HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY

Report Project 2: A CLAP-SWITCH CIRCUIT

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Course:
ELECTRONIC DEVICES AND CIRCUIT(LAB)

May 8th, 2019

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Contents

Light Sensing Circuit

Group 1

May 8^{th}, 2019

1 Proceeding Steps

▶ Circuit Analysis When System In Stand By State (No Sound Detected).

$$V_{G1} = 0(V)$$

Applying Kirchhoff's Voltage Law, this expression can be inferred:

$$V_{R_{4,5}} = \frac{V_1.R_5}{R_4 + R_5} = \frac{12x10}{10+10}(V)$$

• Hence V_2 and V_3 share a common intput value of 6 volts, the output signal of Op-Amplifier is zero.

$$V_3 = V_2 = 6(V)$$
$$\Longrightarrow V_{2,3} = 0(V)$$

• Thus V_{out} takes the same value with V_{R_1} and V_{R_2}.

$$V_{out} = V_{R_1} = V_{R_2} = 6(V)$$

▶ Circuit Analysis When System In Operation State (Clapping-Sound Is Recorded).

$$V_{G1} \neq 0(V)$$

• If a sound is recorded. The microphone converts physical sound waves into electronic pulses. Eletronic signals run through wires to C_1 capacitor. C_1 is reposible for stablizing the pulses.

This results in changes of V_{mic}:

$$V_{mic} = 6 - V_{G1}(V)$$

Electronically, a current would run through the circuit.

$$i = \frac{V_{mic}}{R_2} = \frac{V_{mic}}{1K(\Omega)}(A)$$

Subsequently, V_{out} suffers a voltage drop down.

$$V_{out} = 6(V) - \frac{100K(\Omega).V_{G1}}{1K(\Omega)}(V)$$

• Theoretically, Amplification at the output port U_1 is demonstrated in the expression below:

$$U_1 = \frac{R3}{R_2}(V)$$

Applying Nodal Analysis, V_{ref} can be calculated by the following formular:

$$V_{ref} = \frac{R_6}{R_6 + R_7}$$

Similarly, through Nodal Analysis, V_{rec} estimation is illustrated bellow:

$$V_{Rec} = V_{out} - 0.7(V)$$

This results in $V_{rec} > V_{ref}$ which cause reversed polarity in the second amplifier.

$$U_2 = 0(V)$$

• Which means no electronic signal comes to Switch port.

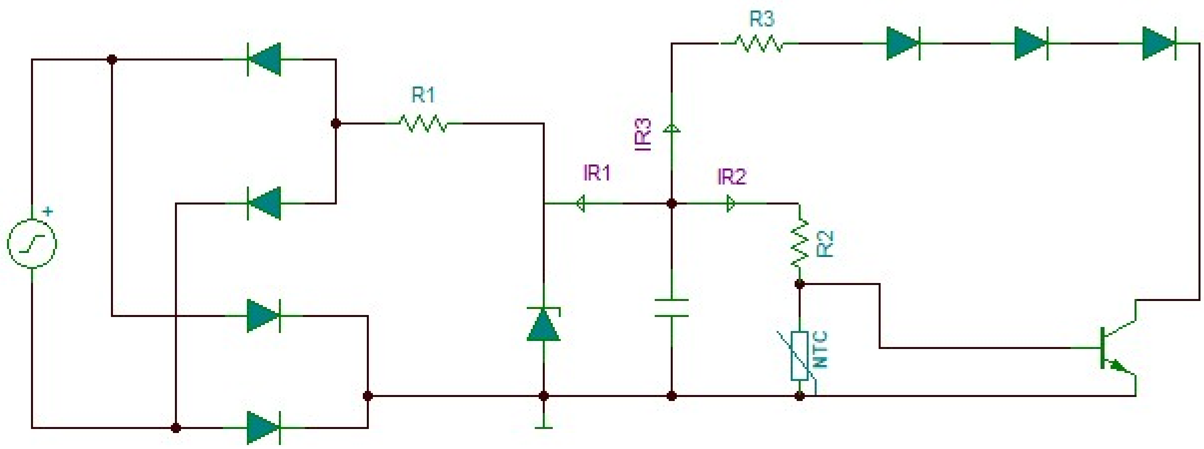
$$V_{sw} = 0(V)$$

Meanwhile, the subsequent voltage differentitation at the two ends of LED1 makes it glow.

