



Semi-Automatic Dyeing Tool for Palembang Typical Natural Fibre Jumputan Batik Fabric Based on Internet of Things

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Abstract. The development of cloth at this time is creating various types of fabric products. Of the various decorative fabrics that have been made for daily needs using machine tools, one of the tools used is a tool for making printed fabrics. One example of printed fabric is tie dyed fabric or jumputan fabric which is often found in the market. The process of tie-dyed or jumputan fabrics has now undergone many changes. The technique and manufacture are no longer complicated and time-consuming. As technology advances, production is now more practical and fast, so that production results can be increased. To make this happen, this study proposes an Internet of Things-based jumputan batik dyeing tool that can work automatically in the mixing section with an intelligent control system. That is using the NodeMCU ESP32 microcontroller which is controlled through the Batik_Jumputan application on Android which was developed with the MIT App Inventor. The results of connection testing that has been done, it is obtained that the average length of time it takes for Wi-Fi to connect is 02.05 seconds with the description that the connection is connected, it can be said that this tool has a fast response.

Keywords: Artificial Intelligence, MIT Application, NodeMcu, Sensor and Transducer, Internet of Thing

1. Introduction

The development of fabrics at this time is to create various types of fabric products. A piece of beautiful fabric is made with a variety of fabric making techniques, including for the development of various forms, properties, shapes, uses, decorative fabrics. Some decorative fabrics that have been made for daily needs using machine tools, one of the tools used is the printing fabric making tool. The number of consumers who choose to look for fabrics at a fairly cheap price and many kinds make fabric producers choose to use instant and mass machines. It is not uncommon if only a few fabric crafts are still seen from the human side and high artistic value.

The level of motif making tends to be more difficult. Get to know ikat-dyed fabrics or jumputan fabrics using various types of fabrics. The origin of fabrics that use the tie-dye technique, types of decoration and areas producing tie-dye fabrics. - The dyeing

technique originated in China, this technique then developed to India and the archipelago, the ikat dyeing technique was introduced to the archipelago, by Indians through trade missions. This technique received great attention especially in the beauty of its ornamental variety in captivating colours. The use of the ikat-dye technique can be found, among others, in Sumatra, especially in Palembang, South Kalimantan, Java and Bali. Each region has its own name for the tie-dye technique.

In Palembang, this type of tie-dyed fabric is called rainbow fabric or cinde. Meanwhile in Banjarmasin, South Kalimantan, the fabric with this technique is known as sasirangan. The making of ikat-dyed cloth in Java is known as jumputan or tritik. Each region has its own characteristics in managing patterns with this technique, making it easier for us to recognise them. The name Jumputan comes from the word "Jumput" this word has an understanding related to the way of making fabrics that are picked (pulled) or jumput in (Javanese language).

In addition, there is also an opinion that is almost the same, namely the word jumputan from the Javanese language which means picking up / taking with all the fingertips. As the name implies, jumputan is made by grasping the cloth filled with seeds according to the desired motif, followed by tying and dipping into the dye. The process of making jumputan is simple and easy, not using canting and malam. This process is also applied in making jumputan cloth in the Palembang area.

It can be concluded from the above opinion that jumputan is a technique of decorating fabric by pinching the fabric then filled with certain objects (seeds, marbles, nuts, stones, beads) with certain patterns that are tied, sewn, crimped and dipped in dye. The tools and materials commonly used in tie-dyeing consist of fabric, dye, raffia, and other aids to the dyeing process. The binding tool used has changed. In the past, palm leaves were used and now raffia is used.

Basically, all straps must use waterproof materials. It only uses colouring agents which are then adapted to the development of technology. The process of making it by tying the fabric and dyeing it in colour will create a jumputan fabric. Jumputan fabrics usually feature textured motifs of various materials, such as grains, rocks and wood [1] .

2. Design system

This paper, at electronic design is a design that includes the manufacturing process of each circuit block related to electronic components such as schematics, component selection. This electronic design also functions as an electrical system contained in a circuit where current and voltage will alternate between electronic components, so that individual functions.

In this design process, it can be seen that the outline that can be carried out in making this final report is semi-automatic hardware for the typical Palembang jumputanseratalam batik fabric based on the Internet of Things. In the design process, this tool is created with the help of a block diagram of the entire system.

A block circuit diagram is a circuit that is needed in making a tool, this is done to make it easier for the author to make the tool. In this circuit block diagram you can also see how the entire circuit works. So that the block diagram can produce a system that functions or can work in accordance with the specified tool manufacturing design. The following block diagram will be created to facilitate the design process.

