

Translating Finnish compound words in context¹

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Abstract

In three Technical Reports (No. 75, 77, 78) I have described, how compound words in Finnish can be morphologically described and how they can be translated lexically into English. In this report I will concentrate on the methods of converting the lexical translations into proper translations in context. The problems in this process include the conversion of inflected Finnish forms into corresponding English structures. The full set of inflected forms occurs in the last segment of the compound. In addition, there is a restricted set of inflected forms in segments on the left from the last segment. I will test how these forms affect the translation and how the translation can be implemented.

The translation process also involves disambiguation of segment glosses in cases, where there is more than one gloss alternative.

Key Words: *compound words, morphological analysis, translation.*

1 Introduction

The description of segments in compound words differs from the description of ordinary words in that while ordinary words produce the gloss in base form, in the segments of compound words the gloss is precisely in the same form as it is in text. For example, if the segment is in genitive form, also its 'base-form' is in genitive form. In other words, the segment in text is copied as such as its base-form. This decision was made, because in compounds words only the last segment inflects.

The translation of these segments must be performed as a separate operation, apart from the translation of ordinary words. The assignment of English glosses to these segments faces the problem of how to deal with inflected segments. For example, the genitive form in a segment only seldom corresponds to the genitive form in English. Also, the singular/plural variation only seldom corresponds as such to English. Segments may also have such inflected forms, the translation of which is not clear. The translation may or may not involve using prepositional structures.

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2 Translation of genitive structures in compound segments

A genitive form is a frequent feature in compound segments. In (1) are some examples of such compounds, where at least one segment is in genitive form. The form of the last segment, which is an inflecting segment, is not counted.

(1)
Työ|kyvyttömyys|eläkkeen|saaja
eläkkeen|saajan
työ|eläkkeen|saajat
työn|antajasi
työn|tekijäsi
hammasten|kiristelyn
ajan|varauksen
hampaan|poiston
hampaan|hoidon
hampaiden|valkaisu|tuotteita
hampaiden|valkaisu|metodi
hampaiden|valkaisu|liuskat

The genitive forms are emphasized. Next, we translate these compounds using glosses in base form (2).

(2)
"<työkyvyttömyyseläkkeensaajat>"
" { work|incapability|pension|saaja { beneficiary , recipient
, winner } HUM" C1 C2 C3 N PL NOM
"<eläkkeensaajan>"
" { pension|saaja { beneficiary , recipient , winner } HUM" C3
N SG GEN
"<työeläkkeensaajat>"
" { work|pension|saaja { beneficiary , recipient , winner }
HUM" C2 C3 N PL NOM
"<työnantajasi>"
" { work|antaja { giver , donor , prescriber } HUM" C3 N SG
GEN POS-SG2
"<työntekijäsi>"
" { work|tekijä { factor , maker , player } " C3 N SG GEN POS-
SG2
"<hammastenkiristelyn>"
" { tooth|kiristely { } " C1 N SG GEN
"<ajanvarauksen>"
" { time|varaus { reservation , reserve } " C2 N SG GEN
"<hampaanpoiston>"
" { tooth|poisto { removal } " C1 N SG GEN
"<hampaanhoidon>"
" { tooth|hoito { cure , nurture } " C1 N SG GEN
"<hampaidenvalkaisuotteita>"

```
"{ tooth|whitening|tuote { product , artifact , goods }}" C1  
C2 N PL PAR  
<hampaidenvalkaisumetodi>  
  "{ tooth|whitening|metodi { method }}" C1 C2 N SG NOM  
<hampaidenvalkaisuliuskat>  
  "{ tooth|whitening|liuska { sheet }}" C1 C2 N PL NOM
```

Each compound word above has at least one segment that is in genitive form, in singular or plural. In this translation phase, the compound segments, except for the last one, are translated in base form. We see that all translations are acceptable, and they do not need further processing. This is only a small sample, and further study might show that this does not apply to all cases.

Note that the last segment of the compound has the glosses withing curly braces, because some of them need disambiguation. Usually the disambiguation needs context information, but in disambiguating compound words, the needed information is the reading itself.

We disambiguate the readings and join the English glosses of the last segment to the compound itself (3).

```
(3)  
<työkyvyttömyyseläkkeensaajat>  
  "{ work|incapability|pension|beneficiary } HUM" C1 C2 C3 N PL  
NOM  
<eläkkeensaajan>  
  "{ pension|beneficiary } HUM" C3 N SG GEN  
<työeläkkeensaajat>  
  "{ work|pension|beneficiary } HUM" C2 C3 N PL NOM  
<työnantajasi>  
  "{ work|giver } HUM" C3 N SG GEN POS-SG2  
<työntekijäsi>  
  "{ work|maker }" C3 N SG GEN POS-SG2  
<ajanvarauksen>  
  "{ time|reservation }" C2 N SG GEN  
<hampaanpoiston>  
  "{ tooth|removal }" C1 N SG GEN  
<hampaanhoidon>  
  "{ tooth|cure }" C1 N SG GEN  
<hampaidenvalkaisutuotteita>  
  "{ tooth|whitening|product }" C1 C2 N PL PAR  
<hampaidenvalkaisumetodi>  
  "{ tooth|whitening|method }" C1 C2 N SG NOM  
<hampaidenvalkaisuliuskat>  
  "{ tooth|whitening|sheet }" C1 C2 N PL NOM
```

In (3), the last segment of a compound inflects. We produce plural forms of nouns where needed (4).

