Quantum Computing Analysis in Electricity Circuit Using Python

Andy Satria[1], Fanny Ramadhani[2],
[1] Department of InformationTechnology, Universitas Dharmawangsa, Indonesia
[2]Department of Computer Science, Universitas Negeri Medan, Indonesia

ABSTRACT

This study aims to determine the quantum computing analysis in electrical circuits using python ptogram. Python is a programming language that can execute a number of multi-use instructions directly (interpretive) with the object orientation method. Python is the easiest programming language to understand. Python was created by a Dutch programmer named Guido Van Rossum. In the digital era, all professions related to technology and computers are considered promising in the future, one of which is programmer. There are many things you can create while pursuing the programmer world, such as software, smartphone applications, GUI programs, CLI programs, Internet of Things, games and others. Where quantum computing has inspired countless scientists, physicists and computer scientists. The development of the field of quantum computing can be seen from several demonstration experiments in the last two decades (C´orcoles, et al., 2019). Quantum information processing is a field that includes quantum computation, quantum cryptography, quantum communications, and quantum games, this field brings with it the idea of using quantum mechanics more than classical mechanics to model information processing. Quantum computing theory is not about changing the physical substrate on which computations are made from classical to quantum, but rather changing the idea of computing itself. This change can be seen from the change in the basic unit of calculation on the computer, namely the bit, which is changed to the quantum bit or qubit.

Keyword : Electrical circuits, Python, Quantum Computing

Corresponding Author:
Andy Satria,
Department of Information Technology,
Universitas Dharmawangsa,
Jalan Kol. Yos Sudarso No.224, 20115 , Indonesia.
Email: andysatria@dharmawangsa.ac.id

1. INTRODUCTION (10 PT)

The electric circuit is part of the science of electricity and magnetism as a whole. In an electric circuit, the amount of electric current or the flows of electric charges is limited by an electrical component called an electric resistance. An electric component specifically made to produce electrical resistance is called a resistor. In complex circuits such as radio and television circuits, resistors are used to limit the electric current and the potential difference to a certain value so that the electrical components others in the chain may function well (Giancoli, 1998). Electricity is a very important necessity and cannot be avoided in everyday life. In fact, almost every equipment and item in the house uses electricity such as lights, televisions, and refrigerators when the cable is connected to the socket, it will turn on and function. This is because there is energy in the form of an electric current. This research also discusses Quantum Computing. the term "quantum" is borrowed from the world of physics to mean the interactions that convert energy into light. This means in quantum learning, changing the various interactions that occur in learning activities.

The purpose of this research is to test Quantum Computing Electrical Circuits using the Python Program with USB Relay Testing using the Python Program.

2. RESEARCH METHOD/MATERIAL AND METHOD/LETERATURE REVIEW

The methodology used in this research is to test the Quantum Computing Electricity Series using the Python program. Python is a multi-purpose interpretive programming language. with a design philosophy that focuses on code readability. Python is claimed to be a language that combines capabilities, capabilities, with a very clear code syntax, and is equipped with a large and comprehensive

standard library functionality. Python supports multi programming paradigms, primarily; but not limited; in object oriented programming, imperative programming, and functional programming. One of the features available in python is as a dynamic programming language that is equipped with automatic memory management. As in other dynamic programming languages, pyhton is generally used as a scripting language, although in practice the use of this language covers a broader context of use which is generally not done using a script language. Python can be used for various software development purposes and can run on various operating system platforms. In this study, several electrical circuits using USB Relay were tested using the Python program. So the programming used is the USB interface programming. The USB Relay Module uses the LibUSB library. This library is available by default on the linux operating system. This research also discusses Quantum Computing. Although not everything that computers currently do can be replaced by quantum computers, basically various applications that require high performance and fast computing capabilities will be able to benefit from the existence of this quantum computer. Illustration-1 shows the various potential applications of quantum computers in various industrial fields. Various digital computer processing that we know today is based on base 2 numbers (base number 2) which we know as binary numbers which at one time can exist in just 2 states, namely '0' or '1' (not simultaneously), this is the base for what we know as binary digits (bits). A collection of eight bits (8 bits) forms 1 Byte. 1024 (210) Bytes make 1 Kilo Bytes (1 KB), 1024 x 1024 (220) Bytes make up 1 Mega Bytes (1 MB), and 1024 x 1024 x 1024 (230) Bytes make up 1 Giga Bytes (1 GB) . The basis for the formation of this bit is a transistor (which is generally formed from Silicon and Germanium), where there is an electronic input gate which by controlling the input voltage to be less or more than a certain threshold, resulting in a low '0' or high '1' thus forming one of the 2 states of a bit. Currently, a transistor is so small that it is measured in just a few dozen nanometers (nm).
The research framework is as follows:

