, 2019.

[3] A. Lyutov, Y. Uygun, M. T. Hütt, "Managing workflow of customer requirements using machine learning," *Computers in Industry*, vol. 109, pp. 215-225, 2019.

[4] Y. Lu, X. Xu, X. L. Wang, "Smart manufacturing process and system automation–a critical review of the standards and envisioned scenarios," *Journal of Manufacturing Systems*, vol. 56, pp. 312-325, 2020.

[5] Kembro, J. H., & Norrman, A. (2020). Warehouse configuration in omni-channel retailing: a multiple case study. *International Journal of Physical Distribution & Logistics Management*, *50*(5), 509-533.

[6] T. Zhang, X. Zhang, J. Li, X. Xu, B. Wang, X. Zhan, S. Wei, "SAR ship detection dataset (SSDD): Official release and comprehensive data analysis," *Remote Sensing*, vol. 13, no. 18, p. 3690, 2021.

[7] Y. Agyabeng-Mensah, E. Afum, E. Ahenkorah, "Exploring financial performance and green logistics management practices: examining the mediating influences of market, environmental and social performances," *Journal of cleaner production*, vol. 258, p. 120613, 2020.

[8] R. Mangiaracina, A. Perego, A. Seghezzi, A. Tumino, "Innovative solutions to increase last-mile delivery efficiency in B2C e-commerce: a literature review," *International Journal of Physical Distribution & Logistics Management*, 2019.

[9] R. Valavi, J. Elith, J. J. Lahoz-Monfort, G. Guillera-Arroita, "blockCV: An r package for generating spatially or environmentally separated folds for k-fold cross-validation of species distribution models, *Biorxiv*, pp. 357798, 2018.

[10] X. Xu, Z. Xue, Y. Zhao, "Research on an Algorithm of Express Parcel Sorting Based on Deeper Learning and Multi-Information Recognition," *Sensors*, vol. 22, no. 17, p. 6705, 2022.

[11] C. A. Lauff, D. Kotys-Schwartz, M. E. Rentschler, "What is a Prototype? What are the Roles of Prototypes in companies?," *Journal of Mechanical Design*, vol. 140, no. 6, 2018.

[12] H. A. Wahsheh, F. L. Luccio, "Security and privacy of QR code applications: a comprehensive study, general guidelines and solutions," *Information*, vol. 11, no. 4, p. 217, 2020.

[13] M. Kusriyanto, A. A. Putra, "Weather station design using IoT platform based on Arduino mega. In 2018 International Symposium on Electronics and Smart Devices (ISESD), pp. 1-4, 2018.

[14] M. Maringer, N. Wisse-Voorwinden, P. van't Veer, A. Geelen, "Food identification by barcode scanning in the Netherlands: a quality assessment of labelled food product databases underlying popular nutrition applications," *Public health nutrition*, vol. 22, no. 7, pp. 1215-1222, 2019.

[15] S. Fang, Y. Wang, W. Wang, Y. Chen, Y. Chen, "Design of permanent magnet synchronous motor servo system based on improved particle swarm optimization," *IEEE Transactions on Power Electronics*, vol. 37, no. 5, pp. 5833-5846, 2021.

[16] A. Latif, A. Z. Arfianto, H. A. Widodo, R. Rahim, E. T. Helmy, "Motor DC PID system regulator for mini conveyor drive based-on MATLAB," *Journal of Robotics and Control (JRC)*, vo. 1, no. 6, pp. 185-190, 2020.

[17] L. Safari, G. Barile, V. Stornelli, G. Ferri, "An overview on the second generation voltage conveyor: Features, design and applications," *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 66, no. 4, pp. 547-551, 2018.

[18] M. Catillo, A. D. Vecchio, L. Ocone, A. Pecchia, U. Villano, "USB-IDS-1: a public multilayer dataset of labeled network flows for IDS evaluation, "2021 51st Annual IEEE/IFIP International Conference on Dependable Systems and Networks Workshops (DSN-W)," pp. 1-6, 2021.

[19] O. E. Amestica, P. E. Melin, C. R. Duran-Faundez, G. R. Lagos, "An experimental comparison of Arduino IDE compatible platforms for digital control and data acquisition applications," *2019 IEEE CHILEAN*

*Conference on Electrical, Electronics Engineering, Information and Communication Technologies (CHILECON)*, pp. 1-6, 2019.

[20] J. Peurifoy, Y. Shen, L. Jing, Y. Yang, F. Cano-Renteria, B. G. DeLacy, M. Soljačić, "Nanophotonic particle simulation and inverse design using artificial neural networks," *Science advances*, vol. 4, no. 6, 2018.