Automatic over and under voltage protection using Arduino

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ABSTRACT - Sudden changes in voltage can cause problems for businesses and household appliances, damaging electrical circuits. To prevent this, we use an automatic cutoff circuit made from simple parts like transistors. This circuit protects devices like TVs and refrigerators from sudden voltage spikes and drops. It sits between a stabilizer and the device, cutting off power if the voltage gets too high or too low. It also includes a delay to prevent rapid on-off switching. This circuit provides protection against various voltage-related issues using components like zener diodes and relays.

INDEX TERMS – Arduino, LCD Display, Voltage sensor, Relay, Regulator, Lamp, Adapter, Adder pin etc.

I. INTRODUCTION

Voltage instability is a big problem in homes and businesses. It can cause problems and damage to electrical circuits. These incidents also affect the reliability of other devices that control voltage. Voltage swells and over-voltage conditions often occur when there's a sudden decrease in the amount of electricity being used.. When the voltage drops between 0.1 and 0.9 pu for a short time, it's called a sag condition. Swell conditions happen when the voltage goes up between 1.1 and 1.8 pu for a short time, or even higher if there's a problem with the voltage controller or connections. To fix these issues, we need a system that can detect and protect against low and high voltage conditions. We've created a circuit that can detect when the voltage drops below 198 volts or goes above 242 volts. When this happens, the circuit stays open, preventing any current from flowing and keeping our equipment safe from damage. This circuit helps protect devices during voltage fluctuations.

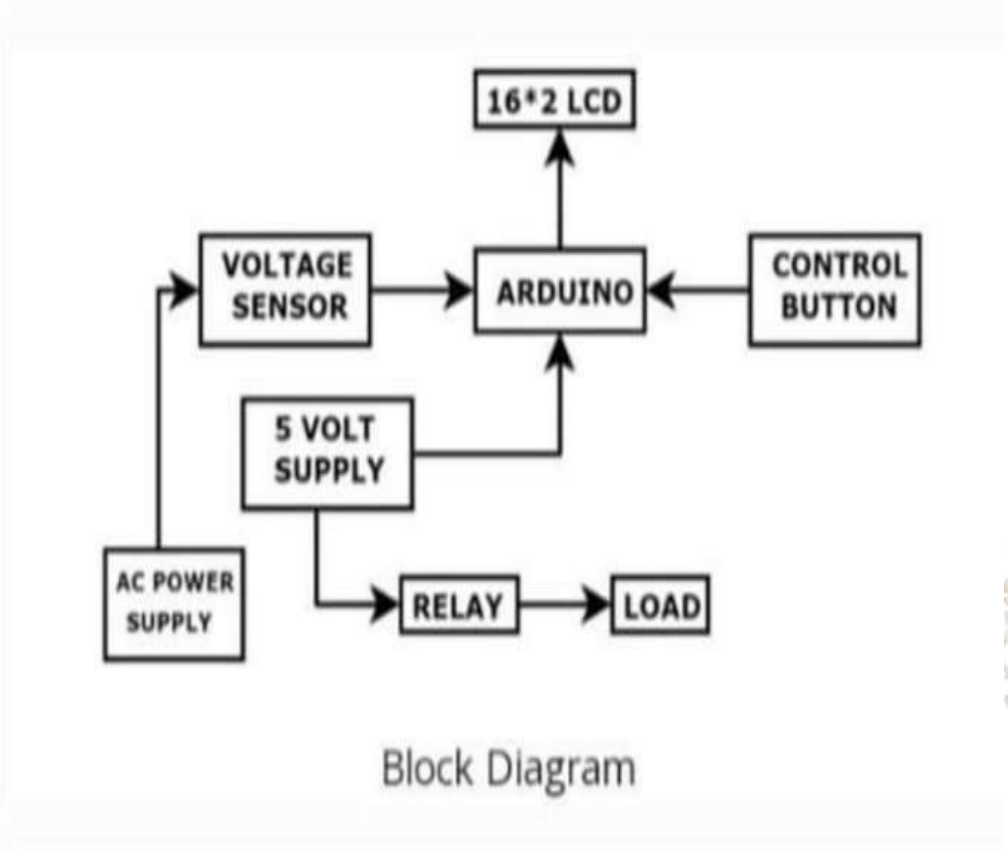
II. PROBLEM STATEMENT

The electronic devices get easily damaged due to fluctuations. To overcome this problem, we can implement a tripping mechanism of under / overvoltage protection circuit to protect the loads from the under damage.

