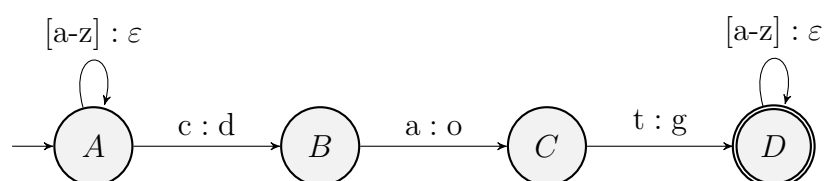


Foundations of Information Systems

Winter Semester 2025–26, Exercise 6

For discussion on Wednesday, November 26, 2025

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 $Y \leftarrow X$ 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.