



Technion – SciTech 2003

Turing Machine Development Environment

Daniel Guetta

Mentor:

Bobi Gilburd

Faculty of Computer Science

About Turing Machines...



- The Turing Machine is a simple computing model equivalent to today's computers
- It can show us what computers can do and what they can't do – in other words, whether a task is computable or not.

Computability



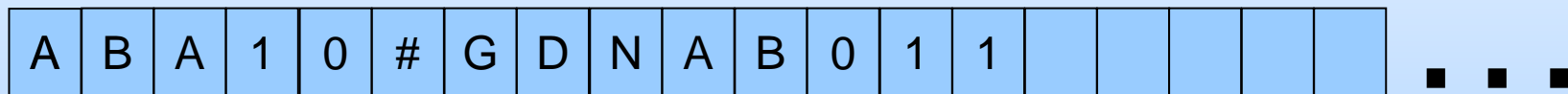
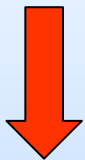
$f(x) = x + 1$ is computable

Deciding whether a program will ever halt
is not computable

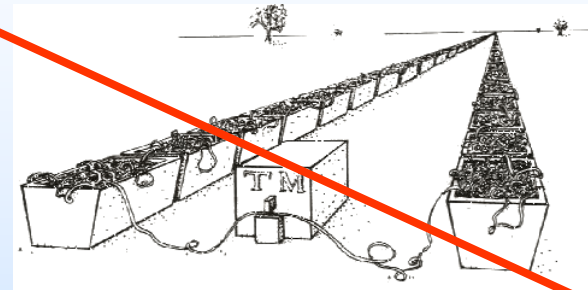
What is a Turing Machine ?



Read/write head



Semi finite tape



How do you tell a Turing Machine what to do?



Each Turing Machine has a set of **states**.

If Machine is in state **x** and is reading character **a** , change to state **y** , change the character to **b** and move **left**, **right** or **not at all**.

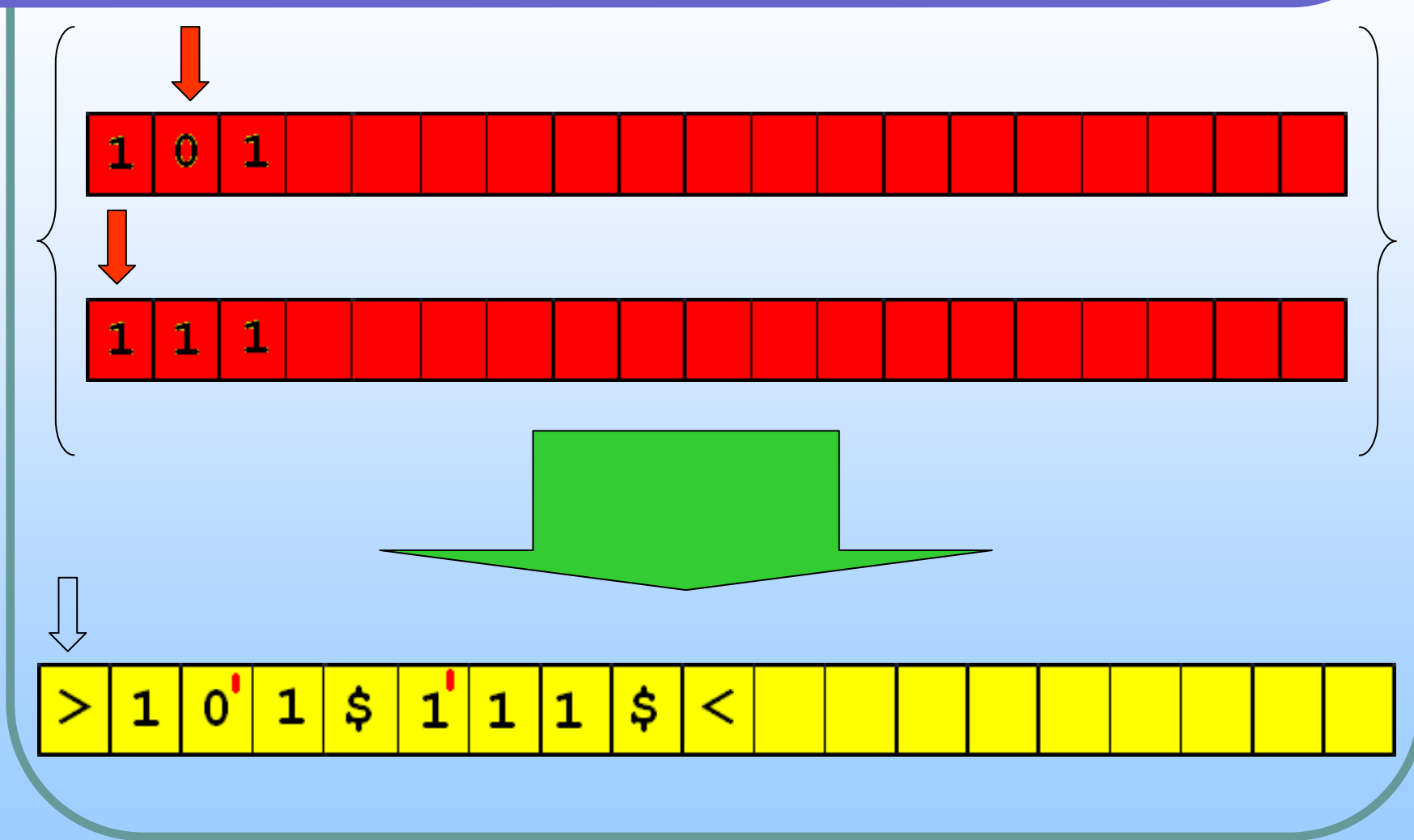
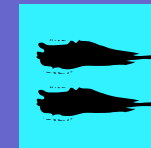
Variations



