West Science Information System and Technology
Vol. 2, No. 03, December 2024, pp. 348~364

Design of a Desktop Java-Based Introduction to Basic Electronic Components

Ulil Albab[1], Muhammad Bakhar[2], Qirom[3]
[1-3]Politeknik Harapan Bersama

Article Info

Article history:

Received December, 2024
Revised December, 2024
Accepted December, 2024

Keywords:

Learning
Software
Java
Basic Electronics

ABSTRACT

The development of information technology has had a positive impact on the world of education, one of which is to simplify the learning process. In the field of electronics, understanding basic components is an important foundation for students and practitioners. This Java Desktop-based application design aims to introduce basic electronic components with an easy-to-understand interactive interface. In this software, it contains various information about basic electronic components such as Resistors, Capacitors, Transistors, Diodes, Push Buttons, which is equipped with detailed information about the specifications and basic functions of various electronic components. In addition, the app comes with visual illustrations in the form of images that support the understanding of physical and component symbols. To explain how components in a series work, the app presents interactive animations to clarify the concept of how each component works and functions. During the creation and testing of 5 times, which was carried out using 5 different basic components resulting in different circuits and explanations of how to work, these results then obtained data from these 5 components which were then entered into the MySQL Database. The data present in the Driver Database is displayed using the Desktop-Based Java Programming Language.

This is an open access article under the CC BY-SA license.

Corresponding Author:

Name: Ulil Albab, M.T
Institution: Politeknik Harapan Bersama
Email: italbabz@gmail.com

1. INTRODUCTION

The development of technology in the field of Electrical (Electronics) is also developing rapidly, so it is required to be able to recognize and understand the components related to electronics, especially among students, both students and students, and it is possible for teachers, both teachers and lecturers, and even other professions related to Electronics science [1]. Learning is a process activity and is a very fundamental element in the implementation of every type and level of education [2].

Electronics is a science that studies low-current electrical devices that are operated by controlling the flow of electrons or electrically charged particles in a device such as computers, electronic equipment, thermocouples, semiconductors, and so on [3]. Basic Electronics is a course listed in the Curriculum of the Electronics Engineering Study Program of Harapan Bersama Polytechnic with the number of credits is 2. The Basic Electronics course is to learn about

the basics of semiconductors, diodes, MOSFET transistors and BJT. The learning time during the lecture process between lecturers and students per credit is 50 minutes, which means that the total learning time is 100 minutes in 1 meeting per week. This is considered less effective where students are required to know various basic electronic components. To deal with these problems, the solution is to create software that is educational. It is hoped that the creation of a Desktop-Based Application can help students during the learning process.

Java is a programming language that can create entire forms of applications, desktop, web, mobile and others, as made using other conventional programming languages. This Java Programming Language is Object Oriented Programming (OOP), and can be run on a variety of operating system platforms. The development of Java is not only focused on a single operating system, but is developed for various operating systems and is open source [4].

2. LITERATURE REVIEW

2.1. Originality of Research

Based on a search of the research title that takes on the Introduction of Basic Electronic Components.

1) Akbar Zafar, AD Suhardi Rahman, Sharifuddin Qasim, Android-Based Electronic Components Introduction Application: A Case Study on Analog and Digital Electronics Courses, Journal of Electrical Media Vol 19 No 1 pp31-34, 2021. The research was conducted with the aim of producing an android-based electronic component recognition application. Data was collected using documentation and questionnaire techniques. The data obtained in this study were processed using descriptive data analysis techniques. The application testing made is carried out using the ISO 25010 standard by taking three criteria, namely (1) functionality, (2) performance efficiency, and (3) usability. Functionality testing is carried out using the test case method, performance efficiency testing is carried out by installing applications on several types of smartphones with specifications and operating system versions on Android. Usability testing is carried out using questionnaires or questionnaires. The value of the functionality test is stated to be very good and can be said to be receptable. The performance efficiency test has been met and declared good while the usability test shows that this application can be used well by users with a percentage rate of 92% [1].
2) Nurdiana Handayani, Rizqi Abdulrohman, Design and Build Java-Based Electricity Usage Information System (Case Study on Pt. Argo Pantes, Tbk), Journal of Informatics Engineering Vol 12 NO 1 pp97-108, 2019. This research uses the waterfall method and the system design is implemented with Unified Modelling Language (UML). The expected final result is that this Java Desktop-based information system can overcome the problems of the running system, including more optimally in the process of calculating electricity consumption, making electricity consumption reports and searching for electricity consumption data easier. With this research, it is hoped that it can help PT. Argo Pantes Tbk, especially the Utility Electricity Unit to develop an electricity consumption information system [2].
3) Aryani Rombekila, Design and Build a Basic Electronics Learning Trainer at Amamapare Timika Polytechnic, AMATA Engineering Journal Vol 04 No 1, 2023. This study aims to find out the performance of, and Learning Media eligibility *Trainer* Basic Electronics as a learning medium for the Basic Electronics course in the Department of Electrical Engineering at the Amamapare Timika Polytechnic campus. The results of the research conducted at the Amamapare Timika Polytechnic Campus show that the performance of Learning Media *Trainer* The Electronics series is in

accordance with its purpose as a learning medium for Basic Electronics. The props made here are very useful for students as a means of electrical engineering lectures which are very helpful for students to understand the series and physical shape of components. This final project has successfully realized an Electronics Circuit Trainer which is used as a teaching aid for Basic Electronics learning. This teaching aid can be used to assemble a basic electronic circuit as the initial stage in knowing and learning about basic electronics. Based on the test results, it can be known that the performance of the basic electronics trainer as a whole, the performance of the tool has shown results in accordance with the design, namely various kinds of electronic components as an introduction to electronic components and for circuit blocks are also in accordance with the needs in learning, especially in the Basic Electronics course [5].

2.2. Electronics

Electronic technology has given a lot for comfort, safety, fun or other things. Electronic, then life will feel less comfortable, less safe, less interesting, or fun. Some important areas that are greatly influenced by the development of electronic technology include information and telecommunication technology, multimedia technology (audio-visual), sensors, control systems, instrumentation and measuring instruments and various other fields.

Electronics is a science that studies low-current electrical devices that are operated by controlling the flow of electrons or electrically charged particles in a device such as computers, electronic equipment, thermocouples, semiconductors, and so on. The science that studies such tools is a branch of physics, while the design and manufacture of electronic circuits is part of electrical engineering, computer engineering, and electronics and instrumentation science.

These tools that use the basis of electronic work are usually referred to as electronic devices. Examples of these electronic equipment/devices: *Cathode Ray Tube* (CRT), radio, TV, cassette recorder, video cassette recorder (VCR), VCD recorder, DVD recorder, video camera, digital camera, desktop personal computer, laptop computer, PDA (pocket computer), robot, smart card, etc.

