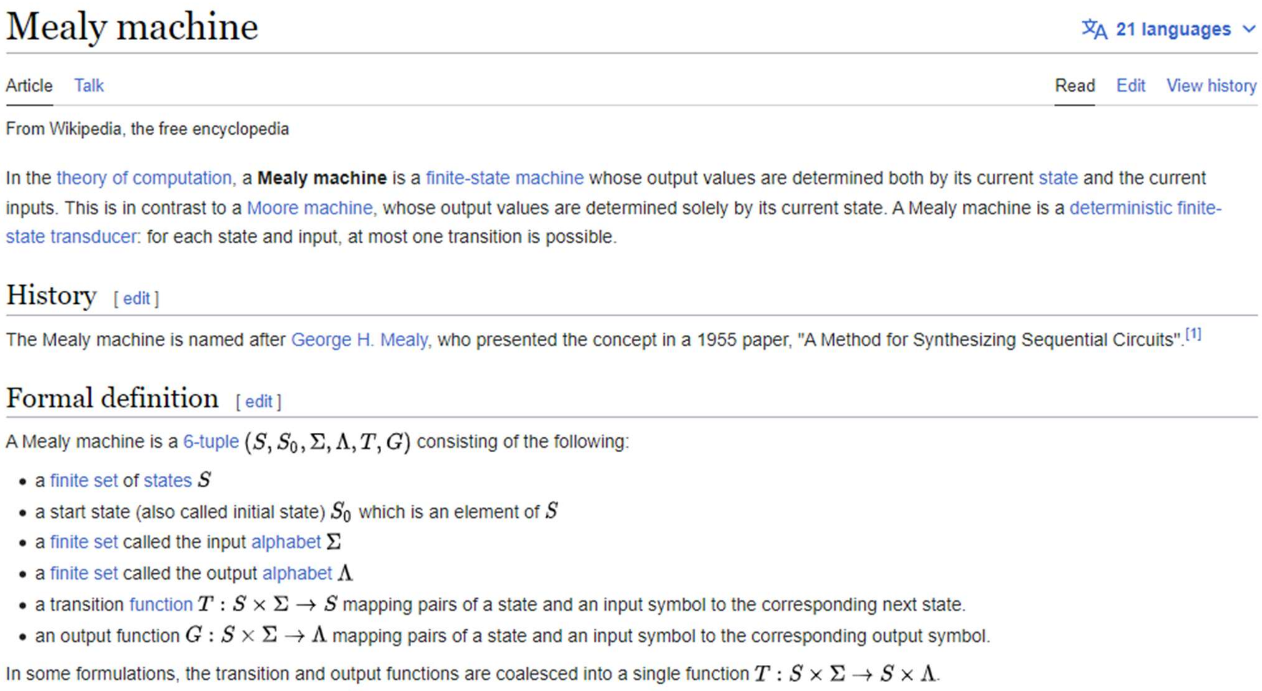
Mealy Machine



Mealy machine

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In the theory of computation, a **Mealy machine** is a finite-state machine whose output values are determined both by its current state and the current inputs. This is in contrast to a Moore machine, whose output values are determined solely by its current state. A Mealy machine is a deterministic finite-state transducer: for each state and input, at most one transition is possible.

History

The Mealy machine is named after George H. Mealy, who presented the concept in a 1955 paper, "A Method for Synthesizing Sequential Circuits".[1]

Formal definition

A Mealy machine is a 6-tuple $(S, S_0, \Sigma, \Lambda, T, G)$ consisting of the following:

- a finite set of states S
- a start state (also called initial state) S_0 which is an element of S
- a finite set called the input alphabet Σ
- a finite set called the output alphabet Λ
- a transition function $T : S \times \Sigma \rightarrow S$ mapping pairs of a state and an input symbol to the corresponding next state.
- an output function $G : S \times \Sigma \rightarrow \Lambda$ mapping pairs of a state and an input symbol to the corresponding output symbol.

In some formulations, the transition and output functions are coalesced into a single function $T : S \times \Sigma \rightarrow S \times \Lambda$.

```
inputs: activate, deactivate;
outputs: active_flag;

G(activate->F(active_flag)) &
G(deactivate->F(!(active_flag))) &
G(active_flag -> (active_flag U deactivate)) &
G(!(active_flag) -> (!(active_flag)U activate)) &
G(!(activate & deactivate))
```

```
digraph "" {
  graph [rankdir=LR,ranksep=0.8,nodesep=0.2];
  node [shape=circle];
  init [shape=point,style=invis];
  init -> 0 ;
  0 -> 0 [label="00/0"];
  0 -> 0 [label="-1/0"];
  0 -> 1 [label="10/1"];
  1 -> 1 [label="11/1"];
  1 -> 1 [label="-0/1"];
  1 -> 0 [label="01/0"];
}
```

```
.inputs activate deactivate
.outputs active_flag
.i 2
```

```
.o 1
.p 6
.s 2
.r S0
00 S0 S0 0
-1 S0 S0 0
10 S0 S1 1
11 S1 S1 1
-0 S1 S1 1
01 S1 S0 0
```