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Development of Learning Media Simulation of Automatic Garden Lights Using the Proteus Application

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Abstract

With so many garden lights, gardeners often struggle to turn on or turn on garden lights manually, this study aims to make it easier for park officers or gardeners to turn on or turn off garden lights practically. Automatic garden light is a lighting system that runs automatically, this system can use light sensors such as LDR (Light Dependent Resistor), photodiode and others. However, this circuit system can also use a timer that has been set in time when the circuit or garden lights will turn on and off, this can happen because there is an automatic switch circuit that utilizes the characteristics of one of the light sensors, namely the LDR sensor whose resistance value can change according to Light intensity. During the day, the resistance value of the LDR will be very high and even reach its maximum value of 10k , this makes the current flowing to the base of the transistor very small, to activate the transistor 2N3055 a minimum voltage of 0.9V is needed to the base of the transistor. Because the resistance of the LDR is very large, the voltage that enters the base of the transistor will be very small or even non-existent so that the transistor is like an open switch and does not flow current. One type of automatic switch that is widely used today is a light switch with a light sensor, where the switch will turn off and on automatically because it is affected by the intensity of the light around it. For example, at night, we don't need to press the switch to turn on the lights, because the lights will turn on automatically. The results of this study indicate that the simulation experiment of garden lights using the Proteus application went well, the use of simulation using Proteus also aims to make it easier for us to understand an electronic component and how it works.

Keywords: Simulation, Automatic Garden Lights, Proteus, LDR, flowchart.

1. Introduction

Along with the times, effectiveness and efficiency are prioritized in various fields, humans are encouraged to be creative and innovate in the field of technology to create tools that are more effective and efficient (Kuncoro et al., 2020). The existence of technology is very helpful in human life in carrying out their various jobs. Technology makes humans feel free from difficulties, so that they will be facilitated in their respective jobs, as today, for example, computers have been created that have been created several years ago, thus creating a history of computers that need to be known (Sambas et al., 2019). The computer is a device that is currently widely used in everyday life, with this computer, we can use it as a support for human activities, one example of the use of computers can be for electronic

simulation learning media, electronic simulation simulations are a solution for students. beginners who want to learn about electronics (Campanile et al., 2020; Ula et al., 2021).

Electronic simulation is a learning method or training method for designing web-based electronic circuits or applications on a computer before conducting a direct circuit on the electronic device that we want to use, the benefit of doing a simulation is that we can analyze or evaluate the design stage before the actual stage, making it easier for learning media to students, minimize the failure of the initial circuit, the limitations of components in the market and save costs due to a failure when assembling it (Rusyn et al., 2021; Kusuma and Oktaviani, 2017; Syahminan and Hidayat, 2021). There are many electronic simulation applications that can be used, such as autodesk circuits, proteus, livewire, electronics workbench and others, but the one used in this study is the proteus application.

Proteus is a software for designing PCB (Printed Circuit Board) which is also equipped with Pspice simulation at the schematic level, before the schematic circuit is upgraded to a PCB, so that before the PCB is printed, we will know whether the PCB we are going to print is correct or not (Rusyn et al., 2022; Sanjaya et al., 2018). Proteus combines the ISIS (Intelligent Schematic Input System) program to create a circuit design schematic with the ARES (Advanced Routing and Editing Software) program to create a PCB layout from the schematic we created, this software is good for microcontroller circuit design. Proteus is also good for learning electronics such as the basics of electronics to microcontroller applications, this software if installed provides many examples of design applications that are included so that we can learn from existing examples (Hidayat et al., 2020; Chalh et al., 2020; Tunclap et al., 2015; Obe et al., 2020).

Proteus has many features, namely having the ability to simulate both digital and analog designs or a combination of both, supports interesting simulations and graphical simulations, has interactive peripheral models such as LED (Light Emitting Diode), LCD display (liquid crystal display). RS232 (data sent per bit), and various other types of libraries. supports virtual instruments such as voltmeter, ammeter, oscilloscope, logic analyzer, and others, has the ability to graphically display various types of analysis such as transient, frequency, noise, distortion, AC and DC, supports various types of analog components, supports open architecture so that we can include programs such as C++ for simulation purposes, supporting PCB creation which is updated directly from the ISIS program to the PCB-ARES program (Kiruthiga and Thangasamy, 2015; Song et al., 2012).

