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DESIGN AND DEVELOPMENT SYSTEM OF ELECTRONIC CANDLE BASED ON MICROCONTROLLER

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Abstract
In this paper is described how the assembly process of designing and developing a series of inflatable candles microkontroller. The series based on electronics is a simple circuit that utilizes condenser microphone as a sensor. The use of these components are suitable for use in an application circuit electronic candles where the workings of this series starts from LEDs that analogous to wax and then lit using a pushbutton that analogy as lighters, and a flame from the LED can be extinguished by blowing. The concept of this series is simple but could be developed into a series of more innovative and interesting. One development is to add the output of the LED running that made candles burn more lively and interesting. Running LED of this circuit works by using a transistor as a switch that controls power of Az IC 368 and IC Az 418 M J. To simplify the development process, combination of a series of electronic candles with LED running can be simulated using the software *Livewire* and *Proteus*. Results of designing and developing a tool is not a new thing or that have not been found but the result of this achievement can be a source of inspiring in the world of electronics that can later be developed further so that it becomes a result of more recent example, lights out with once pat.

Keywords : electronic candle, assembly design and development, condenser microphone, LED running and control

1.0 INTRODUCTION

1.1 Background of The Problems

The electronic candle [Karisma Alfiansyah, 2014] is a close electronics with aesthetic value. This tool can be used at birthday events or as a tool to beautify the room. In the planning of electronic candle has a difficulty level that is not too complicated but requires precision and accuracy in terms of electronic circuit planning. The principle of candlelight in general is burning when burned by matches and matches when in the wind. Then it can be simply concluded that the electronics candle to be made has the same performance in wax generally only electronics candles produce the output of a flame instead of fire.

In a study undertaken by Dien (2015), chrysanthemum is a short-day plant whose initiation and development of flowers are controlled by the length of the day. Chrysanthemum plants need more than 13-16 hours of light a day to keep growing vegetatively. In tropical regions such as Indonesia, these needs can not be met by the average sun light 12 hours a day, so it needs to be coupled with artificial lighting from electric lights that are usually done after sunset. Light Emiting Diodes (LEDs) are semiconductors that emit light when in an electric current. Semiconductors are materials that can act as conductors (electrical current carriers) and insulators (electric current outages). The LED light emits light solely by the movement of electrons in the material. LED lamps are made up of semiconductor materials / materials that emit light waves that can be seen by the human

eye and transmit them in large quantities. Semiconductor materials are wrapped in plastic so that the concentrated light is generated in a particular direction. The plastic covering material can also be colored, but this is only for aesthetics and reinforces the color display that results in this plastic coloring not affected by the color waves generated depending on the semiconductor material used.

Chrysanthemum fiji variety wrapped in additional light yellow led lamps have high stem growth faster than other color LED light and LED colors for the growth of chrysanthemum plants ie red ledge, blue, yellow, while the LED light with blue and red color help optimize the process of plant photosynthesis than green.

Electricity [Gunawan. S, 1995] is the main energy source in the community, almost all human activities can not be separated from the use of electrical energy. Along with the current economic and educational improvement, 20% of electrical energy is used for lighting, efficient use of lighting can result in cost observers and energy conversion. The magnitude of the voltage for the bright flame on the fluorescence lamp (TI) with electronic reply is 110 Volts, while for the flourescen lamp with the unreachable indicator reply is 180 Volts. So the most profitable electronic reply user is seen from the voltage.

1.2 Formulation of the Problems

Based on the background of the problems, the problem can be formulated to serve as the discussion in this paper is how to develop an electronic candle that will produce the output of a flame LED.

1.3 Objectives

Goal to be achieved of this paper are to find out old type of electronics candle and to knowing the candles that produce LED.