In electronics, there are several main branches including digital electronics, analog electronics, microelectronics, integrated circuits (ICs), optoelectronics, and semiconductor semiconductors. Digital electronics is an electronic system that works with a digital system or discrete signal, where the signal only has two levels, namely high and low. Generally, digital circuits are built using a combination of a number of transistors and/or logic gates. Digital electronics is an electronic system that uses digital cues of representations of the boolean alphabet. These digital electronics are used in computers, mobile phones, and other products. Meanwhile, analog electronics is an electronic system that has a continuous signal. Analog circuits are generally constructed using a combination of op-amps, resistors, capacitors, and other electronic components.

An electronic circuit is always built using several lyric components. The components used can be broadly grouped into two groups, namely active components and passive components. Active components are electronic components that require an energy source (*power supply*) to carry out their functions. Examples of active components are *integrated circuits* (ICs) and transistors. Meanwhile, passive components are components that do not require an energy source to carry out their functions. Examples of passive components are resistors, capacitors, inductors and transformers.

Current technological developments show that almost all electronic devices are made using materials from semiconductor components. Semiconductor material components have a huge impact today on the development of electronic technology. The semiconductor materials used can be found in transistors and *microprocessor chips*. Radio

wave transmitters or computer systems rely heavily on semiconductor components

2.3. Basic Concepts of Electronics

Electronic systems can function to control electric current, change its fluctuations, direct, and manage time to produce different functions. To understand how electronic systems work, it is necessary to understand some of the basic quantities and concepts in electronics.

2.3.1. Conductors and Isolators

A conductor (conductor) in electronics is a material or substance that can conduct electric current. Generally, good conductors are made of metal materials such as copper. Almost all cables contained in electronic equipment use copper. The most common type of metal copper is used as a conductor because its electrical charge conducts better than other metals.

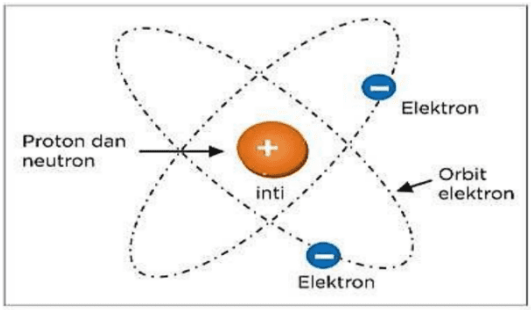

Figure 2.1. Electrons surrounding the nucleus of an atom [7]

2.3.2. Resistance and Resistivity

In an electrical circuit, there is one property of a circuit or material that can resist or resist the flow of electric current. This ability to resist electric current is known as resistance which is expressed in ohms (Ω). The magnitude of the resistance value of 1ohm is defined as the value of resistance between two points in a conductor when a tapped electric potential of one volt is applied between the two points resulting in a current flow of one amperage in the circuit. Electronic components that are designed to have a resistance value are called resistors [6].

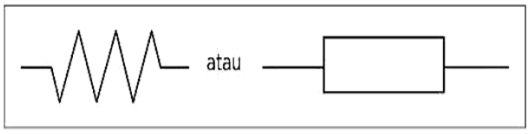

Figure 2.2. Resistor Symbols in Circuits [7]

2.3.3. Arus Arus Listrik (*Electrical Current*)

An electric current occurs due to the flow of electrons where each electron has the same charge. If we have A negatively charged object means that it has an excess of electrons [7]. The degree of loading of the object is measured by the number of excess electrons present. The charge of an electron, often expressed by a symbol or, expressed in coulomb units, is equal to

$$q \approx 1{,}6 \times 10^{-19} coulomb$$

2.3.4. Voltage

It will be easy to analogize the flow of electricity with the flow of water. Suppose we have 2 tubes connected to pipes as shown in figure 2.3. If both tubes are placed on the table then the water surface on both tubes will be the same and in this case there is no flow of water in the pipe. If one of the tubes is lifted then automatically water will flow from the tube to the lower tube. The higher the tube is lifted, the faster the water flows through the pipe.

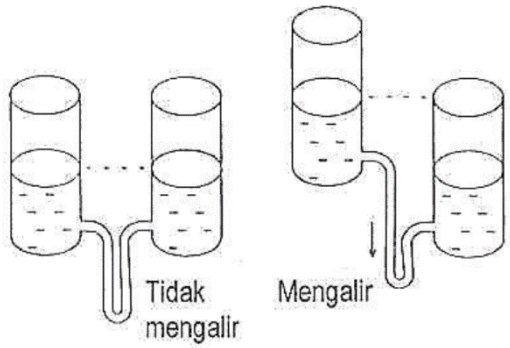

Figure 2.3. Water flow in a correlation vessel [7]

2.4. Electronic Components

The basic components of electronics are generally grouped into two types, namely passive components and active components. Passive components are electronic components that do not require an external current source to operate. Examples of components that fall into this type are resistors, capacitors, inductors, and transformations [8].

Active components are electronic components that require an external current to operate. The active component will function if it is stimulated in the form of an external source of electric current. Examples of electronic components that are grouped into active components are diodes, transistors and ICs (*Intergrated Circuits*). These components are made of semiconductor materials such as germanium, selenium, silicon, and metal oxides.

2.4.1. Resistor

Resistors are the basic components of electronics that are always used in every electronic circuit because they can function as regulators
or to limit the amount of current flowing in a circuit [9]. With resistors, electric current can be distributed according to needs. As the name implies, resistors are resistive and are generally made of carbon material. The unit of resistance of a resistor is called Ohm or denoted by the symbol Ω (*Omega*).

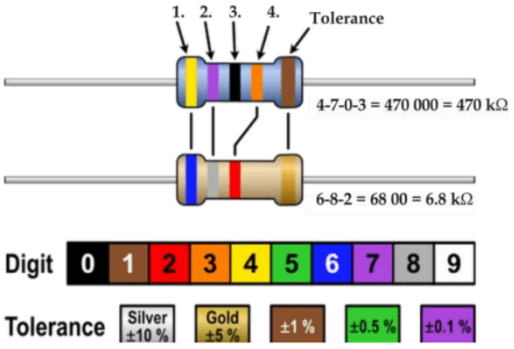

Figure 2.4. Sequence of color rings on resistors [7]

2.4.2. Capacitor

A capacitor is an electronic component that has the ability to store electrons for an indefinite period of time. Understanding
Other capacitors are electronic components that can store and discharge electrical charges. The structure of a capacitor is made of 2 pieces metal plates separated by a dielectric material [10]. Common dielectric materials are vacuum air, ceramics, glass and others. If both ends of a metal plate are given an electrical voltage, then a positive charge will accumulate on one of the metal legs (electrodes) and at the same time the negative charges will accumulate on the other end of the metal. The positive charge cannot flow towards the negative end and vice versa the negative charge cannot go to the positive end, because it is separated by a non-conductive dielectric material. This electrical charge is "stored" as long as there is no conduction at the end of the toe. In the wild, this capacitor phenomenon occurs when positive and negative charges accumulate in the clouds. The ability to store an electrical charge in a capacitor is made by capacitance or capacity.

