Subiecte 1

June 7, 2022

Exercise 1 (25p)**.** *Imagine a Turing Machine (TM) that has one head and two tapes. The second tape must be a copy of the first one. Imagine the second tape as a backup copy of the first one, so it can be used to detect possible storage errors. You need to:*

1. *Give formal definition of this type of TM.*
2. *Give a clear explanation of computation for this type of TM. Include a formal description of computation.*

You can approach the construction of this TM as a multiple-head TM or a single head TM with an interlaced tape or a single head TM with two inputs/outputs. Be creative but rigorous.

Exercise 2 (20p)**.** *Implement a library/program (in a programming language of your choice) to load and validate a configuration file of a TM with one head and two tapes. Also implement a simulator for this type of TM.*

Exercise 3 (25p)**.** *Extend the TM simulator to validate if the two tapes are identical using as input the configuration file from previous exercise. An immediate approach is to compare the two tapes (arrays) which is fine, but we want an extended δ function in such a way that when then TM will reach a previous final state (as a normal TM) will proceed to check of the two tapes are identical and if so then enter to a new final state.*

Exercise 4 (20p)**.** *Create a configuration file for a one head, two tapes TM that recognize the language $L = \{w\#w | \text{where } w \text{ is a string}\}$ and also check for the integrity of the tapes (if they are identical).*