Solution to the Homework

Id(3,4,5,6,9)

$a:C_1$

$\varepsilon:u$

$\varepsilon:C_2$

$\varepsilon:C_3$

$\varepsilon:un$

$b:aC_1C_1\bar{a}C_2iC_3u$

$c:C_1uC_2aC_3a$

$d:C_1iC_2C_3an$

$e:muC_1aC_2C_2aC_3un$

$f:C_1\bar{a}C_2iC_3an$

q0 q1 q2 q3 q4 q5 q6 q7 q8 q9
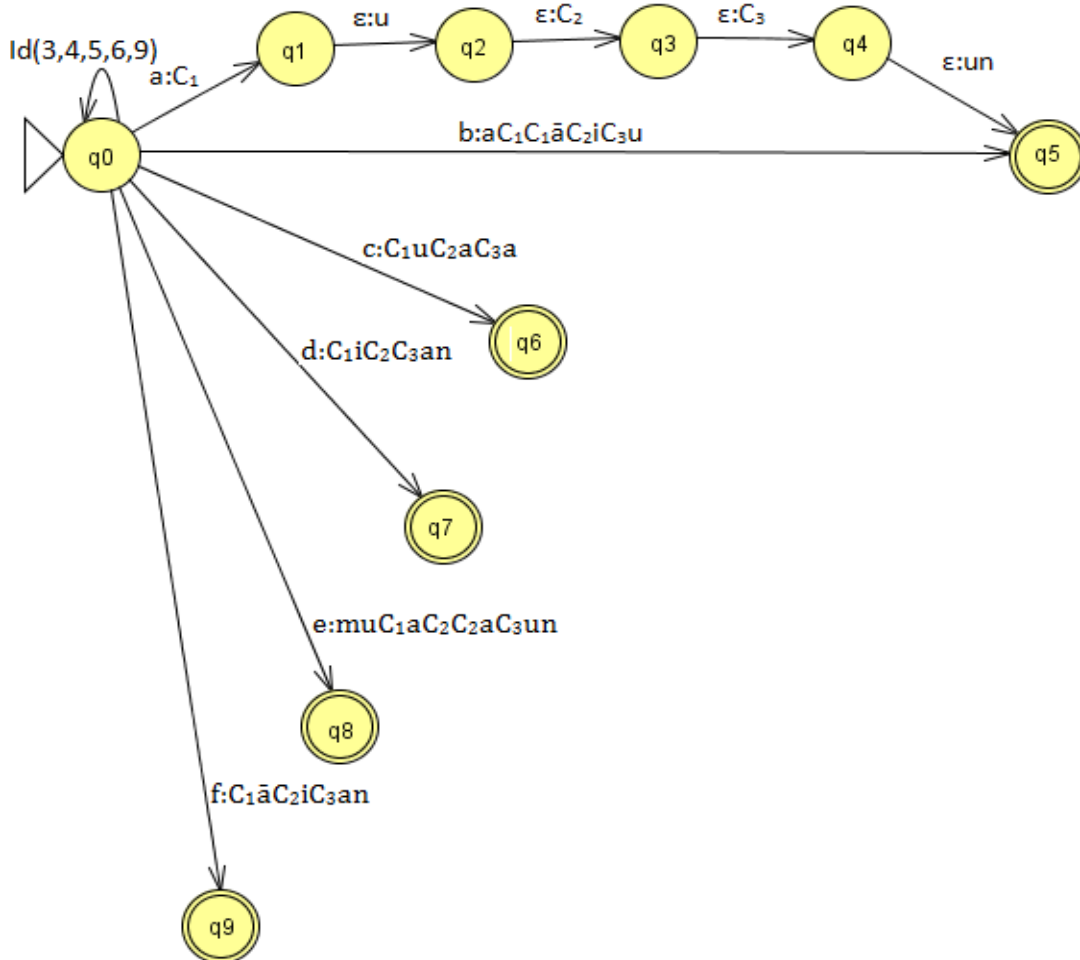
Input to the 1st transducer is supposed to be "Number"+"Letter", e.g. 3a, 9e etc.
Therefore we need to map the roots to their translations (numbers) and the letters to the different patterns.

Letter	Meaning	Pattern
a	$1/x$	$C_1uC_2C_3un$
b	xth	$aC_1C_1\bar{a}C_2iC_3u$
c	group of x	$C_1uC_2aC_3a$
d	every x	$C_1iC_2C_3an$
e	$x$angle	$muC_1aC_2C_2aC_3un$
f	in xth place	$C_1\bar{a}C_2iC_3an$

| Number	Root
3	θ-l-θ
4	r-b-ʕ
5	x-m-s
6	s-d-s
9	t-s-ʕ

Either the pattern is partitioned as shown in the example for the pattern corresponding to a or we can alternatively choose the way shown for the patterns b, c, d, e and f. If the different paths share the final state or don't does not matter in this case.

For any input "Number"+"letter" (3a, 9b...) the Number according to the root at front is remembered and the letter that reveals the information about the pattern is transduced into the pattern itself.

Output of the first transducer for example for

	3a is	3 $C_1uC_2C_3un$
	9e is	9 $muC_1aC_2C_2aC_3un$

Now we need a second transducer that takes the output of the first transducer as input and "fills" the pattern with the root corresponding to the Number. We state that $C_1, C_2, C_3 \notin \Sigma$ to avoid that $Id(\Sigma)$ includes the root's consonants.