The basic Turing Machine model presented so far can have several variations.

A particularly interesting variation of the Turing Machine is one that has multiple tapes.

Equivalence of the Multitape Model



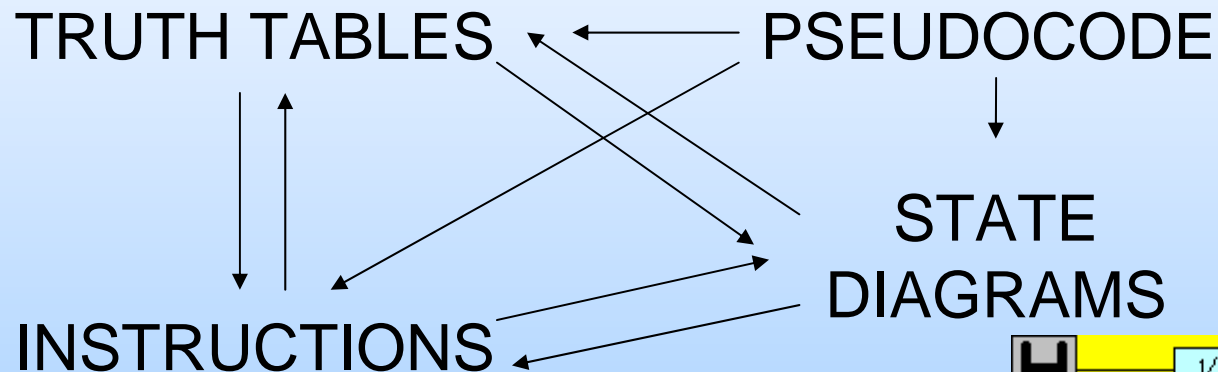
Aims of program – improvement over existing work



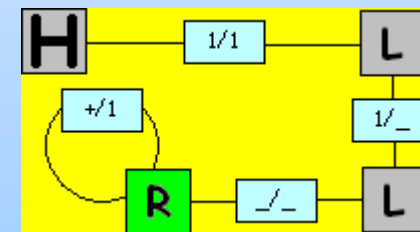
- To perform the following conversions:

	1	+	_
q ₁	q ₁ , 1, R	q ₁ , 1, R	q ₂ , _, L
q ₂	q ₃ , _, L	-	-
q ₃	FINAL STATE		

Add c and d



If in q₁ reading 1, write 1, move right goto q₁.
 If in q₁ reading +, write 1, move right goto q₁.
 In in q₁ reading _, write _, move left goto q₂.
 If in q₂ reading 1, write _, move left, goto q₃.



MULTITAPE MACHINES → MULTITAPE SIMULATED ON SINGLE TAPE

Aims of program – improvement over existing work – continued



- To simulate Turing Machines in a graphical environment
- The ability to save machines and re-open them later
- To divide the program into parts that can then be used independently in other programs.
- The ability to view, edit and/or simulate several machines at the same time, for comparison.

Demonstration of the program



You will now see a short
video of a user using the
program to create
machines

Future work



- Implement the theory set out for the pseudo code \rightarrow Turing Machine conversion
- Support different Turing Machine variations (doubly infinite, multi-track, etc...)
- Include finite state automata in the program

Acknowledgements

**THANK
YOU!**



- My mentor, Bobi Gilburd
- Technion's computer science faculty
- My father and Stanislav Tsanev
- The British Technion Society
- Everyone that made SciTech 2003 such an amazing, incredible experience

Q & A