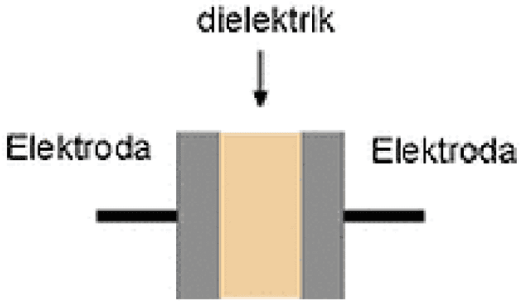

Figure 2.5. Basic Principles of Capacitors [7]

2.4.3. Diode

Diodes are electronic components made of Semiconductor. Moving on from the discovery of diodes, experts also found other unique derivative components. Diodes have a unique function, which is that they can only conduct current in one direction. The diode structure is nothing but the connection of the P and N semiconductors. One side is a semiconductor with type P and the other side is type N. With such a structure, the current will only be able to flow from the P side to the N side [11].

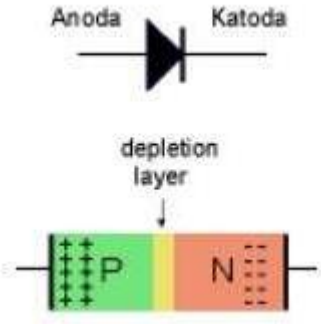

Figure 2.6. Basic principles of diodes [11]

The illustration above shows a PN connection with a small portion called a depletion layer, where there is a balance of holes and electrons. As is already known, on

the P side there are many holes that are ready to receive electrons while on the N side there are many electrons that are ready to be free. Then if given a positive bias, in the sense of giving the potential voltage of the P side greater than the N side, then the electrons from the N side will immediately be moved to fill the hole on the P side. This is called the flow of the hole from P to N, If you use the terminology of electric current, then it is said that there is an electric flow from the P side to the N side.

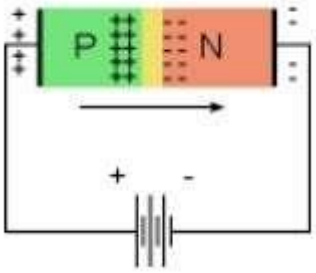

Figure 2.7. Forward bias diodes [11]

On the other hand, what happens if the polarity of the voltage is reversed, i.e. by giving a negative bias (reverse bias). In this case, the N side gets a greater voltage polarity than the P side.

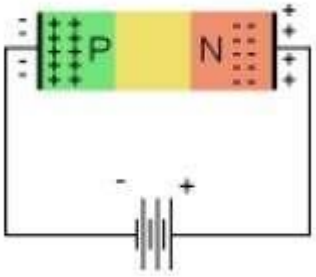

Figure 2.8. Refractory diodes [11]

Of course, the answer is that there will be no electron transfer or hole flow from P to N and vice versa. Because both the hole and the electron are each attracted in the opposite direction. Even the depletion layer is getting bigger and blocking the occurrence of current. That's a little bit of how diodes can only conduct one-way current. With only a small forward bias voltage, the diode is already a conductor. It is not necessarily above 0 volts, but indeed a voltage of several volts above zero can conduct occur. This is due to the presence of a depletion layer. For diodes made of Silicon material, the conduction voltage is above 0.7 volts. Approximately 0.3 volts of the minimum limit for diodes made of Germanium material [11].

2.5.3. Transistor

Transistors are electronic components, consisting of three layers of semiconductors, with examples of NPN and PNP. The transistor has three legs of emitter (E) Base (B) and a collector (C) which are used as amplifiers, as circuit breakers and connectors (switching), voltage stabilization, signal modulation or as other functions. Transistors can function as electrical faucets, where based on their input current (BJT) or input voltage (FET), allows for a highly accurate flow of electricity from their power source circuits [12].

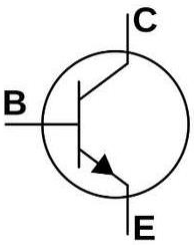

Figure 2.9. Transistor Symbol

The function of a transistor is as an amplifier, as a breaker and connector (switch), voltage stabilization, signal modulation and various other functions. Transistors can also function as electrical faucets, where based on their input current (BJT) or input voltage (FET), allows for a very accurate flow of electricity from their power source circuits. The transistor functions as a switch. By controlling the bias of the transistor until this component becomes saturated, it will cause as if a short connection is obtained between the emitter and the collector leg. This phenomenon can be used so that transistors can be used as electronic switches. The function of the transistor as a current amplifier. Based on this function, transistors can be used in power supply circuits where the voltage is set [12].

2.6.3. Push Button

A push button switch is a simple device/switch that functions to connect or disconnect the flow of electric current with a

press unlock (non-locking) working system. The unlock working system here means that the switch will work as a connecting device or circuit breaker when the button is pressed, and when the button is not pressed (released), then the switch will return to normal condition [13].

As a connecting device or breaker, the push button switch only has 2 conditions, namely On and Off (1 and 0). The term On and Off is very important because all electrical devices that require an electrical energy source must need On and Off conditions

Figure 2.10. Inductor shape and symbols [12]

2.7.3. Induktor

An inductor or coil is one of the components of passive electronics that can produce magnets if applied to an electric current and vice versa can generate electricity if given a magnetic field. These inductors are usually made with copper conducting wire that is formed into a coil or coil [14].

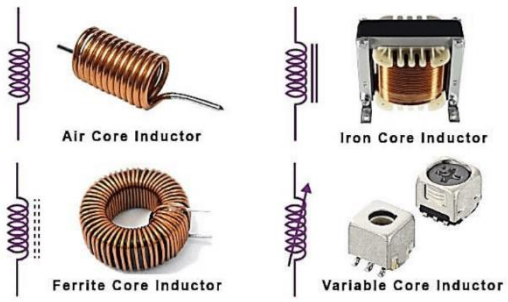

Figure 2.11. Inductor shape and symbols [7]

2.4.4. Transformator

The existence of a transformer is very important considering its benefits in an electrical array. A transformer is an electronic component that used to transfer electrical power in electrical circuits [15]. In the transfer of electric power, it is usually done through electromagnetic induction.

The transfer of electrical power usually occurs between two electrical networks if the electricity needs between the two are different. Usually this difference is caused by a change in the voltage of the electric current in an electrical array. So the displacement must be made to adjust the existing impervance between the asynchronous electrical circuits in the electrical circuit. This transfer of electrical power will make the electrical voltage in two or more electrical circuits stable. Because of this, the existence of a transformer is very important in the transfer of electrical power in an electrical circuit.

Figure 2.12. Transformers [7]

2.4.5. Java

With Object-Oriented Programming like Java, today it is possible to organize complex and large programs through encapsulation, polymorphism, inheritance, objects, and classes. For many years, C++ used the OOP language [16]. With the advent of the World Wide Web, Java programming became more popular, especially in the development of consumer electronics such as televisions, microwaves, and more. Computer experts devote a lot of their time to trying to find software that is secure, reliable, compact, and processor-independent. Java programming has gradually evolved into a full-fledged programming language, shifting its focus from consumer electronics to various platforms to develop more powerful applications.

