# BASICS OF ELECTRICITY

SEMINAR: Future challenges and trends in HCI - Physical Computing

MADHURIMA VARUGHESE

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# AGENDA

- Introduction

- Basics of Electricity

- Components of Electrical Circuits

- Conclusion

# 3 INTRODUCTION

Transduction

# INTRODUCTION

- Transduction
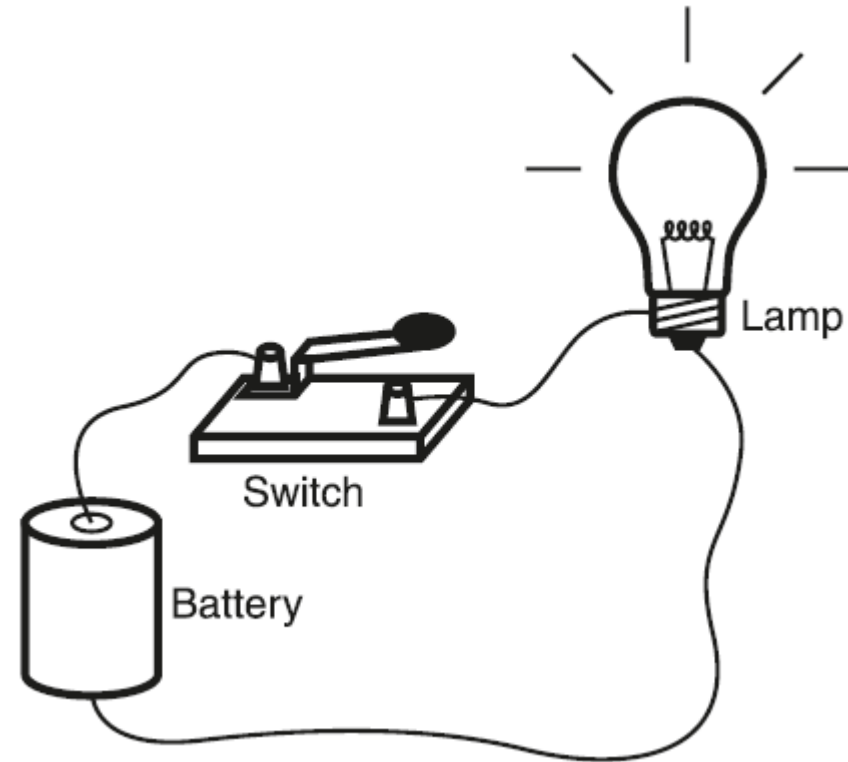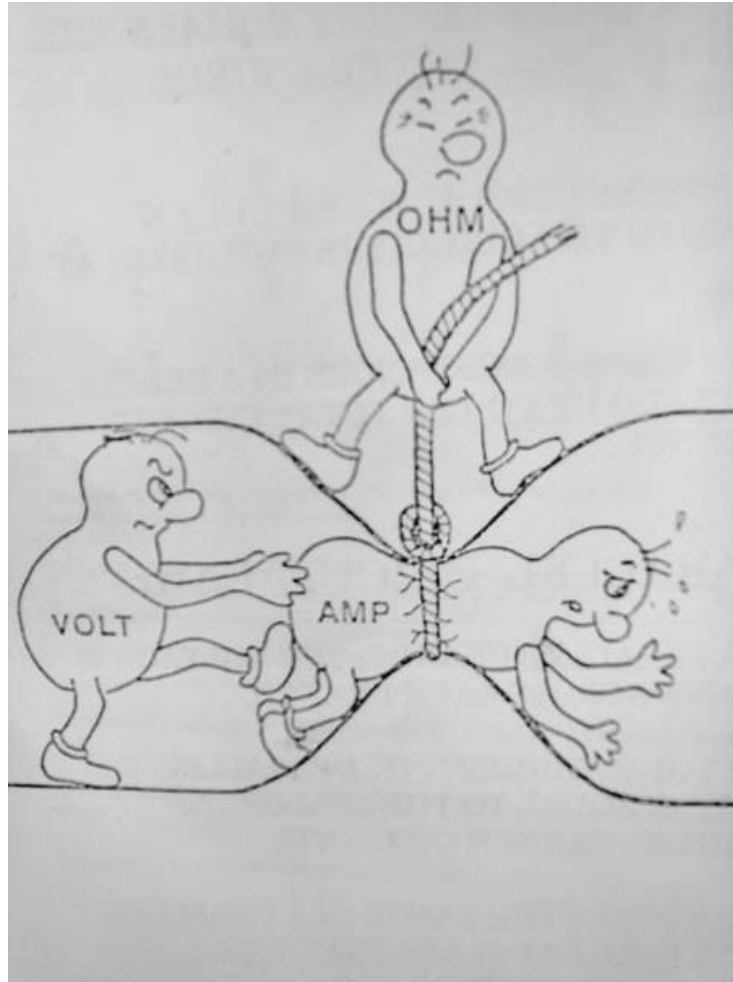  - Conversion of one form of energy into another.