• Hence V_{sw} is connected to signal pin of IC 4017 counter so that Y_1 would be shifted to HIGH.

In the meantime Y_1 triggers the collector pin of the C1815 NPN transitor C1815. At this point, a connection is established so that a current running though the coil is generated.

Magnetic field of the coil attracts the switch conducing to connection between COM (Communication port) and NC (Normally closed port) which signals control of the device.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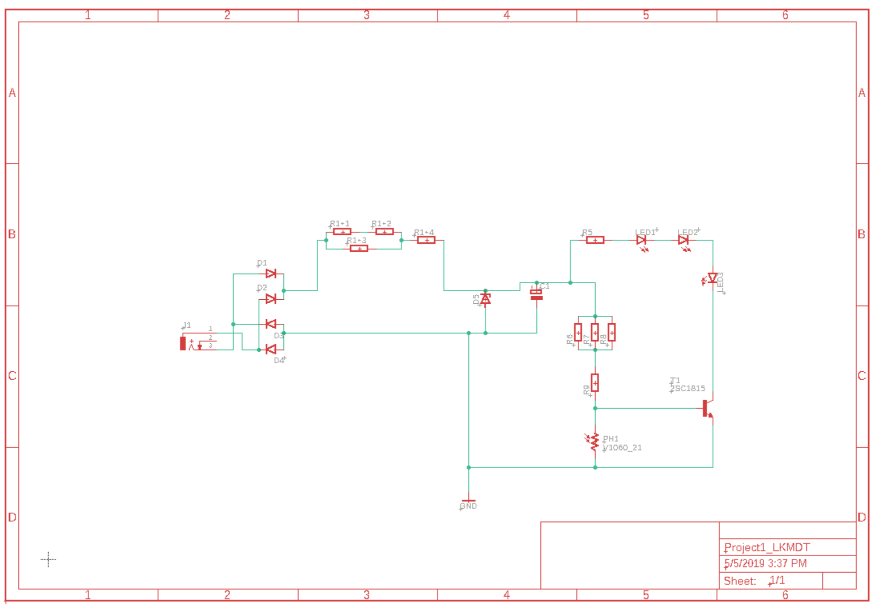
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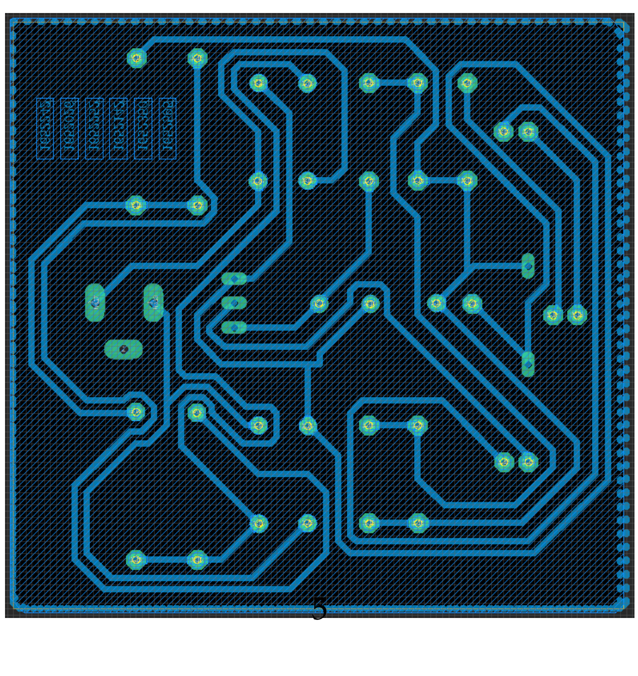

2 Results Evaluation

▷ Amplification: x100.
▷ Clapping range: 0.5(m).

3 Application

In spite of poor performance and improper functionality in noisy enviroment, the system performed flawlessly in quiet enviroment this could be attributed to the reason why clapping-switch system could be extensively used in controling home devices (lights, heating and air-conditioning systems, fans, etc).

Nonetheless, more advanced, the system could be used as a cheap and economic theif dectecting system which functions as an ear listen to unidentified sound.

However longer clapping range and more precise sound detection must be taken into account in order to make the system more user-friendly comercalizable.