3. METHODS

3.1. Research Materials

The materials used to conduct the research are as follows:

1) Resistor

2) Capacitor
3) Diode
4) Transistor
5) Push Button
6) PCB Board
7) Copper cable
8) Tinol
9) Pin header
10) Java Programming Language
11) MySQL

3.2. Research Tools

The research tools needed to conduct research include the following:

1) Netbeans
2) Solder
3) Attractor
4) Cut pliers
5) Cutter

3.3. Research Procedure

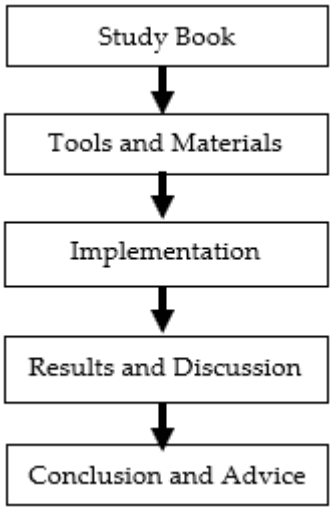

Figure 3.1 Research Procedure

1) Study Book

Collecting references from the results of research that has been produced or collecting books that are related to the problem to be solved.

2) Tools and Materials

The tools and materials that are already available are then checked for the completeness of each component in accordance with the design of the needs that have been formed.

3) Implementation

- Assembling tools and materials based on the design of tool forming using PCBs connected to electronic components.
- Creating Java Desktop based software displays component names, symbols, descriptions and a short video of the functionality of electronic components.

4) Results and Discussion

Test the tools and software that have already been built by reviewing the success of each part.

5) Conclusion and Advice

Summarizing the results that have been obtained from the implementation that has been carried out and what forms need to be improved in the future.

The development stage needs to be carried out to a further stage so as to produce more educational learning media as described in the flow below. This research focuses on introducing and making basic electronic components that are included in the Java-Based Desktop Program.

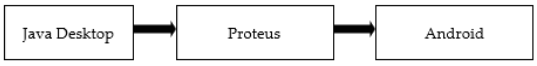

Figure 3.2 Research Roadmap

3.4. Data Collection Techniques

a. Conduct direct obervation by reviewing the needs of tools and materials.
b. The number of basic electronic components used is 10 – 15 pieces.
   - 6 pcs resistors
   - 5 pcs Led
   - 2 Capacitors
   - 1 diode
   - 1 push button
   - 2 transistors

3.5. Research Process

The research process was carried out to produce a basic electronic component introduction program based on java desktop

1) Prepare components and tools for research based on the needs needed to prototype as simulation tools such as PCB boards, Tinol, Wires, Components, Solder, 5V adapters
2) Creating a simulation design using proteus software before proceeding to the assembly stage, The proteus is simulated based on the function of the

components used, using a 5V input design and an output using Led lights.

3) After simulating the proteus correctly, then the components are assembled on the Pcb according to the simulated on the proteus, connect the 5V power to the resistor then to the + Led and ground is connected to – Led (Resistor), connect the 5V power to the + capacitor and + Led then the ground is connected to the – capacitor and – Led (Capacitor), connect the 5V power to the + diode then connect – the diode to + Led and the Ground is connected to – Led (Diode), connect the power 5V to R1,R2 then R1 is connected to + Led ,R2 is connected to the transistor base , - Led is connected to the transistor collector, and ground is connected to the transistor emitter (transistor), connect the power 5V with leg 1 push button then leg 2 push button is connected to + Led and ground is connected to - Led (push button)
4) Furthermore, conduct a test to see if the tools and components work according to their function or not, if not, they must press the installation of components on the Pcb
5) If it has run well, it will produce the output of an Led light that lights up according to the function of the component, then shooting when testing the function of the component.
6) The next process is to enter data information about components into the MySQL Database
7) Displaying components to the Java desktop

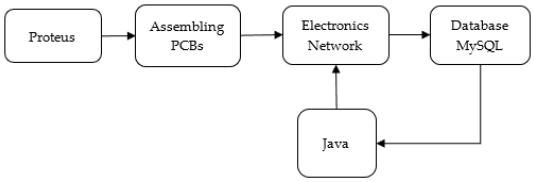

Figure 3.3 Flow of the Research Process

1) Simulate the proteus according to the function of the component until it produces the appropriate output.
2) Designing and assembling components on PCB holes as a component network medium.
3) Conducting a test on the circuit to ensure that the circuit is suitable, if it is not suitable, it must go through assembly or rechecking.
4) Then input the set data into the MySQL database which is then displayed on the java desktop.

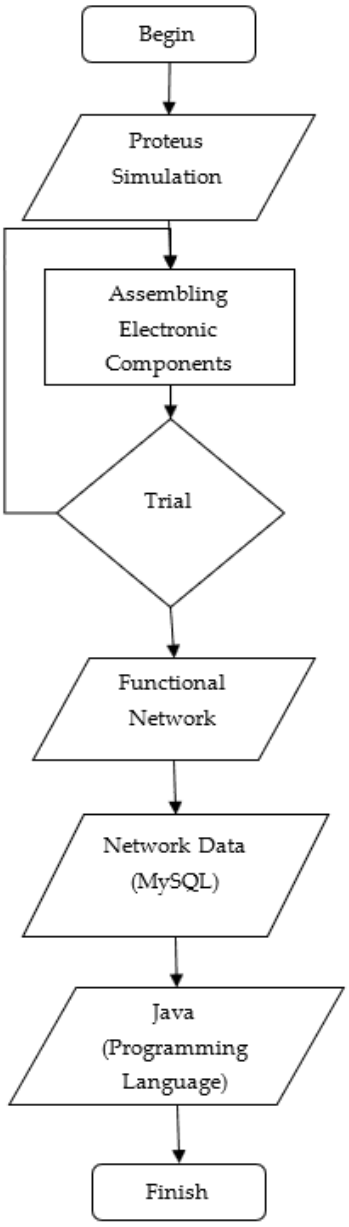

Figure 3.4 Flowchart of the Research Process

Resistor circuit with 5V power input and output in the form of Led

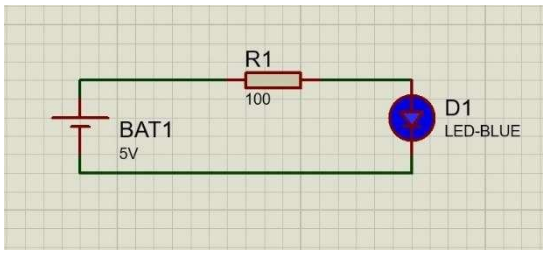

Figure 3.5 Proteus Resistor Simulation

Capacitor series with 5V power input and output in the form of led and resistor as a safety LED

