Universidad de los Andes

ISIS-1106 Lenguajes y Máquinas
Quiz Taller 3
Fecha: April 15, 2024

Indivdual Work

1. [100%] Use GOLD to implement:

We have a Mealy machine that reads strings of $(0..9)$ and writes strings of $(0..9) \cup \{+,-\}$ where:

Reads: $d_0 \dots d_n$

Writes: $d_0 R_1 \dots R_n$

Where

$$R_i = \begin{cases} 0 & \text{if } d_i = d_{i-1} \\ \text{“}+\text{”}\,(d_i - d_{i-1}), & \text{if } d_i > d_{i-1} \\ \text{“}-\text{”}\,(d_{i-1} - d_i), & \text{if } d_{i-1} > d_i \end{cases}$$

This is the definition of the Mealy machine that codes the strings.

$$Coder = (Q, \Sigma, \Sigma', q_I, \delta, h)$$

Q= $\{I\} \cup (0..9)$

$\Sigma =$ $(0..9)$

$\Sigma' =$ $(0..9) \cup \{+,-\}$

q_I =I

Transition function: $\delta(q,d) = d$

State Output function:

$$\begin{cases} d & \text{if } q = I \\ 0 & \text{if } q \in (0..9) \wedge d = q \\ \text{“}+\text{”}\,(d-q), & \text{if } q \in (0..9) \wedge d > q \\ \text{“}-\text{”}\,(q-d), & \text{if } q \in (0..9) \wedge q > d \end{cases}$$

TASK: Define an automaton that decodes strings coded with the previous automaton. The decoder should verify coding errors. There are strings of $(0..9) \cup \{+, -\}$ that could not have be generated by the coder. These strings should not be accepted. For example 8+3 could not have been generated because the second symbol read would have to be 11. Another incorrect string would be: 4-5. Additionally, 5++4 would also be incorrect. This would also be incorrect: 3+0.

Attached you will find a Gold project with a transducer that performs the coding described above. The decoder that is included has a single state and does not produce any output. You have to modify this definition so that it implements the decoder correctly. The coder-decoder tester lets you test the decoder, so you can verify that it does detect coding errors.