III. LITERATURE SURVEY

Voltage Protection Techniques Review (2017): This paper looks at different methods to protect against voltage sags, swells, over-voltage, and under-voltage situations.
Over-voltage Protection in Low Voltage Systems (2018): Explores ways to safeguard low-voltage systems from over-voltage situations using various protection techniques.
Handling Voltage Dips and Interruptions in Adjustable-Speed Drives (2013): Discusses strategies to manage voltage dips and interruptions, focusing on protecting adjustable-speed drives from under-voltage situations.
Automatic Voltage Regulator (AVR) Systems (2014): Covers the design and uses of automatic voltage regulator (AVR) systems for regulating voltage and protecting electrical systems.
Smart Grid Technologies Review (2019): Explores smart grid technologies and how they protect against voltage fluctuations in modern power systems.
Protection Schemes and Control Strategies for Microgrids (2015): Examines protection strategies in microgrid systems, particularly those related to voltage. These papers discuss different techniques and technologies used to protect electrical systems from voltage fluctuations and ensure reliable power supply.

III . BLOCK DIAGRAM

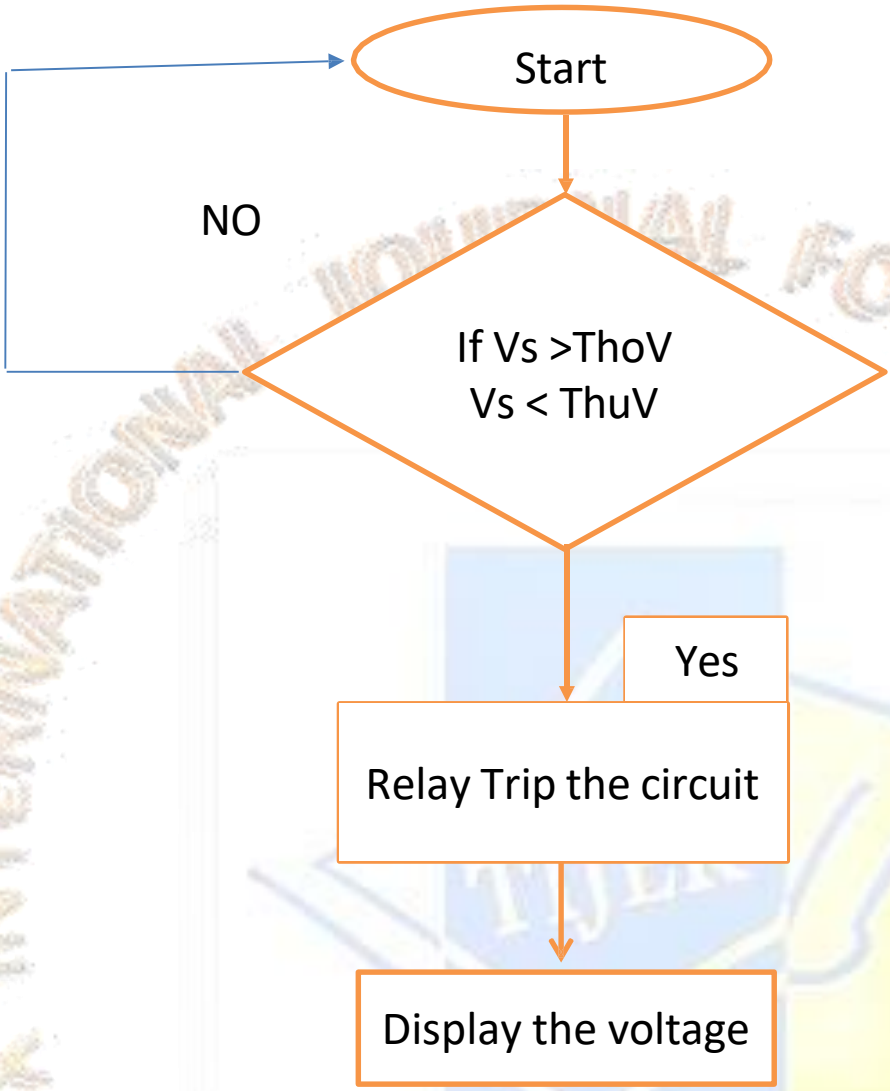


Block Diagram

IV. WORKING PRINCIPLE

This set voltage range is for a working range of 180VAC up to 240VAC at the input of the12VAC step down transformer. Whenever the voltage goes below 180VAC at the input ofthe transformer, it will trip down the relay and thus the load will automatically get disconnected in the under-voltage condition. Similarly, at voltages higher than 240VAC,the over voltage sensing Op amp IC will trip down the relay, hence protecting it from over voltage condition.

V. IMPIEMENTATION



VI. CONCLUSIONS

By using this project we are going to protect the equipment from overvoltage and under voltage.

VII. REFERENCES

1.G. Yaleinkaya, M. H. J. Bollen and P.A. Crossley (1999), "Characterization of voltagesin industrial distribution systems", IEEE transactions on industry applications, vol.34, no.4, pp. 682-688, July/August.

2.C. H. Vith Alani, "Over-Under Voltage Protection of Electrical Appliances", August 2003, Electronics for You.

VIII. ADVANTAGES

1. Highly sensitive.
2. Low cost.
3. Protect equipment.
4. High Reliability.