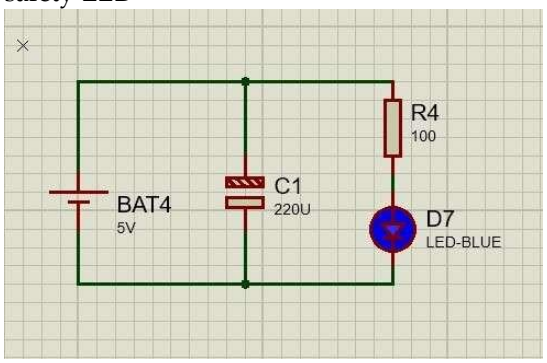

Figure 3.6 Capacitor Proteus Simulation

Diode circuit with 5V power input and output in the form of led and resistor as a Led safety

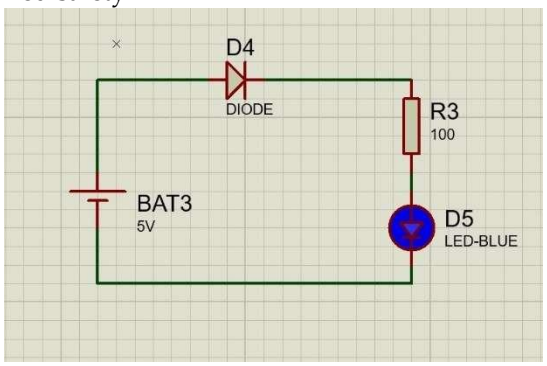

Figure 3.7 Proteus diode simulation

Transistor circuit with 5V power input and output in the form of LEDs and 2 resistors that function R5 as the base voltage input of the capacitor and R6 as the LED safety

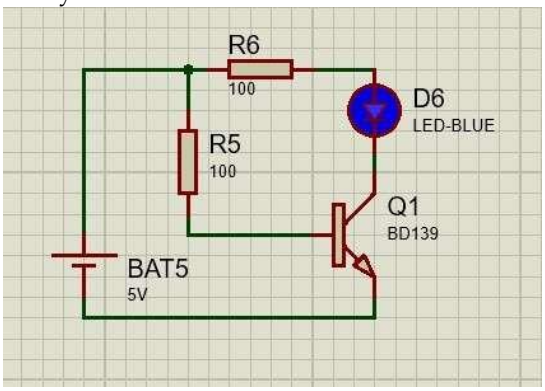

Figure 3.8 Transistor Proteus Simulation

A series of push buttons with a 5V power input and output in the form of LEDs and resistors as LED safety

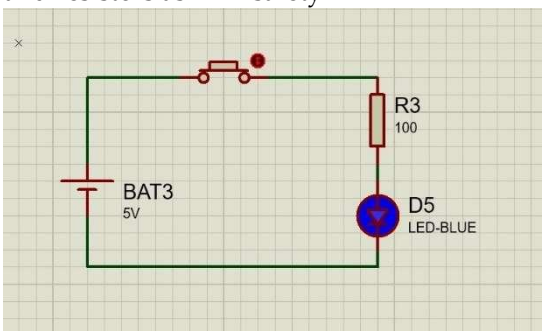

Figure 3.9 Simulation of Proteus Push Button

Database Design

Table : Components

Column	Type	Long	
id	Int	11	Primary key, Auto Increment
nama_komponen	varchar	50	
description	text		
picture	varchar	250	
symbol	varchar	250	
video	varchar	50	

4. RESULTS AND DISCUSSION

4.1 Research Results

The research results obtained during the process of simulating and assembling device components, making programs and conducting tests of the component series work quite well based on the function and usability of the components.

4.1.1 Basic Component Network

This set of components can provide insight and information about the workings and functions of some of the basic components that we are learning.

The circuit consists of a PCB board, resistor, header pin as connector, Led as output indicator and cable as input

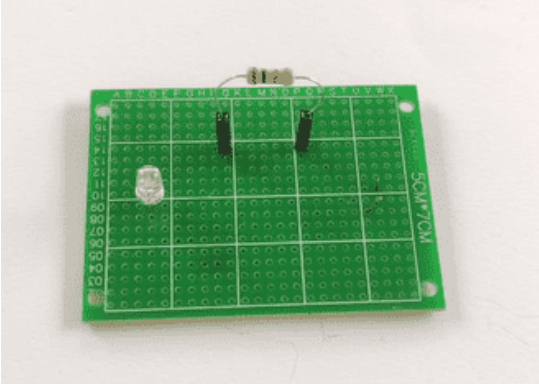

Figure 4.1. Resistor Assemblies

This circuit consists of a PCB board, a capacitor, a header pin as a connector, a Resistor as a safety Led and Led as an output indicator and a cable as an input

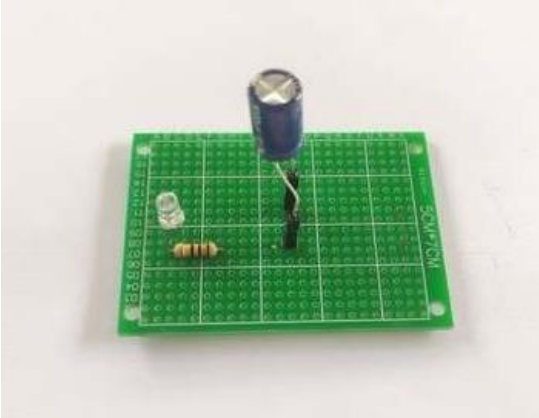

Figure 4.2. Capacitor Assemblies

This circuit consists of a PCB board, a Diode, a header pin as a connector, a Resistor as an LED safety, and Led as an output indicator and a cable as an input

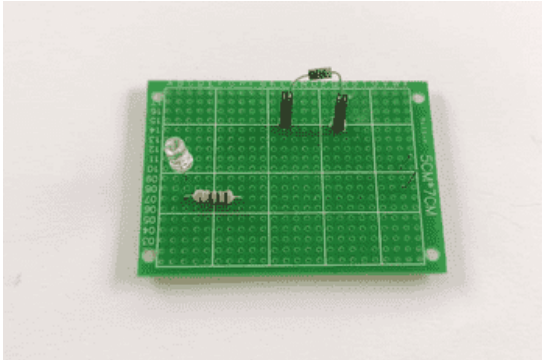

Figure 4.3. Diode Array

This circuit consists of a PCB board, Transistor, header pin as a connector, 2 Resistors as led safety, and 2 Resistors as a base pin connector of the transistor as well, 2 LEDs as an output indicator and a cable as an input

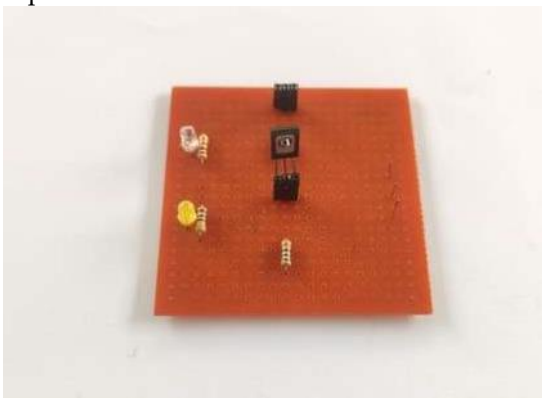

Figure 4.4. Transistor Assemblies

This circuit consists of a PCB board, push button, Led as an output indicator and a cable as an input