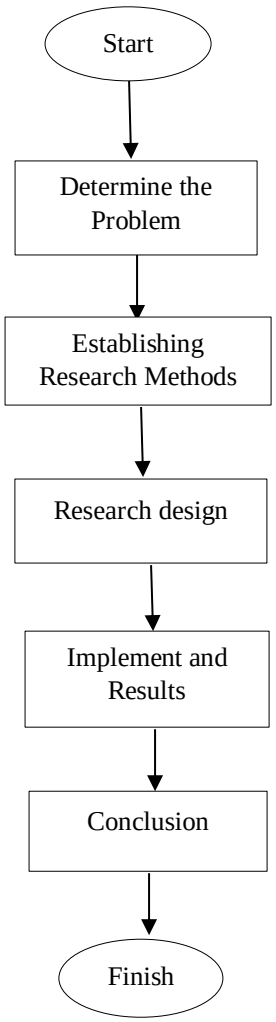

Figure 1. Flowchart of research framework

3. RESULTS AND DISCUSSION

A. USB Relay Testing Program Using Python Language

USB Relay is a relay driver module with a USB port connection / interface. This driver module does not use a USB-to-Serial converter. So the programming used is the USB interface programming. The USB Relay Module uses the LibUSB library. This library is available by default on the linux operating system. For Windows operating systems, the LibUSB-Win32 library installation process is required.

In accordance with the example above, this paper discusses an example of a USB Relay test program complete with test photos and test results. In this test, I used a USB-4REL module with a load of an incandescent lamp.

Figure 2.USB Relay Testing

The purpose of this test is to find out:

1. How to control the USB-4REL using Python programming language
2. How well the USB-4REL performs So, let's go straight, here is a list of the USB-4REL testing program in Python.

```
#-------------------------------------

# Name: usb4rel.py

# Purpose: TESTING PyUSB - USB-4REL

# Author: Chandra MDE

#-------------------------------------



import usb.core

import time
```

```
def main():

 ec = 0 # error counter

 d = 0.05 # delay



usb4rel = usb.core.find(idVendor=5824,
idProduct=1500)

if usb4rel == None:
```

```
print "USB-4REL tidak ditemukan!"
 exit
 else:
 ID = usb4rel.ctrl_transfer(0xc0, 0, 0, 0, 100,
1000)
 print ID.tostring() #tampilkan ID modul

for i in range(1,1000):
 print "Perulangan ke-", i,
 print " Error count: ", ec
#relay1
 try:
```

```
 usb4rel.ctrl_transfer(0xC0, 1, 1, 1, 100,
1000) #Relay-1 ON

 except:
 ec = ec + 1
 print "E: Relay1ON"
 for j in range(1,10):
 time.sleep(1)
 usb4rel = usb.core.find(idVendor=5824,
idProduct=1500)
```

```
if usb4rel != None:
 break
 usb4rel.ctrl_transfer(0xC0, 1, 1, 1, 100,
1000)

time.sleep(d) #tunda 1 detik

try:
 usb4rel.ctrl_transfer(0xC0, 1, 0, 1, 100,
1000) #OFF
 except:
```

```
def main():

ec = 0 # error counter

d = 0.05 # delay



usb4rel = usb.core.find(idVendor=5824, idProduct=1500)

if usb4rel == None:


print "USB-4REL tidak ditemukan!"

exit

else:

ID = usb4rel.ctrl_transfer(0xc0, 0, 0, 0, 100, 1000)

print ID.tostring() #tampilkan ID modul



for i in range(1,1000):

print "Perulangan ke-", i,

print " Error count: ", ec

#relay1

try:

usb4rel.ctrl_transfer(0xC0, 1, 1, 1, 100, 1000) #Relay-1 ON

except:

ec = ec + 1

print "E: Relay1ON"

for j in range(1,10):

time.sleep(1)

usb4rel = usb.core.find(idVendor=5824, idProduct=1500)


if usb4rel != None:

break

usb4rel.ctrl_transfer(0xC0, 1, 1, 1, 100, 1000)



time.sleep(d) #tunda 1 detik



try:

usb4rel.ctrl_transfer(0xC0, 1, 0, 1, 100, 1000) #OFF
```

```
#relay3

try:

usb4rel.ctrl_transfer(0xC0, 1, 1, 3, 100, 1000) #Relay-3 ON
```

```
except:

ec = ec + 1

print "E: Relay3ON"

for j in range(1,10):

time.sleep(1)

usb4rel = usb.core.find(idVendor=5824, idProduct=1500)
```

```
if usb4rel != None:

break

usb4rel.ctrl_transfer(0xC0, 1, 1, 3, 100, 1000)



time.sleep(d) #tunda 1 detik
```

```
try:

usb4rel.ctrl_transfer(0xC0, 1, 0, 3, 100, 1000) #OFF
```

```
ec = ec + 1

print "E: Relay3OFF"

for j in range(1,10):

time.sleep(1)
```

```
usb4rel = usb.core.find(idVendor=5824, idProduct=1500)

if usb4rel != None:

break

usb4rel.ctrl_transfer(0xC0, 1, 0, 3, 100, 1000)
```

```
time.sleep(d) #tunda 1 detik



#relay4

try:

usb4rel.ctrl_transfer(0xC0, 1, 1, 4, 100, 1000) #Relay-4 ON
```

```
except:

ec = ec + 1

print "E: Relay4ON"
```

```
for j in range(1,10):
time.sleep(1)
usb4rel = usb.core.find(idVendor=5824,
idProduct=1500)
if usb4rel != None:
break
usb4rel.ctrl_transfer(0xC0, 1, 1, 4, 100,
1000)

time.sleep(d) #tunda 1 detik
try:
usb4rel.ctrl_transfer(0xC0, 1, 0, 4, 100,
1000) #OFF
except:
ec = ec + 1
print "E: Relay4OFF"
for j in range(1,10):
time.sleep(1)
usb4rel = usb.core.find(idVendor=5824,
idProduct=1500)
if usb4rel != None:
break

usb4rel.ctrl_transfer(0xC0, 1, 0, 4, 100,
1000)

time.sleep(d) #tunda 1 detik

if __name__ == '__main__':

main()
```

The program above will carry out the process of controlling the relay on / off at fast intervals, namely 0.05 seconds (d = 0.05). The process of controlling the on / off relay is repeated 1000 times.

Whenever controlling a relay, the program uses try ... except to ensure the program can catch errors when a control failure occurs so that it can repeat the control process.

The USB-4REL module is equipped with the WATCHDOG feature. This feature will ensure that the controller is reset in case of system failure (hang condition) due to noise and spikes when the relay moves the load.

If the on / off relay control process fails, which is very likely the result of a microcontroller system failure, the program will repeat 10 times while trying to retrieve (update) the USB communication handle between the PC and the USB-4REL. The process of updating the handle is necessary because the microcontroller automatically resets itself when a system failure occurs due to the WATCHDOG feature. In this way, it is almost certain that the relay control command (on / off) will succeed.

Figure 3. Relay Control (on / off)

From the results of the program execution, satisfactory results are obtained as shown in the following screenshot.