As for the advantages and disadvantages of Proteus, the advantages are that this software can perform microcontroller simulations up to the program level, the library is quite complete, there are two programs in one software, namely ISIS which is used for simulation and ARES which is used for PCB manufacture, so if the circuit we simulate is has been successful, all you have to do is convert the circuit file into its PCB format, Proteus is able to simulate analog, digital, a combination of the two, as well as components that are programmable devices, has the ability to display various types of analysis graphically such as transients, frequencies, noise, distortion, AC and DC, and others. For the lack of proteus, it requires higher computer specs, especially the speed of the processor and VGA, sometimes crashes often occur, especially those who use virtual instruments such as oscilloscopes., have not been able to represent the actual condition of the circuit, especially with regard to timing. For example, when the author simulates the seven-segment scanning method, the results in the simulation process are still not maximized (Wankhade and Dahad, 2011; Gill and Sachin, 2016; Saini et al., 2014).

In this study, the use of LDR is the most important component, this component is a resistor belonging to the transducer class because its resistance value can change by the intensity of light hitting it or simply, LDR is a light sensor. The brighter the light intensity that hits the LDR, the higher the light intensity, the lower its resistance. Conversely, the darker or lower the light intensity, the higher the LDR resistance value, thus inhibiting the electric current to flow, the LDR which is a light sensor can be used for electronic circuits such as automatic switches that work based on light intensity, where you can make a switch which automatically conducts electricity (ON) when exposed to light and will be blocked (OFF) when it is dark. One example of the LDR function is that it can be applied to garden lights, if night falls and the sun is dim, the garden lights will turn on automatically (Rathore and Channi, 2017; Singh and Bhullar, 2015; Santos et al., 2020; Shakti Priya et al., 2017).

The purpose of this research is to make it easier for us to understand an electronic component and how it works on Proteus, and to reduce the risk of loss or damage to the electronic components that we use. because many people know that electronic components are very easy and prone to damage, and if we don't simulate it first then we will increase the budget for one time engineering. Proteus is a software that uses a combination of ISIS and ARES so that it can make it easier for us to make component, electronics and PCB display layouts and simulate them. The good thing is that this software supports several ICs, for example if we want to simulate a running Led program then we can draw the IC used and observe the IC pins that make the Led work.

2. Materials and Method

2.1. Materials

In this research method, several materials are used for simulating the manufacture of automatic garden lights in Table 1.

Table 1. Components that will be used to simulate automatic garden lights on Proteus

No	Component	Amount	Mark
1	Transistor	2	625mW, 150^{o}C
2	Batterie	1	12 Volt
3	Resistor R1	1	1000 Ohm
4	Resistor R2	1	330 Ohm
5	LDR	1	ORP-12
6	Switch on	1	-
7	LED yellow	1	-
8	Diode	1	-
9	Relay	1	-

2.2. Method

Blood clam shell powder was soaked using 3.5% NaOH in a ratio of 1 : 1 w/v, heated in a saucepan at 100°C for 1 hour while stirring every 10 minutes. When finished, let it sit for a few hours until it cools and the shell powder settles, after that, the precipitate is filtered using a cloth while rinsing with sterile water, then dried in an oven at 200°C for 20 minutes. In this study, the method used for simulating automatic garden lights using Proteus is as follows:

2.2.1. Proteus App Installation

1. Download proteus 8 professional software and crack it
2. Extract the two files
3. Before installing Proteus 8 Professional, you must install "Microsoft. NET Framework 4" and "Microsoft Visual C++ 2008". Open setup proteus 8 and install.
4. In the Setup Type screen select "Use a locally installed license key"
5. When the license request appears, click "Browse for Key File", then locate or open the crack proteus 8 folders.
6. Click LICENSE.lxk, then click install then close.
7. Check the options on "Import Legacy Styles, Templates and Libraries"
8. Select Typical and wait for the installation process.
9. If the installation process is complete, do not open the file first.

