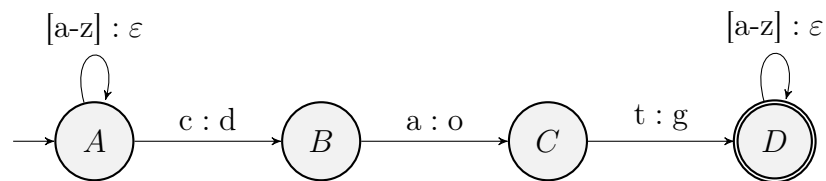


Foundations of Information Systems

Winter Semester 2024–25, Exercise 7

For discussion on Tuesday(!), December 3, 2024

1. Consider the following non-deterministic finite state transducer:



- (a) What does this transducer do?
- (b) Convert this non-deterministic transducer into a deterministic transducer.

Note: The output symbol ε denotes that no output is issued. In part (b), you may also encounter transitions that read a single character, but issue several characters.

2. Is it possible to construct a finite state transducer that sorts a string of characters from the Latin alphabet in increasing order?
3. Recall the “simple language” from class, which has non-negative integer variables, the statements `incr(X)` and `decr(X)`, as well as while loops of the form

```
while(X) :  
    loop body
```

In class, we looked at a macro `Y ← X` which assigns the value of `X` to `Y`, while setting `X` to zero. Modify this example so that the end of the operation, `X` retains its original value.