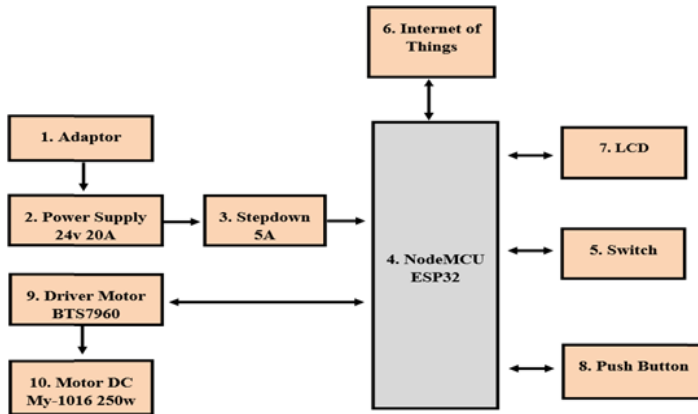


Fig.1. Block Diagram for Making Fiber Jumpan Batik Cloth Dyeing Tools IoT-based typical Palembang nature

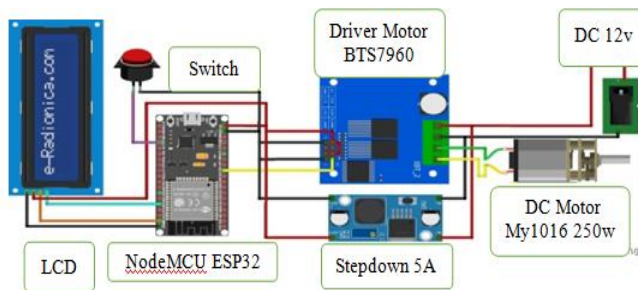


Fig.2. Complete diagram of the circuit to be design

In this mechanical design, there are components that are used to place the mechanical design of the automatic soybean crusher so that it can run well, where the components include an LCD, pushbutton, stepdown, selector switch. Real image display on a typical Palembang batik dyeing tool, as in the image below.



Fig.3. Semi Automatic Batik Fabric Dyeing Equipment Multiplied Natural Fiber Typical In Palembang Based on Internet of Thing

Based on the schematic design above, it can be seen that the pushbutton is to turn on and off (on/off) the jumputan batik cloth dyeing tool. This is because the ESP32 Node MCU cannot be run directly to run the Jumputan batik cloth dyeing tool, therefore it requires a power supply as a connection. This system can be run using three methods either via the MIT App Inventor web and via the Adafruit IO, Bluetooth (Iot), and manual (button) applications. will be used, it will be detected and the MCU Node will immediately activate the motor driver and DC motor so that the machine will start running immediately. When using Bluetooth it also requires connectivity where the internet network is used to transmit data. After that the data will be sent to the NodeMcu and the motor driver which also activates the DC motor will detect it so that the machine will be activated by running the jumputan batik cloth dyeing machine. And when using the manual method (button) you must ensure that the tool is connected to a power supply first so that it can run or activate the jumputan batik cloth dyeing machine.

3. Current Result

This measurement aims to determine the DC motor speed output obtained from the speed level used, so that the test results for measuring motor speed in Rpm units will be clearly visible. The DC Motor speed results can be seen in the table 1.

This measurement point is the speed of the DC motor which functions to drive a semi-automatic tool for dyeing Palembang's typical natural fiber batik cloth based on the Internet of Things. For DC motor speed it can be seen that it uses speed. The greater the nominal speed used, the greater the Rpm value produced.

Table 1. Result Speed Level DC Motor

No.	Speed Level (PWM)	DC Motor Speed Level (Rpm)
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1.	55	216,8
2.	75	332,6
3.	95	402,9
4.	135	595,3
5.	150	712,2

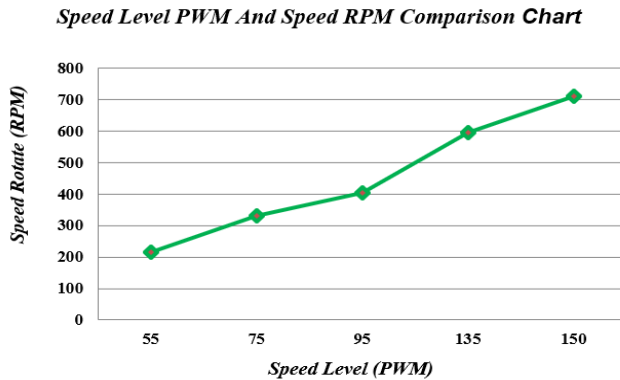


Fig.4. Graph of comparison test result between Speed Level Vs Speed level DC motor

The results of DC motor speed testing, the data obtained is the level of stirring in the dye powder and the level of stirring in dyeing Jumptan batik cloth when given different speed levels. In this test, it can be seen from the level of mixing speed for dyeing the jumptan fabric used, namely a speed level of 50 - 150 PWM, so the results obtained also vary. The test results can be seen in the graph below.

