Theory of Computation

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1 Why TOC?

- It helps us to understand the limits of what computer can do and how to model computation using mathematics

Q1: What is the motivation for studying theory behind computation? OR Needs of TOC?
A:

- Understanding the capability of a computer
- To find steps to solve a problem
- Increase efficiency while doing a task

Q2: List the problems that cannot be solved by a computer.
A:

1. Ethical problems. Eg: Self-driving car deciding to save the driver/passenger or the pedestrian
2. Generating truly original art of emotion

Automaton (pl.: Automata)

A simplified mathematical model of a machine (digital computer). It

- Accepts input
- Produces output
- Nay have some temporary storage
- can make descisions in transforming the input into the output

Q1: Why study computability and theory?
A:

- It helps to answer: "Can this be solved by a computer?"

- Understand the principles behind algorithms and programs
- Explore the boundary between what is possible and impossible in computing

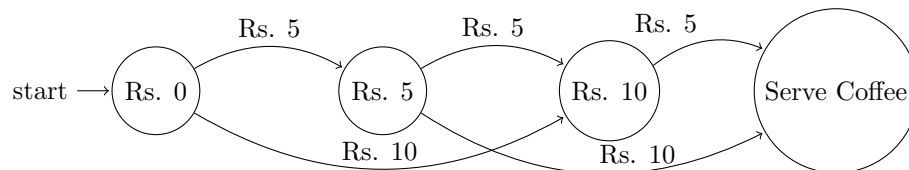## 1.1 Need for mathematical modelling

- Computers work on rules & logic
- We can represent computers using abstract models
- These models helps us study complex behaviour in a simplified way

2 Introduction to finite automata

1. ON/OFF Switch:
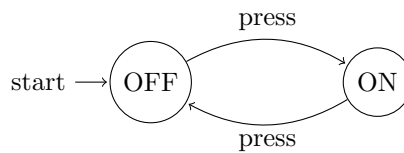
2. Coffee vending machine (Inputs: Rs. 5 & Rs. 10 — Rs. 15 for one coffee):

3 Formal Language

A formal language is an abstraction of the general characteristics of programming langauges.

A formal language consists of set of symbols and some rules of formation by which these symbols can be combined into entities called sentences.