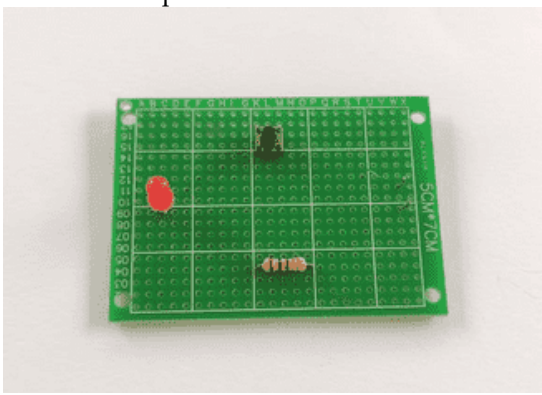

Figure 4.5. Push Button Series

In this simple circuit can work according to the function and way of working with a 5V power input test and an output in the form of Led, this circuit is designed to make it easier to understand the concept and function of the component, which previously

went through a simulation process on the proteus.

Here's a simple test using the inputs and outputs of the circuit:

Table 4.1 Resistor Test Results

It	Component	Value	Result	Trial date
1	Resistor	1K	LED lights up brightly	22 Nov 2024
2	Resistor	100K	LED dimly lit	22 Nov 2024

Table 4.2 Capacitor Test Results

It	Component	Value	Result	Trial date
1	Capacitor	100uf	LED lights up with short duration	22 Nov 2024
2	Capacitor	1000uf	LED lights up for longer duration	22 Nov 2024

Table 4.3 Diode Test Results

It	Component	Condition	Result	Trial date
1	Diode	Forward bias	LED lights up	22 Nov 2024
2	Diode	Backward bias	LED Not Illuminating	22 Nov 2024

Table 4.4 Transistor Test Results

It	Component	Kind	Result	Trial date
1	Transistor	NPN	LED lights up brightly when the base foot is positively current	22 Nov 2024
2	Transistor	PNP	LED illuminates when the base leg is negatively tensioned	22 Nov 2024

Table 4.5 Push Button Test Results

It	Component	Condition	Result	Trial date
1	Push Button	Unpressed	LED does not light up	22 Nov 2024
2	Push Button	Pressed	LED Illuminated	22 Nov 2024

Each experiment produced a different state, and each component worked according to the function of the component itself, from which the results could be used as a reference as the basis for how the components worked for learning.

4.1.2 How it works

Here's how the set of components works:

1) Components function if in the flow of electric current which then works in the way of the component, resistors as inhibitors, capacitors as temporary voltage storage, diodes as rectifiers, transistors as switches and push buttons as switches.
2) The data obtained from the trial is then entered into a database which is then displayed on the desktop.

4.2 Discussion

The results of the implementation of the TASS that have been carried out based on the research method are as follows:

4.2.1 Trial

The test was carried out using 5v power and Led output, the components worked according to their function, as shown in the following test results:

a. **Resistor**

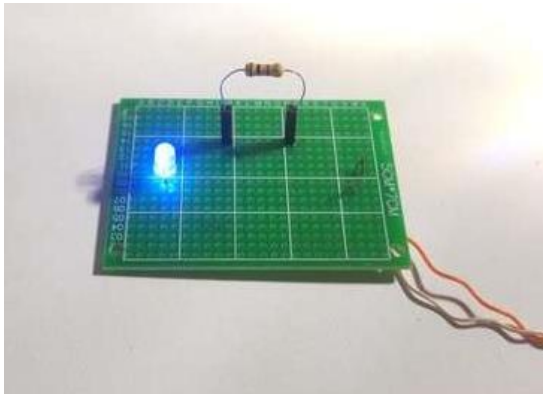

Figure 4.6. 1K Resistor range

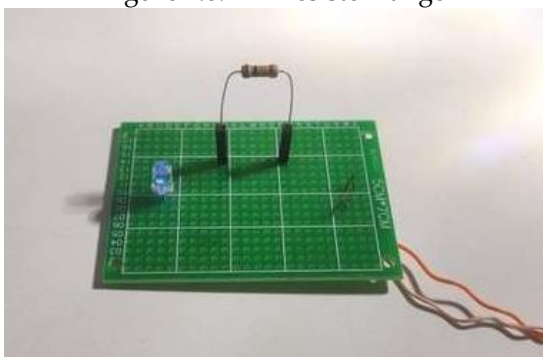

Figure 4.7. 100K Resistor Circuits

The results of the resistor test show that the resistance value affects the intensity of the light produced by the Led. On the 1K resistor, the LED brightly shows that the current flows quite large because the resistance provided is small. On the other hand, on the 100k resistor, the LED lights dimly which shows that the current flowing is smaller because the resistance given is large. This result is in accordance with the principle of resistor, which is to inhibit the electric current where the greater the value of the resistance, the smaller the current flowing.

b. **Capacitor**

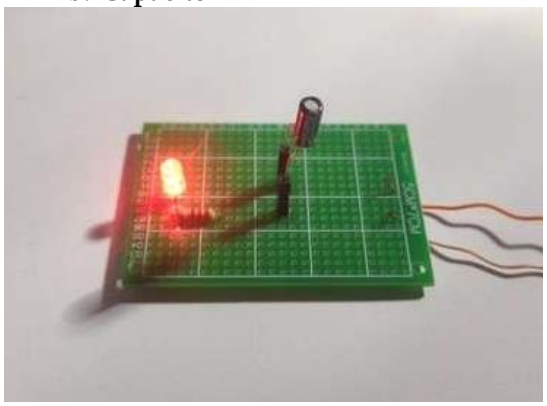

Figure 4.8. 100uf Capacitor Series

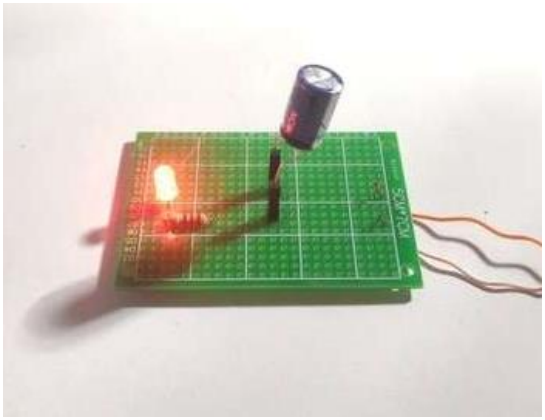

Figure 4.9. 1000uf Capacitor Range

The results of the capacitor test show that the capacitance value affects the duration of the LED flame in the circuit. On capacitors with a value of 100 μF, the LED lights up for a short duration, which indicates the capacitor stores and discharges electrical charge faster. In contrast, on capacitors with a value of 1000 μF, the LEDs light up for a longer duration, which indicates the capacitor stores and discharges electrical charges more slowly. This is according to the basic principle of capacitors, which is to store temporary electrical charges and discharge them according to their capacitance value, where the greater the capacitance, the longer it takes to charge and discharge the charge.