10. Copy the "BIN" folder to the installation folder, for example: "C:\Program Files\Labcenter Electronics\Proteus 8 Professional"
11. Finally, Copy the 'MODELS' folder to the installation folder, for example: "C:\Documents and Settings\All Users\Application Data\Labcenter Electronics\Proteus 8 Professional" or "C:\Program Files\Labcenter Electronics\Proteus 8 Professional "

For the library folder, then search in the folder "C:\Documents and Settings\All Users\Application Data\Labcenter Electronics\Proteus 8 Professional, after opening the proteus application, the front screen will look like in Figure 1.

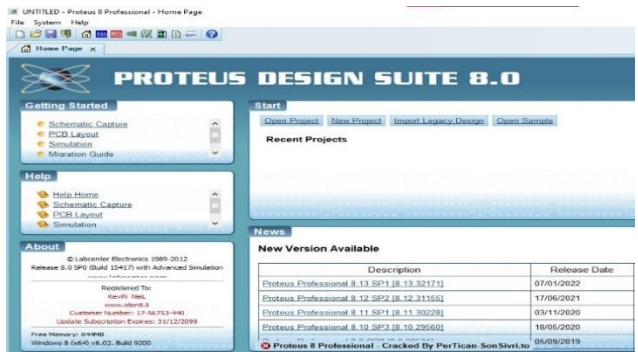

Figure 1. The main view of the Proteus application

2.2.2. Component Function Introduction

Before assembling the components in the schematic, of course, you must know the function of the components to be used, the battery here functions as a current source, the relay functions to move the switch contacts so that with a small current it can deliver a higher voltage electric current for the lamp to be turned on, diodes functions as a rectifier and the two transistors function as current rectifiers, resistors R1 and R2 function as voltage dividers, the switch functions as a breaker and connects the voltage or as an igniter or not, and the LDR light sensor works when it receives light, the resistance will be low and the current will go towards to R2, if the LRD receives light and does not go through the relay then the LED will light up, then if the LDR does not receive light then the resistance will be high and will make a current through the relay, after the light goes through the relay it will make the light turn on. To start the component search, the thing to do on the main proteus display, click new project and then click the sign that says ISIS, it will enter the schematic section, after that click the P sign to start the component assembly, for more details, see Figure 2.

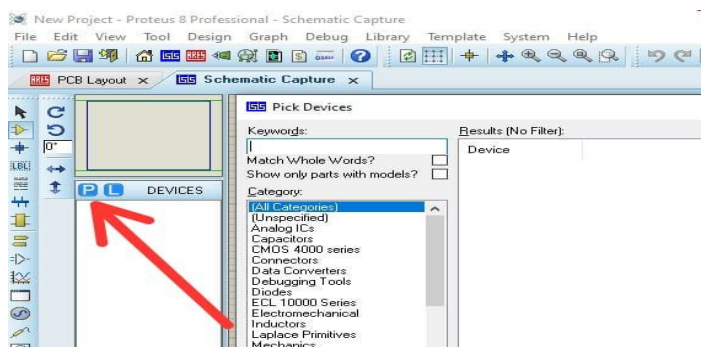

Figure 2. Stages of starting component search

2.2.3. Designing a series of components

Next, understand the assembly of components, first connect the 12-volt battery, the negative battery is connected to the 330-ohm resistor R2, then connected to the emitter leg on the two transistors, then the positive battery is connected to the LDR, resistor R1 and a negative diode, then also connected to a relay which is connected to the LED with the positive leg pole. Then the base of transistor Q1 is connected to the point between the LED and resistor R2, while the collector of transistor Q1 is connected to the base of the transistor on Q2 and resistor R1. Finally, the collector of transistor Q2 is connected to a positive diode and also connected to a relay. In detail can be seen in Figure 3.