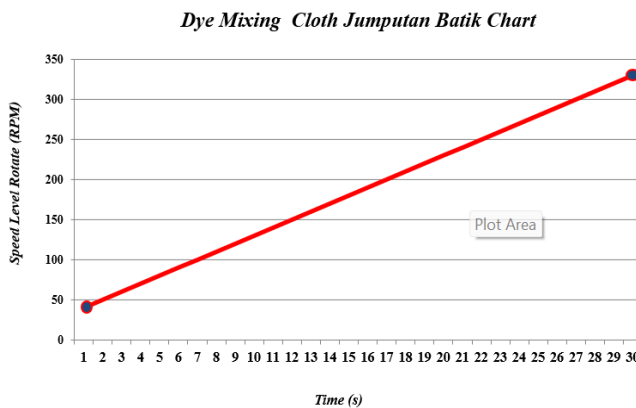


Fig. 5. Graph Dye mixing cloth jumptan batik

From the test results carried out by the research team, a graph can be shown showing that the speed level given affects the length of time the fabric agitates. Furthermore, the test obtained the fastest stirring level within 15 minutes, namely with a speed level of 150 PWM. Meanwhile, the slowest time is 1 minute with a speed level of 55 PWM.

From this data it can be seen that the time span for semi-automatic mixing of the typical internet of things-based dyeing technique for natural fiber batik jumputan cloth from Palembang is 15 minutes.

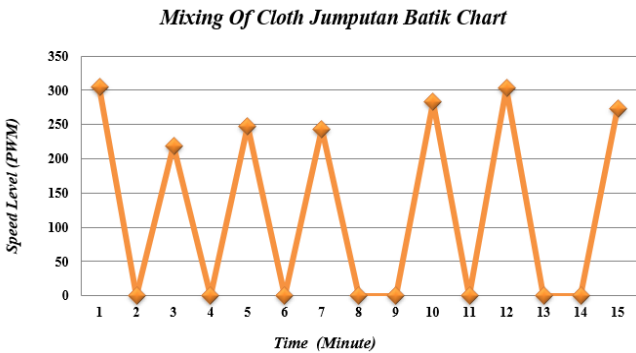


Fig.6. Graph mixing of cloth jumputan batik chart

Furthermore, in this IoT-based semi-automatic jumputan batik cloth dyeing tool, for testing with software using Adafruit IO and MIT App Inventor, which is the server used to receive data sent by the application, where this data will be sent and will be received by the NodeMCU ESP32. The following is a program on the Arduino IDE that connects Adafruit to the NodeMCU ESP32.

```
initialize global url_status to https://io.adafruit.com/api/v2/venuschaniago31f...

when Clock1 Timer
do
  set Web2 Uri to get global url_status
  call Web2 Get

when Web2 GotText
do
  set global request_status to call Web1 JsonTextDecode
  jsonText get responseContent
  set global status to select list item list get global request_status
  index 1
  set global status to segment text get global status
  start starts at text get global status
  piece value
  length length get global status - starts at text get global status
  piece value
  set global status to segment text get global status
  start 10
  length length get global status - 11
  set time Text to 0 join Timer =
  get global status
```

Fig.7. Puzzle listing on MIT app for adafruit I/O connection

Next, after the MIT application has been connected to Adafruit IO, the results of the application design for jumputan batik cloth will appear. For more details, see the image below.

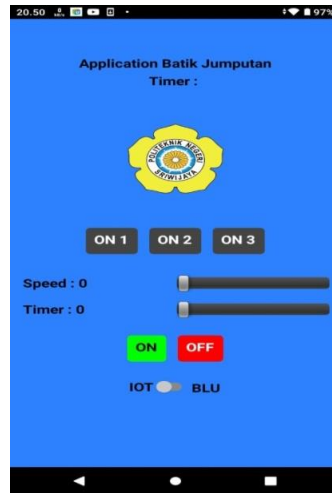


Fig.8. Result for MIT app semi automatic batik jumptan

4. Conclusion

Based on the results of measurements and tests on the tool, it can be concluded that this semi-automatic tool for Palembang's typical natural fiber jumptan batik cloth based on the internet of things can work well and according to its function. In the measurement process, there are differences in the Rpm results for each given speed level. The greater the feed speed level, the greater the Rpm value produced when the DC motor is run. The difference in the range of Rpm measurement results is around 216.8 – 712.2 Rpm.