c. **Diode**

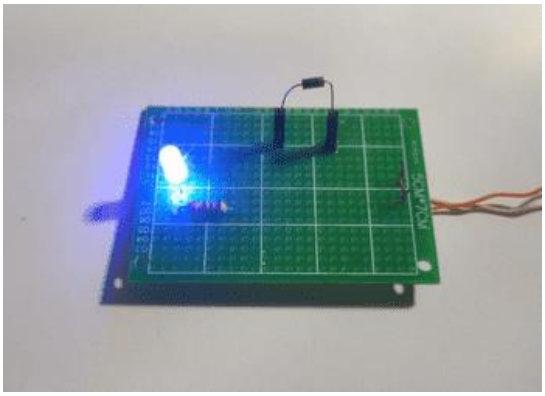

Figure 4.10. Advanced Bias Diode Network

Figure 4.11. Backward Bias Diode Circuits

The results of the diode test showed that the direction of the diode mounting affected the ability of the electric current to flow in the circuit. In forward bias conditions, the diode allows current to flow, so the LED lights up. In contrast, in a reverse bias condition, the diode blocks the flow of current, so the LED does not illuminate. These results confirm the basic principle of diodes as electronic components that allow only one-way flow of current.

d. **Transistor**

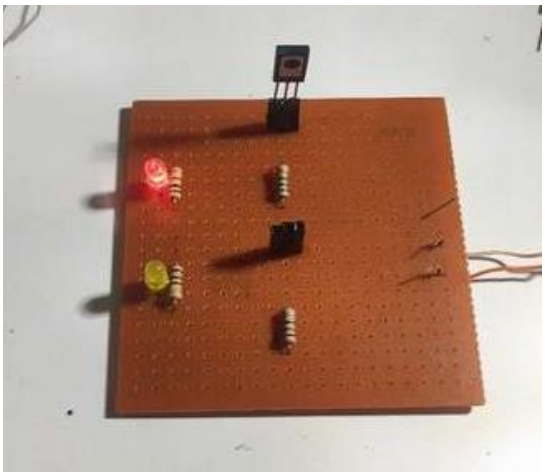

Figure 4.12. NPN Transistor Network

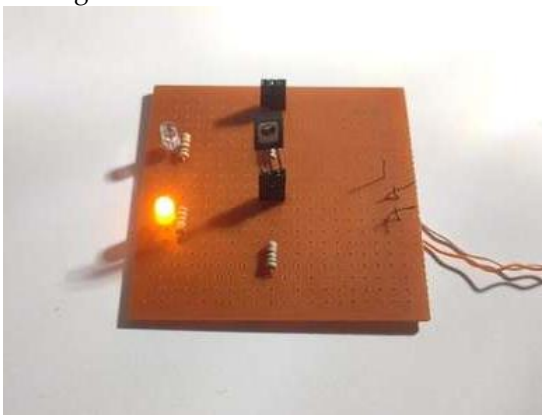

Figure 4.13. PNP Transistor Network

The results of the transistor test show that the type and configuration of the transistor affect the current flow in the circuit. On NPN transistors, the LED illuminates brightly when the base terminal is energized, indicating that the NPN transistor is functioning as a switch. In contrast, in a PNP transistor, the LED lights up brightly when the base terminal is subjected to a negative voltage, This results in as per the basic principle of the transistor as a amplifier component or electronic switch that works by controlling the flow of current using a small voltage or current at the base terminal.

e. **Push Button**

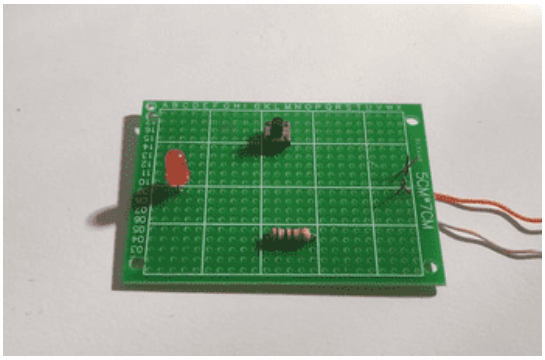

Figure 4.14. Push Button Network Not Pressed

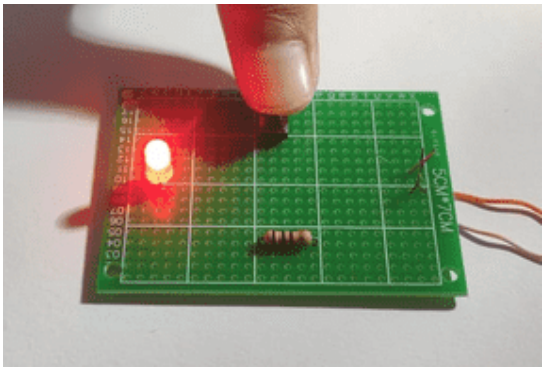

Figure 4.15. Push Button Chains Pressed

The test results of the push button show that this component functions as a simple mechanical switch that connects or disconnects the flow of current in the circuit. When the push button is pressed, the LED lights up brightly, indicating that the push button is connecting the circuit. Conversely, when the push button is released, the LED does not light up, indicating that the push button disconnects the circuit so that the current cannot flow. These results confirm the

basic function of the push button as a manual on/off controller in various electronic circuits.

4.2.2 Desktop View

The results of the information obtained are then uploaded to the MySQL server which is then displayed on the desktop.

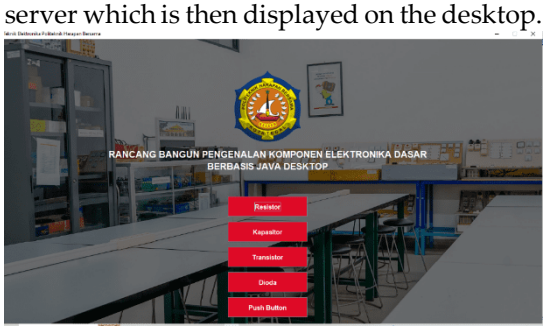

Figure 4.16. Desktop View

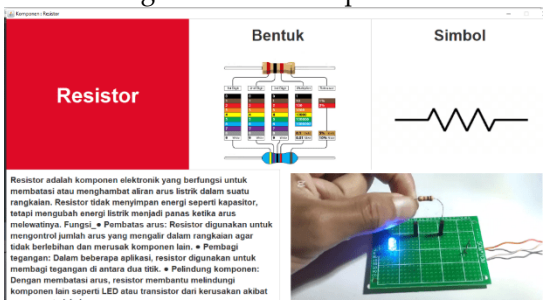

Figure 4.17. Picking Resistor components via desktop

Figure 4.18. Casting capacitor components via desktop

4.2.4 Source Code Java

ElektronikaJava.java

```
package elektronikajava;

import connection.ConnectionDB;
```

Figure 4.19. Picking up transistor components via desktop

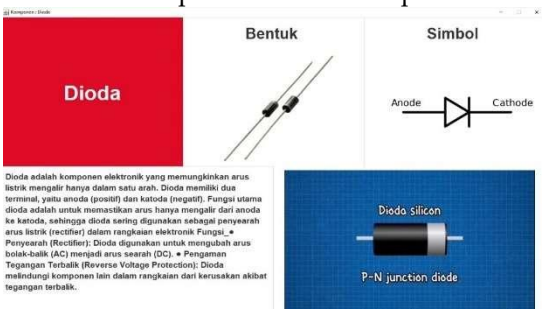

Figure 4.20. Picking diode components through the desktop

Figure 4.21. Deploying push button components via desktop

4.2.3 DataBase View

The database contains detailed information about the various basic components of the electronics, including component names, component descriptions, symbols and how to use them, and this data is then used as a desktop viewer component.