# 5 BASICS OF ELECTRICITY

Glossary of Terms, Ohm's law, Flow of Electricity

# ELECTRICITY BASICS – GLOSSARY

- Power, Ground & Conductor
- Circuit
- Voltage, Current & Resistance
- DC & AC
- Short circuit 💣
- Electrical power/ Wattage

# ELECTRICITY BASICS – VOLT, OHM, AMP



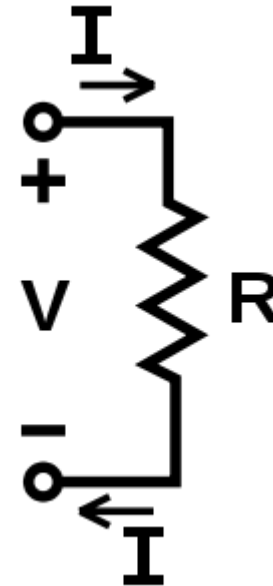References:[4]

# ELECTRICITY BASICS – OHM'S LAW

V = I * R,

where

V = Voltage expressed in volts,

I = Current expressed in amperes

R = Resistance expressed in Ohms

# ELECTRICITY BASICS — FLOW OF ELECTRICITY

| | High Current | Low Current |
|---|---|---|
| **High Voltage** |  By Johnny Albert10 [Public domain], via Wikimedia Commons |  By Tomaszp [CC-BY-SA-3.0], via Wikimedia Commons |
| **Low Voltage** |  USGS image, via Wikimedia Commons |  By User:Ruhrfisch [GFDL] via Wikimedia Commons |

References:[2]

# ELECTRICITY BASICS – FLOW OF ELECTRICITY

Properties of Electrical Energy:

+ Electricity always favour the path of least resistance to ground

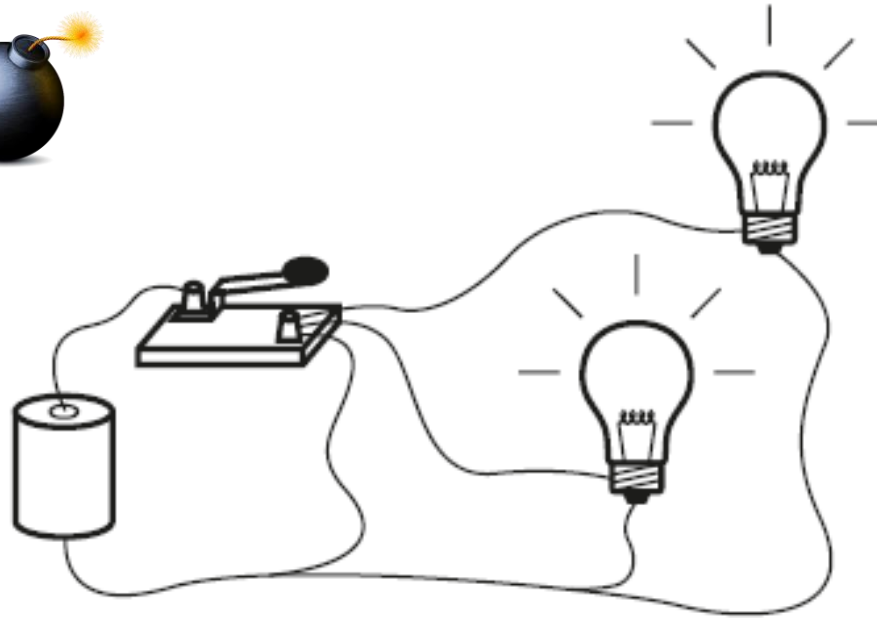+ All the electrical energy in a circuit must be used.

Types of Connection:

+ Series connection

+ Parallel connection
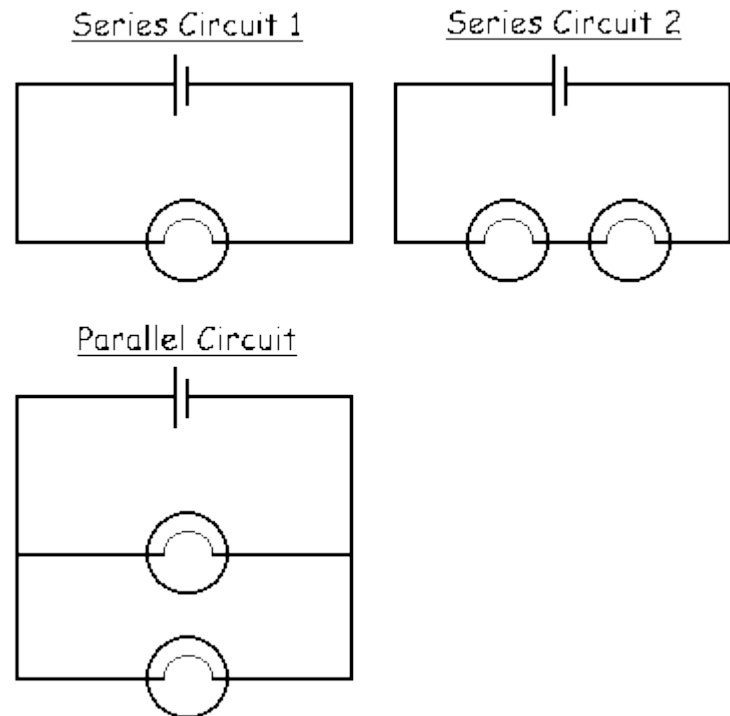
References:[3]

# ELECTRICITY BASICS – FLOW OF ELECTRICITY

Short Circuit!!