2nd transducer
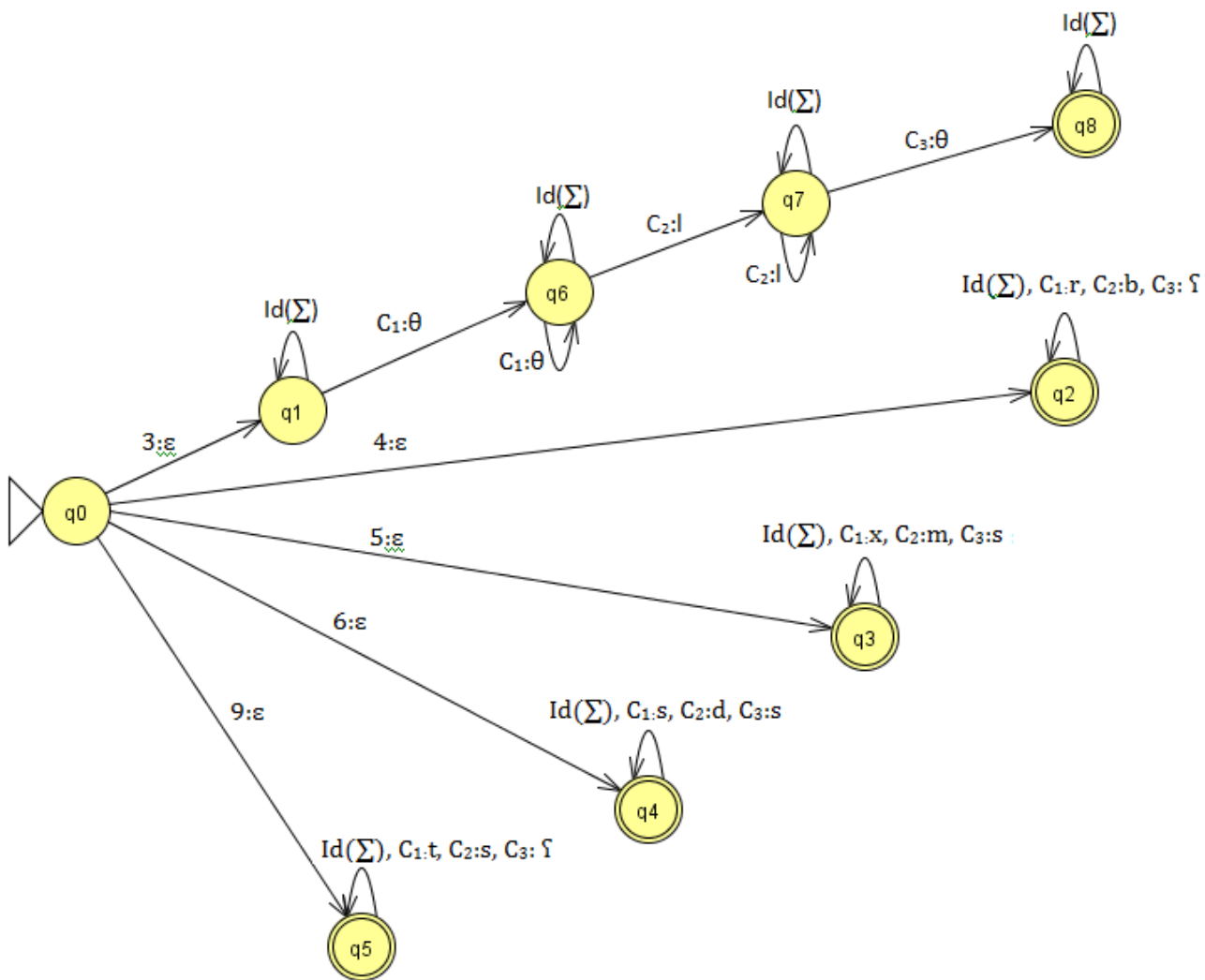
The path that belongs to number 3 is depicted step by step, the paths for the other numbers perform the same actions but are represented in a more compact way.

Choosing the compact way the different paths will have to end up in different final states. In an explicit representation they could share the final state, since the roots would have been mapped correctly to the appropriate numbers before the path enters a final state.

Estonian verbs

Infinitive I	Infinitive II	Present	Past	Participle	

hakkama	hakata	hakkan	hakkasin	hakatud	'start'
hüppama	hüpata	hüppan	hüppasin	hüpatud	'jump'
naïtama	naïdata	naïtan	naïtasin	naïdatud	'show'
kompima	kompida	kombin	kompisin	kombitud	'feel'
lõikama	lõigata	lõikan	lõikasin	lõigatud	'cut'
õppima	õppida	õpin	õppisin	õpitud	'learn'
põdema	põdeda	põøen	põdesin	põøetud	'to be'
pumpama	pumbata	pumpan	pumpasin	pumbatud	'swing'
sulgema	sulgeda	suløen	sulgesin	suløetud	'close'
rääkima	rääkida	räägin	rääkisin	räägitud	'speak'
tõlkima	tõlkida	tõlgin	tõlkisin	tõlgitud	'translate'

Depending on the Inf. II affix –da or –ta the length of the consonant changes:

	ø	ø	ø
↑ - length + ↓	b	d	g
	p	t	k
	pp	tt	kk

Therefore Inf. II is the base:

	-ta	-da
base	Inf. II –ta	Inf. II –da
Inf. I	+length –ma	-ma
Pres.	+length +an	-length +n
Past	+length +sin	+sin
Part.	+tud	-length +tud

Lets state that $\sum_{SYL} = \{ha, hü, naï, kom, lõi, õ, põ, pum, sul, rää, tõl\}$

Transducer for the Present