2.0 THEORETICAL

2.1 Microcontroller Concept

Microcontroller is an intelligent chip that becomes a trend in control and automation that have many types of families, memory capacity, and features. Microcontroller becomes an option in mini-processor applications for small-scale control. In the final project, the authors used ATMega8535 AVR type. ATMega8535 microcontroller using RISC architecture (Reduced Instruction Set Computer), which means that processor has fewer program instruction set compared to MCS-51 implementing CISC architecture (Complex Instruction Set Computer) . RISC processor instructions, almost all of them are basic instructions (not necessarily simple), so these instructions generally require only one machine cycle to run them, except for branching instructions that require two machine cycles. RISC is usually created by a harvard architecture, because this architecture allows to make instruction execution done in one or two machine cycles, so it will be faster and more reliable. The process of downloading the program is relatively easy, because it can be done directly on the system.

2.2 Electronics Candle

Everyone knows that candle is one of the things that can illuminate the darkness during power outages, not only that, candles are often used to celebrate a birthday party and some still use candles to celebrate a celebration on the big day.

Here will be explain about electronic circuits that are electronic candles, candles made from some electronic components that can function as conventional candles, the way it works is similar to the usual candles in daily use, by replacing the fire (matches) in close proximity sensors, then the light will turn on and will not turn off before the light is blown on the censor, in other words how to turn off the electronic wax and even the same way to turn off the candle is generally in the inflatable.

3.0 METHODOLOGY

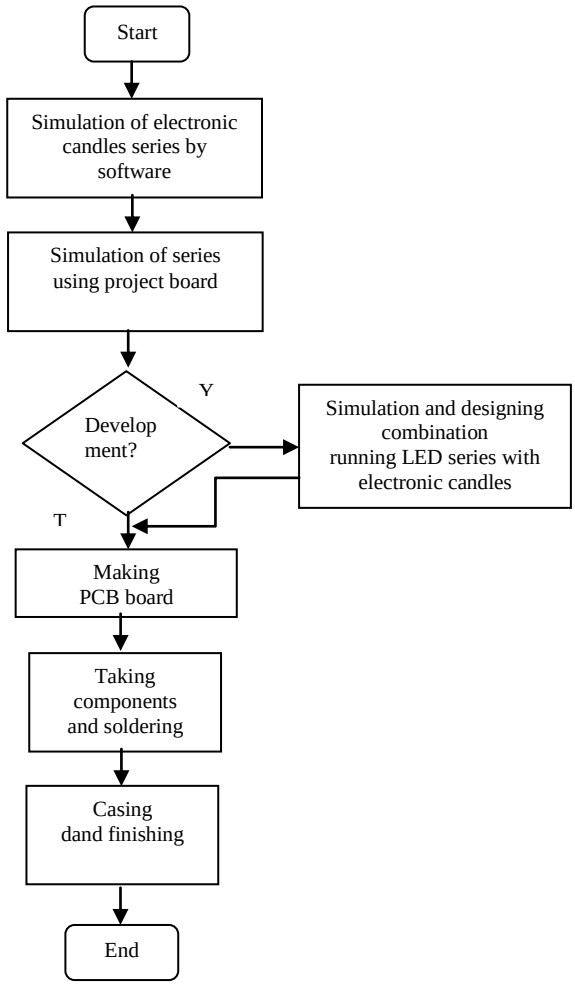
3.1 Data Collecting Method

Researcher used method of literature study, literature study and analysis of various references related to research conducted by reading and understanding reference books, existing software, and other media relevant to the development of microcontroller based electronics candle. Design of electronics candle based microcontroller include:

a) The retrieval of necessary information from data obtained on electronic candle.
b) Searching for electronic and mechanical components required for electronics candle design.
c) Designing electronic circuits used for the manufacture of electronics candle.
d) Assembling electronics and mechanical components of candle.
e) Designing a sensor system interface with a microcontroller that functions as a control system on candle.
3. Conducting testing of electronic candle design results.
4. Analyze results and make conclusions.

3.2 Design and Development

In the manufacture of electronic candles there are stages - steps that must be passed. The process of starting from making the basic circuit until the finishing process is poured by following flow diagram.



Picture 1. Design and development of electronic candles flowchart

3.3 Series simulation by software

The simulation process is done using *Livewire* software. By using this software can be known to work or not the circuit to be made. By using livewire the current direction of each component can be known so that simplify the circuit analysis process.