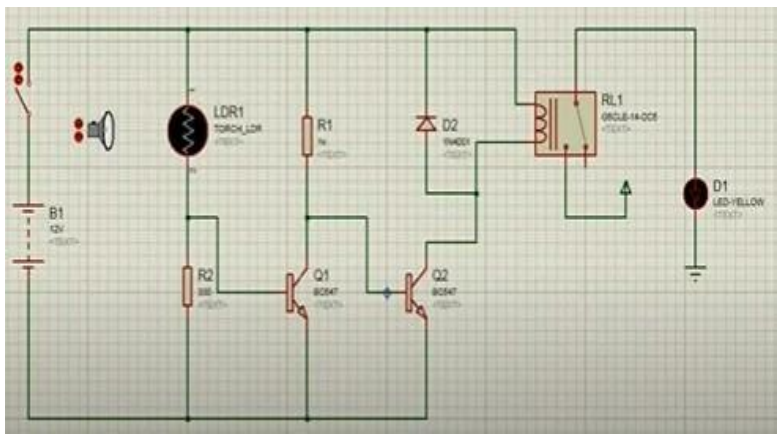

Figure 3. The results of assembling the components in the schematic section

3. Results and Discussion

The simulation that will be carried out is that in the first state the flashlight will be kept away from the LDR, and the result is that the lights will turn on or on, this condition is likened to when the condition of the garden lights at night or the LDR is not exposed to light so that the relay turns ON and the lights turn on, the results of the experiment can be seen in Figure 4 below.

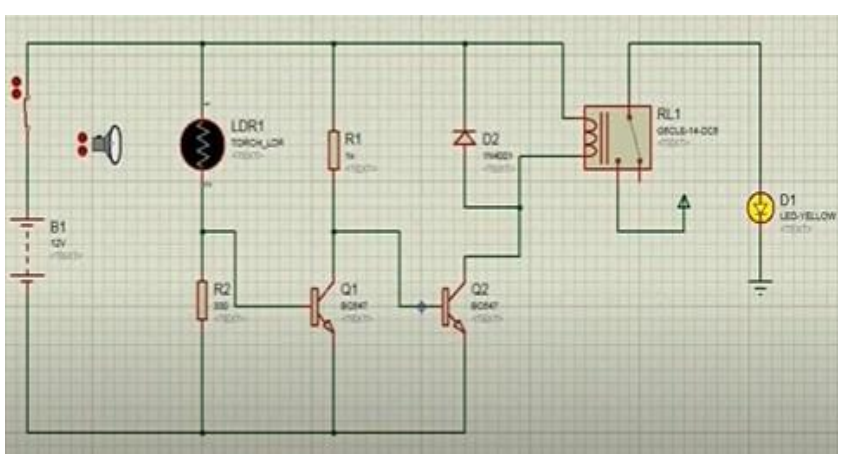

Figure 4. The results of the first experiment, the light is kept away from the LDR

In the second condition, if the flashlight is brought close to the LDR, the result is that the lights turn off again, this condition is for example the garden lights at noon or the LDR is exposed to the sun so that the relay closes and turns off, the experimental results can be seen in Figure.

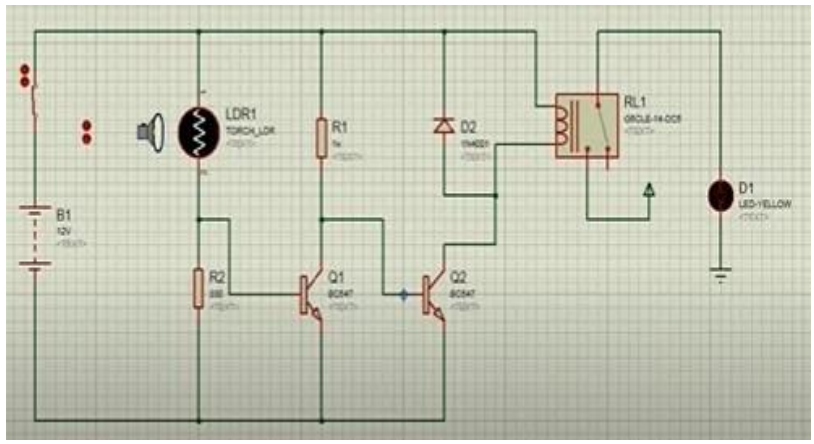

Figure 5. The results of the second experiment, the light is brought closer to the LDR

4. Conclusion

Based on the research that has been done, it can be concluded that the simulation of automatic garden lights can be run or used after using the LDR sensor on automatic garden lights. Where when the flashlight or light is kept away from the LDR, the condition of the lamp will turn on or on, this is very suitable for use in garden lights at night. Meanwhile, when the lamp or light is brought close to the LDR, the garden light will not turn on, with this condition it is very useful for garden lights during the day.

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