Tik-61.231 Principles of Pattern Recognition

Exercise 9: 20.11.2000

1. Language $L = \{a^n b | n = 1, 2, \ldots\}$.

a) Form a grammar, which produces L.

b) Form a parser to the grammar in 1 a). Check, that your parser parses string a^2b but not string ba.

2. Machine parts shown in Figure 1 have primitives a, c and e. Does the following grammar accept these parts. $S \to GQ, S \to QG, G \to EH, H \to AIA, I \to CJC, J \to ACA, Q \to ER, R \to CAC, A \to a, C \to c, E \to e$.

3. A chromosome classifier is based on a syntactic method. The border line of the chromosome illustrated in Figure 2 is composed of certain line segments called a,b,c ja d. Thus, the entire border line can be represented as a string: $\{babcbabdbabcbabd\}$. Will the following grammar accept this chromosome? What if the border line is coded by choosing some other point as a starting point?

$$
\begin{gathered}
G = (V_T, V_N, P, S), \\
V_T = \{a, b, c, d\} \\
V_N = \{S, Armpair, Leftarm, Rightarm, Arm, Side\} \\
P = \{S \to Armpair, Armpair \\
Armpair \to Armpair, Side \\
Armpair \to Arm, Rightarm \\
Armpair \to Leftarm, Arm \\
Rightarm \to c, Arm \\
Leftarm \to Arm, c \\
Arm \to b, Arm \\
Arm \to Arm, b \\
Side \to b, Side \\
Side \to Side, b \\
Arm \to a \\
Side \to b \\
Side \to d\}
\end{gathered}
$$

A comma (',') between two symbols is just a separator.

4. Develop an attributed graph to characters 22, 25 and 39 shown in Figure 3. Form also the corresponding adjacency matrices. Are the graphs isomorphic?

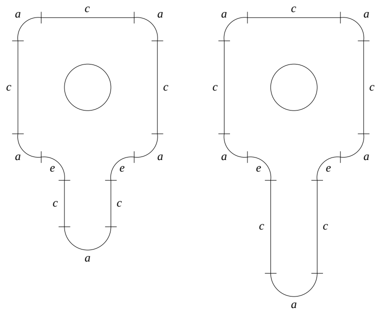


Figure 1: A part

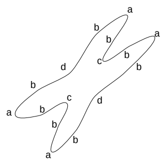
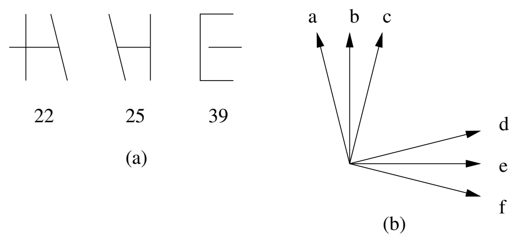


Figure 2: A chromosome



Code	Description	Diagram
u	Above/Underneath	
v	Bend	or
w	Junction	or
x	Intersection	
y	Near to (gap)	or or
z	On the left/right	

(c)

Figure 3: (a) Characters, (b) primitives, and (c) relations between primitives