3.4 Series simulation by project board

The experimental process using the project board is a final-stage experiment to make sure the components used are ready to be plugged into the PCB and soldered it to minimize errors when components are paired to PCB layout.

3.5 Development of electronic candles series

The same development process must go through the experimental stage using the software. By using the software, series can look more real though just a virtual component. After the trial through the software is completed to further convince the experimental process can be done by using project board.

4.0 RESULTS AND EXPLANATION

4.1 Result of research

Hardware testing involves several circuit blocks, and testing of a combination of several circuit blocks as follows:

4.1.1 Power Supply Testing

Testing the power supply circuit by measuring the Vout of each regulator IC Az 368 M and Az 418 J using a digital multimeter. The test of the power supply circuit is shown in the table bellow:

Table 1. Circuit Testing

IC Regulator
Az 368 M
Az 418 J

4.1.2 Lighting Censor Testing

This test is to determine the magnitude of the change when LDR is exposed to the light of fire and when the LDR is not exposed to light (darkness) and the reslut is shown in the table bellow:

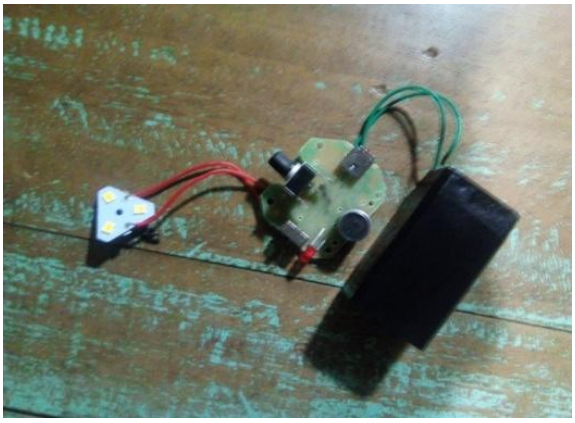
Table 2. Lighting Censor Test

No	Light Condition	R LDR (K_)	VR1(V)
1	Dark Room / no lightning	1986	0,0029

4.1.3 Capacitor

Capacitor is electronic components that can store and release electrical charge and electrical energy in an electric field by collecting the internal imbalances of the electrical charge. The ability to store an electrical charge on the capacitor is called capacitance or capacity.

The capacitor has a unit called Farad because found by Michael Faraday (1791-1867). The capacitor which in electronics science is abbreviated with the letter C is also known as "condenser", the word "condenser" is still used today. The first was named by Italian scientist Alessandro Volta in 1782 (from Italian condensate), with respect to the function of capacitors as a means of storing a high electrical charge over other components.



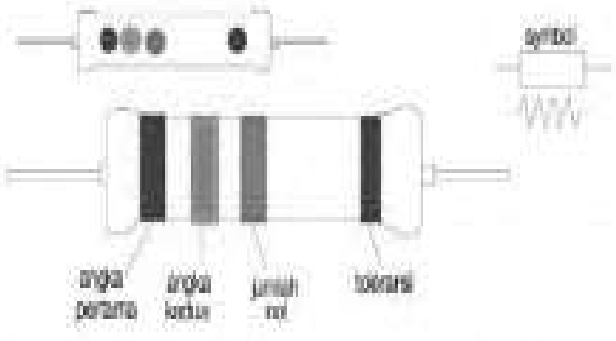
Picture 2. Capacitor

Capacitor function as one of the electronics component is a lot. Capacitor functions include:

1. As filter, usually used in radio system to filter (inhibition) interference from outside (noise), TV, amplifier and others.
2. As coupling, capacitor set low level amplifier to a higher level.
3. As a wave generator.
4. As an electric power saver on the fluorescent lamp, it prevent occurrence of electrical jumps in the circuit that there is a coil.

4.1.4 Resistor

Resistors are electronic components that are always used in every electronic circuit because it can function as a regulator of electrical current. When you want the flow which is great then use the resistor's value resistance is small, close to zero, or equal to zero or not installed at all thus the current is no longer restricted.