In the process of measuring distance on a Bluetooth connection, the tool no longer responds at a distance of 50 meters. Bluetooth can still connect with the nodemcu as far as 50 meters, when above 50 meters the device connection will be lost. However, when you want to connect again to Bluetooth, the application and nodemcu must be 30 meters apart to be able to connect again. The connection distance also affects the response to the tool that will be run. The further the distance between the smartphone and the NodeMCUESP32, the longer the response time of the device will be. From the distance measurement results, it was found that the Bluetooth response range to the device was around 1-3 seconds.

Next, while waiting for 15 minutes of the stirring process, the researcher can take data on the stirring speed, here you can see the comparison of Rpm speed per 30 seconds of the stirring process, then after waiting around 15 minutes for the coloring process, the researcher can lift the cloth and rinse it until it is completely clean from the process. previous coloring.

References

1. Suci Amin, E. D, 2020, DETERMINAN PERKEMBANGAN BAYI DI UPTD PUSKESMAS. *Al-Asalmiya Nursing / Vol. 9, No. 1, Tahun 2020, 9, 81.*
2. Indrianto, M. H., 2019, *Virtual Reality Trafi Sensor*. Jawa Tengah: Lakeisha. (AnggotaIKAPI No.181/JTE/2019).
3. Abdul Aziz, M. J, 2019, *Pedoman Pelaksanaan Model Intervensi*. Jakarta: Perpustakaan Nasional: Katalog Dalam Terbitan (KDT).
4. Pungky Agustine, H. Y, 2020, Pengembangan Interactive Virtual Tour 360° PT. Schneider Electric Manufacturing Batam. *Journal of Applied Multimedia and Networking (JAMN), 4, 2.*
5. Priyanto, D, 2009, Pengembangan Multi Media Pembelajaran Berbasis Komputer. *Jurnal Pemikiran Alternatif Kependidikan, 14, 92-110*
6. Wardhana, R. 2009, *Definisi Multimedia*. Universitas Islam Indonesia.
7. Amin, A., 2016, *Pembuatan Film Animasi Cara Umrah Seuai Software Blender*. Malang: Universitas Islam Negeri Maulana Malik Ibrahim.
8. Nurmalarasi, Q, 2021, *PENGEMBANGAN MULTIMEDIA 3 DIMENSI SEBAGAI SARANA PEMBELAJARAN PRAKTIKUM ELEKTRONIKATELEKOMUNIKASI BERBASIS VIRTUAL REALITY* (Doctoral dissertation, Politeknik Negeri Sriwijaya).
9. Sholihin, Eka Susanti, "Humanoid Robot Control System Balance Dance Indonesia and Reader Filters Using Complementary Angle Value", *E3S Web of Conferences 31.*
10. Sholihin, Eka Susanti, A. A. Pramudita and M. M. Rose, 2017, "MIMO antenna with cross polarisation printed yagi elements for MIMO router", *Proc. 2017 3rd International Conference on Wireless and Telematics (ICWT) Palembang Indonesia*, pp. 65-69, July.
11. Eka susanti, Rosita febriani, Sholihin, Eka susanti, Emilia hesti, 2018, *The design of hand gesture robot software based on wireless technology*, *IEEE conferences ICOIACT 2018, Indonesia*, p.p 401 – 406.
12. Eka Susanti*, Ica Admirani, Romi Wilza, Irawan Hadi, Sholihin Sholihin, 2021, "Automation of The Palembang Semage Fabric Yarn Spinner", *Proceedings of the 5th FIRST T1 T2 2021 International Conference (FIRST-T1-T2 2021).*
13. Suzan Zefi, Eka Susanti*, Sholihin Sholihin, M. Zakuan Agung, R.A Halimahtussa'diyah, "Innovation Technology of Lekor Dough Mixer Based Internet of Thing", *Proceedings of the 5th FIRST T1 T2 2021 International Conference (FIRST-T1-T2 2021).*
14. Emilia Hesti Sholihin, Sarjana, 2019, "Coffee Groping Control System using tcs 3200 Sensor Based on xbee", *Journal of Physics: Conference Series, Volume 1167.*
15. Amirah fakhirah Emilia Hesti, Sholihin, Adewasti, Sarjana, 2020, "Internet of thing for the commando Robot Command System", *Journal of Physics, IOP publishing ltd, Volume 1500.*
16. Emilia Hesti, Adewasti, Rosita Febriani, Sholihin, Eka Susanti, 2018, "Xbee pro module application in to organize and monitoring earthquake disaster location with the robot control system", *International Conference on Information and Communication Technology (ICOIACT) 2018*, page 651 – 655.

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