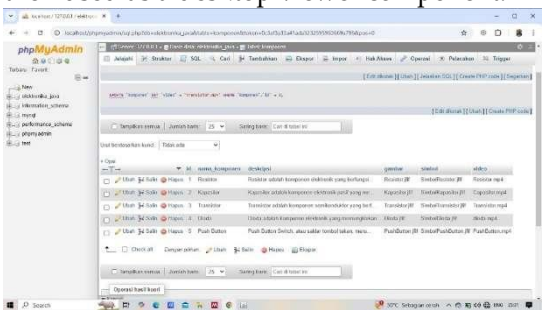

Figure 4.22. Database view

```
import java.awt.Color;

/**
 *
 * @author italbabz
 */
public class ElektronikaJava {

   public static void main(String[] args) {
      // TODO code application logic here
      JFrame frame = new JFrame("Teknik Elektronika Politeknik Harapan Bersama");
      frame.setResizable(false);
      frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      ……..
      } catch (IOException I am running a few minutes late; my previous meeting is running over.
SQLException ex) {
         Logger.getLogger(ElektronikaJava.class.getName()).log(Level.SEVERE, null, ex);
      }

      frame.pack();
      frame.setLocationRelativeTo(null);
      frame.setVisible(true);
   }
}
```

DetailData.java

```
package elektronikajava;

import connection.ConnectionDB;
import java.awt.BorderLayout;
import java.awt.Color;
/**
 *
 * @author italbabz
 */
public class DetailData {
   public DetailData(int id) {
      // TODO code application logic here
      Connection conn = ConnectionDB.getConnection();
      Statement st;
      String nama_komponen = null;
      String deskripsi = null;
      String gambar = null;
      center.add(panelDeksripsi);
      center.add(panelVideo);
      ……..
      frame.add(main);
      frame.pack();
      frame.setVisible(true);
```

```
    }
}
```

5. CONCLUSIONS

1) This research discusses the introduction of basic electronic components based on Java Desktop.
2) The software is designed to help students understand the various components of electronics more easily.
3) This software has proven to be effective in improving students' understanding of electronic components.
4) The presentation of clear information makes it easier for students to understand the functions and applications of components such as resistors, capacitors, and transistors.
5) The software provides practical simulations that resemble real applications of electronic components.
6) This software can be a tool for lecturers to optimize learning time in class.
7) Students feel more confident in understanding the basic concepts of electronics thanks to this application-based learning.

SUGGESTION

1) Added features to customize the interface and functions of the software as per the user's needs, such as selecting specific learning modules or interface color schemes.
2) Integrate features that allow users to work together in real-time, such as joint simulations or sharing network designs.
1) 3) Add a web-based version for easy access without installation.

REFERENCES

[1] A. Jafar, E. Suhardi Rahman, and S. Kasim, "Android-Based Electronics Component Recognition Application: A Case Study in Analog and Digital Electronics Courses," vol. 19, no. 1, pp. 2721–9100, 2021.

[2] B. Hardiyana and Y. Nopandi, "Design and Build Object-Oriented Programming Learning Applications with Java Language," *Sist Study Program. Inf. Univ. Komput. Indones.*, 2014.

[3] D. Reyval, "Basic Transistor Electronics and How They Work," *J. Portal Data*, vol. 2, no. 4, pp. 1–9, 2022.

[4] B. Hartono, "Java Programming for Beginners," *Publisher of Yayasan Prima Agus Tek.*, 2022.

[5] A. Rombekila, "Design and Build a Basic Electronics Learning Trainer at Amamapare Timika Polytechnic," *J. Tek. AMATA*, vol. 4, no. 1, pp. 74–80, 2023.

[6] B. Qirom, Niam and A. Darmawan, *Analog Electronics Textbook*. NEM Publishers, 2022.

[7] R. R. Ibrahim and B. Yulianti, "Design and Construction of Iot-Based Monitoring of Pln Electricity Usage," *J. Teknol. In.*, vol. 11, no. 2, 2022.

[8] K. B. Pranata, C. Sundaygara, M. Sayadi, S. S. Sholikan, H. Wijaya, and M. Ghufron, "Workshop on Improving the Quality of Human Resources for Prospective Physics Teachers through Passive and Active Electronics Components Practicum Media," *J. Service. Masy. Equator*, vol. 3, no. 2, pp. 46–60, 2020.

[9] Z.-Z. Tan and Z. Tan, "The basic principle of m× n resistor networks," *Commun. Theor. Phys.*, vol. 72, no. 5, p. 55001, 2020.

[10] M. F. Hakim, S. Nurhadi, H. D. F. Amaral, and S. L. Hermawan, "Shunt Capacitors as Bus Voltage Correctors in Substations," *Elposys J. Sist. Electrical*, vol. 10, no. 1, pp. 30–35, 2023.

[11] M. A. Praztyio, "Dioda," *Electron. Basis*, p. 240, 2016.

[12] W. Istiana, "Basic Electronics Regarding the Usability of Resistors and Transistors," *J. Teknoinfo*, vol. 2, no. 4, p. 46, 2022.

[13] M. D. Riski, "Design of Automatic Lighting in Arduino-Based Aircraft Cargo Compartment Using Push Botton Switch as Learning at the Surabaya Aviation Polytechnic (udah)," *Pros. Semin. Nas. Inov. Technol. Flight*, pp. 1–9, 2019.

[14] S. D. R. Arianto, "RESISTOR CIRCUIT WITH INDUCTOR."

[15] J. Napitupulu, D. Tinambunan, and L. Sitinjak, "A Study on the Efficiency of Three-Phase Transformers," *J. Teknol. Energi Uda J. Tek. Elektro*, vol. 10, no. 1, pp. 8–16, 2021.

[16] K. Umam *et al.*, "SOCIALIZATION OF COMPUTERS AND JAVA PROGRAMMING TO STUDENTS OF SMK KIHAJAR DEWANTARA JAMBE," *Abdi J. Publ.*, vol. 1, no. 3, pp. 316–321, 2023.