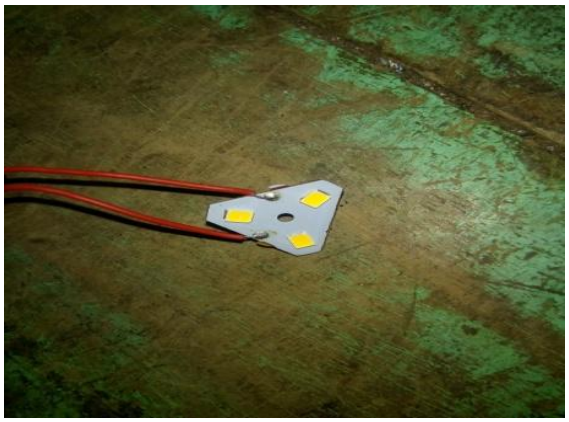


Picture 3. Resistor

4.1.5 LED (Light Emitting Diode)

Light-emitting diode (LED) is a junction semiconductor diode that generates photon emission when forward biased. The effect of light emission is called injection elecrtroluminescence, and it occurs when a minority carrier recombinates with a carrier of the opposite type inside a diode bandgap. The emitted light-wavelengths change primarily from the semiconductor material used, because the bandgap energy changes against the semiconductor. Not all injected minority carriers recombine in an irradiated material in a perfect crystal, non-radiation recombination occurring in defects and disiocation on identical looking diodcodes may produce wide changes in useful emissions. This means, practically, that the creation of a set of LEDs is sorted and adds intesity matching. The

mechanical construction of the LED lamp determines the scattering pattern or the light pattern radiation. A narrow radiation pattern look very bright as shown bellow:



Picture 4. LED indicator

4.2 Eplanation

Discussion of data testing to find answers scientifically and theoretically to systems designed on this tool.

4.2.1 Schematic circuit and electronic candle's work

Picture 5. Combination series of electronic candle and running LED

The workings of the above circuit are the same as the workings of electronics candle, difference that lies in the LED output which is replaced by the transistor circuit as a switch to generate power from the running LED circuit. The way this combination works begins when the push button is pressed, the current will flow and trigger the C2Ty transistor that acts as a switch and the current from the positive pole flows to the IC Az 368 M so that it is active and gives the output of a flip-flop signal as clock for IC Az 418 J which acts as a decade counter. That gives the pulse to the LED circuit in turn so the LED is on and turn on the atmosphere ago when the microphone is blown then the current does not flow again to the base of the base of C2Ty transistor so that the power from the positive pole is cut off and all LEDs are off.

4.2.2 Design and Development Method

In the manufacture of electronic candles there are stages - steps that must be passed. The process of starting from making the basic circuit until the finishing process.

4.2.3 Making of PCB layout

PCB or printed circuit boards are a kind of board that is used as a path for electronic circuits. Before being processed initially PCB board is a board that is only plated copper then of the necessary process of making the path.

Picture 6. Scheme PCB layout making

4.2.4 Soldering

Components that have been placed in accordance with the location of each - each then soldered.

4.2.5 Casing

Casing used to take advantage of the cookie cuts that have been unused and to beautify the outside of the painted casing using red pilot.

4.2.6 Testing

After going through all stages of the process of making and developing electronics candle has been successfully completed as for test indicator of electronic inflatable candle.

Picture 6. Final Result

4.2.7 Explanation

Of the five indicators listed on the table can be concluded that the electronics candle and its development has been successfully running as it should. But there are obstacles faced that is the problem of energy saving. The battery used on this device must have a large current supply, if a small one is given then the flame of the LED will not be bright optimally. Since of the large current consumption of the power absorbed from the battery is very large too and make batre run out quickly, a workable solution is to replace the power supply.

5.0 CONCLUSION

Electronic candle is a simple series that can be developed to be inspirational. By creative ideas the results of the tool made will be more beautiful and more alive for example with

running LED. Combination of electronic candle circuit with running LED is done by using transistor principle as switcher. The process of making this tool should be done systematically although this circuit is a simple circuit. Electronic candles can be embryonic. smart technology will be applied at home with a relatively cheap price.

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