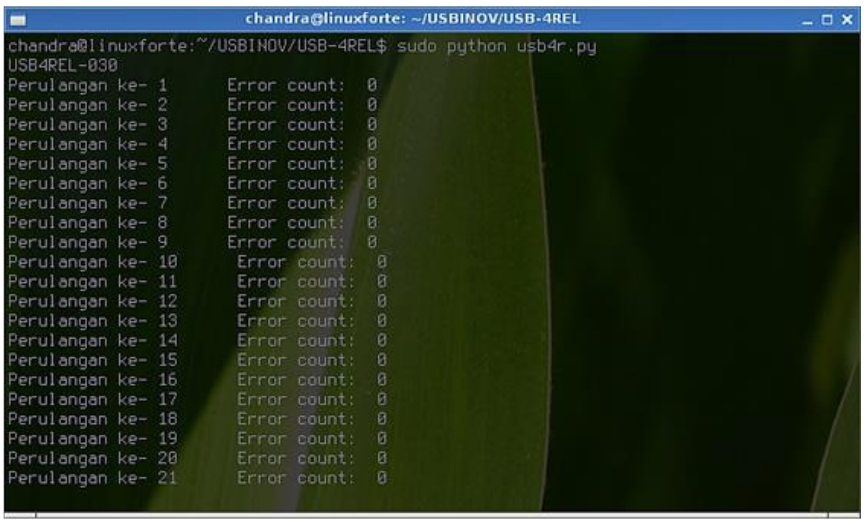

Figure 4. Test Results

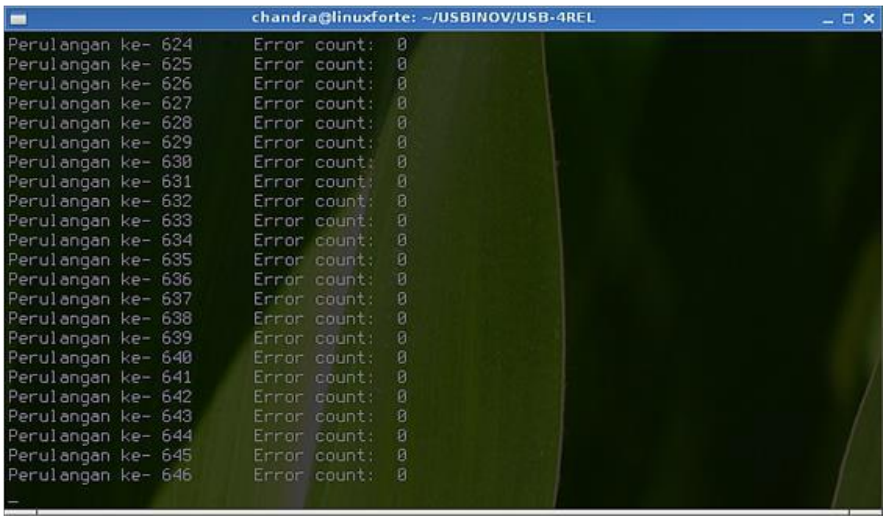

Figure 5. Test Results

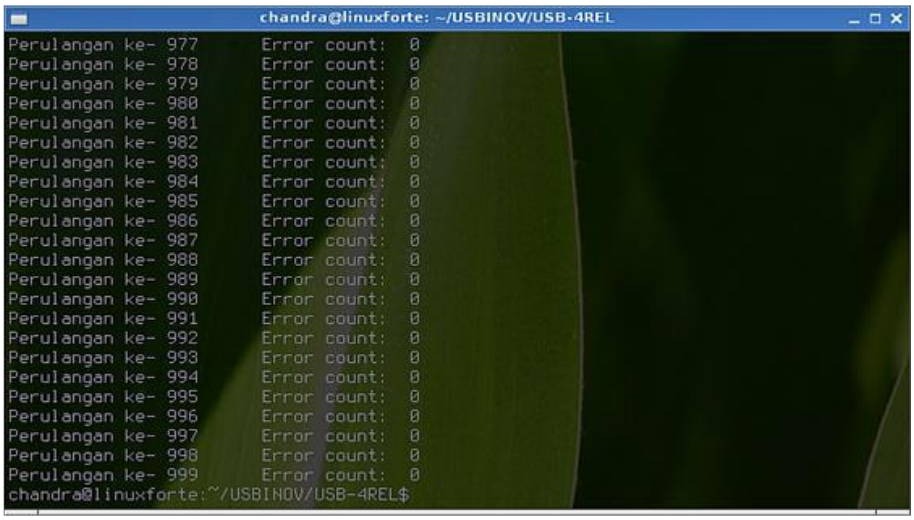

Figure 6. Test Results

4. CONCLUSION

From 1000 times the control with the incandescent lamp load with an on-off relay interval of 0.05 seconds, not even once a failure occurs!

With the proven good performance of the relay driver coupled with the WATCHDOG feature which ensures the controller is reset when it hangs and coupled with implementing try ... except in the program, the reliability of the relay system can be increased even further.

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