References:[3]

# 12 COMPONENTS OF ELECTRIC CIRCUITS

Switches, Resistors, Diodes and LEDs, Transistors and Relays, Multimeter

# SWITCHES

- Pass or interrupt flow of electricity.

- Schematic Symbol:

- Rated by: Maximum voltage and current conducted

- Types:
  - Normally Open(N.O) & Normally Closed(N.C)
  - Momentary or Toggle

# RESISTORS

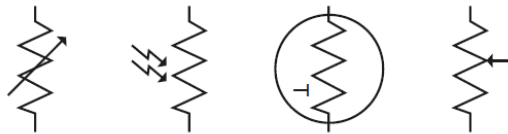- Reduce current flow within circuits.
- Convert electrical energy to heat.
- Schematic Symbol:
- Rated in: Ohms

## VARIABLE RESISTORS:

- Schematic Symbol:
- E.g.: Thermistors, Photocells, Force-sensitive resistors, Potentiometer etc.

# CAPACITORS

- When electricity is flows into a capacitor, it stores up the charge. When the current is removed, the capacitor releases its charge until it's got no charge left.

- Schematic Symbol:

- Rated by: Capacitance measured in Farads(F or mF or µF)

# DIODES & LED'S

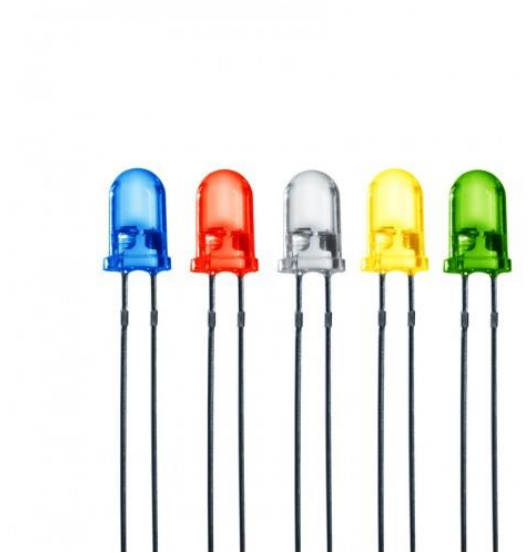- Only allows electricity to flow in one direction and not the other.
- cathode (–), and the anode (+)
- Schematic Symbol: →▷|—
- Types: General-purpose, LED

- LED: Diode that also emits light in the process
- Schematic Symbol: —◁▷|—

# TRANSISTORS & RELAYS

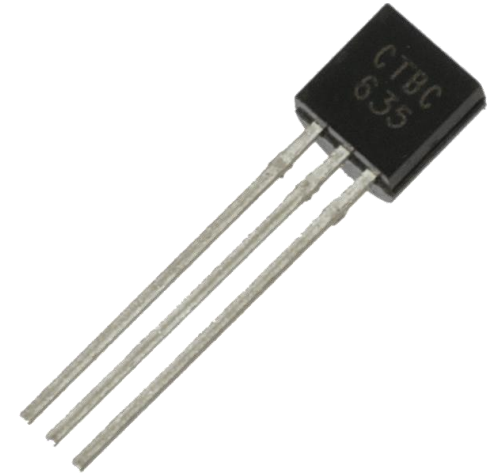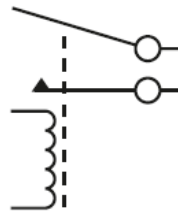- Switching devices(small switches that activate larger switches).

TRANSISTOR:

- Schematic Symbol:

RELAY

- Schematic Symbol:

# MULTIMETER

- Device used to test various electrical properties of a component or a circuit.
- Debugging Tool

# REFERENCES

⊕ [1] Dan O'Sullivan, Tom Igoe (2004)
*Physical Computing: Sensing and Controlling the Physical World with Computers*,
Thomson

⊕ [2] Erik Brunvand. 2013.
*Lights! speed! action!: fundamentals of physical computing for programmers.*

Websites:

⊕ [3] - http://www.qldscienceteachers.com/junior-science/physics/electricity

⊕ [4] -
http://www.reddit.com/r/explainlikeimfive/comments/1qrdc9/eli5how_do_digital
_devices_know_how_much_energy/