Multitape Turing Machine

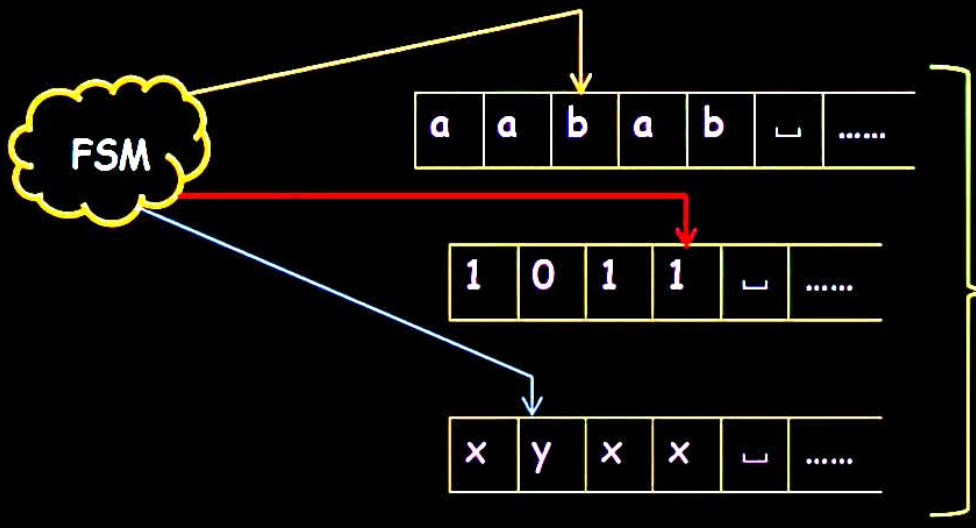
Theorem: Every Multitape Turing Machine has an equivalent Single Tape Turing Machine

Proof

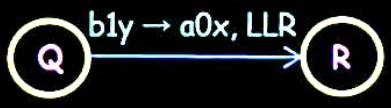
Given a Multitape Turing Machine show how to build a single tape Turing Machine

- Need to store all tapes on a single tape
  Show data representation
- Each tape has a tape head
  Show how to store that info
- Need to transform a move in the Multitape TM into one or moves in the Single Tape TM

Multitape Turing Machine

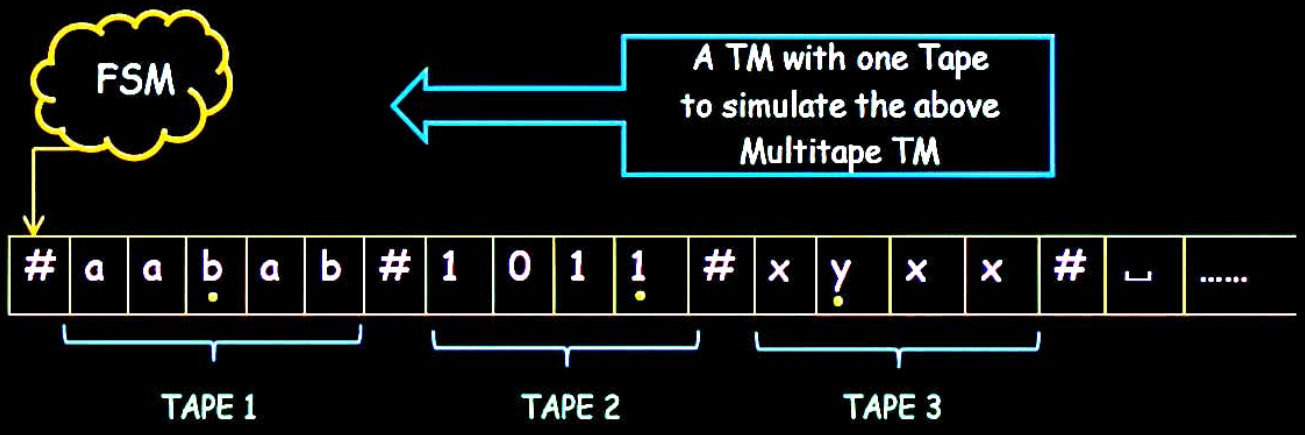


Several Tapes .
Each has its own
TAPE HEAD



An Example Machine with
K=3 Tapes

Single Tape Turing Machine



- Add "dots" to show where Head "K" is
- To simulate a transition from state Q, we must scan our Tape to see which symbols are under the K Tape Heads
- Once we determine this and are ready to MAKE the transition, we must scan across the tape again to update the cells and move the dots
- Whenever one head moves off the right end, we must shift our tape so we can insert a ␣