(4)
"<työkyvyttömyyseläkkeensaajat>"
" { work|incapability|pension|beneficiaries } HUM" C1 C2 C3 N
PL NOM
"<eläkkeensaajan>"
" { pension|beneficiary } HUM" C3 N SG GEN
"<työeläkkeensaajat>"
" { work|pension|beneficiaries } HUM" C2 C3 N PL NOM
"<työnantajasi>"
" { work|giver } HUM" C3 N SG GEN POS-SG2
"<työntekijäsi>"
" { work|maker }" C3 N SG GEN POS-SG2
"<ajanvarauksen>"
" { time|reservation }" C2 N SG GEN
"<hampaanpoiston>"
" { tooth|removal }" C1 N SG GEN
"<hampaanhoidon>"
" { tooth|cure }" C1 N SG GEN
"<hampaidenvalkaisutuotteita>"
" { tooth|whitening|products }" C1 C2 N PL PAR
"<hampaidenvalkaisumetodi>"
" { tooth|whitening|method }" C1 C2 N SG NOM
"<hampaidenvalkaisuliuskat>"
" { tooth|whitening|sheets }" C1 C2 N PL NOM

Now we have the translation of each isolated compound word. In case the translation is not ideal, it is the question of describing all relevant alternative glosses for each segment, and of the subsequent disambiguation.

We can conclude that the genitive forms in segments, in singular and plural, is not a major problem.

Now we look at compound nouns in context, so that we can continue with the translation process.

3 Processing compound translations into surface text

Above I showed stage by stage how Finnish compound words can be morphologically analysed and translated into English surface form. Now we will see how they can be handled in the following phases of translation process. We note that the conversion into plural forms is not the only process needed. While Finnish uses cases for various roles in sentence, English uses principally prepositions. Also, in many cases English uses no marking.

Let us take a look at the above isolated examples put in context (5).

(5)
Työkyvyttömyyseläkkeensaajalla on mahdollisuus toimeentuloon.
Enemmän tukea tarvitaan eläkkeensaajille.
Saamme palautetta työeläkkeensaajilta.
Anna palautetta työnantajallesi.

*Työntekijöidesi eläketurva on sinun vastuullasi.
Saat nopeamman palvelun ajanvarauksella.
On erilaisia välineitä hampaanpoistoon.
Hampaanhoidon hinnalle tulee asettaa raja.
Hampaidenvalkaisutuotteiden määrälle ei ole rajaa.
On monenlaisia hampaidenvalkaisumetodeja.
Hampaidenvalkaisuliuskoiille asetetaan tuontitulli.*

Now we execute the translation process to the point as seen in (4) above. We also cascade the readings with more than one gloss. This is done for making semantic disambiguation possible (6).

(6)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "work|incapability|pension|saaja { beneficiary } HUM"
INITCAP C1 C2 C3 N SG ADE @SUBJ
  "work|incapability|pension|saaja { recipient } HUM" INITCAP
C1 C2 C3 N SG ADE @SUBJ
  "work|incapability|pension|saaja { winner } HUM" INITCAP C1
C2 C3 N SG ADE @SUBJ
"<on>"
  "olla" { be } O-LOC1 V HAVE PRES SG @+FMAINV
  "olla" { have } O-LOC1 V HAVE PRES SG @+FMAINV
  "olla" { be } O-LOC1 V HAVE PRES PL @+FMAINV
  "olla" { have } O-LOC1 V HAVE PRES PL @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG NOM
  "mahdollisuus" { facility } N SG NOM
  "mahdollisuus" { odds } N SG NOM
  "mahdollisuus" { opportunity } N SG NOM
  "mahdollisuus" { chance } N SG ACC-N
  "mahdollisuus" { facility } N SG ACC-N
  "mahdollisuus" { odds } N SG ACC-N
  "mahdollisuus" { opportunity } N SG ACC-N
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV INITCAP @ADV
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
  "tuki" { backup } N SG PAR @OBJ
"<tarvitaan>"
  "tarvita" { need } V TRV PASS-PRES @FMAINV
"<eläkkeensaajille>"
  "pension|saaja { beneficiary } HUM" C3 N PL ALL @<P
  "pension|saaja { recipient } HUM" C3 N PL ALL @<P
  "pension|saaja { winner } HUM" C3 N PL ALL @<P
"<.>"
```

```
    "." **CLB
"<*saamme>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES PL1 @+FMAINV
    "saada" { dissuade } TRV V INITCAP TRV VMOD PRES PL1
@+FMAINV
    "saada" { elicit } TRV V INITCAP TRV VMOD PRES PL1 @+FMAINV
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
    "work|pension|saaja { beneficiary } HUM" C2 C3 N PL ABL @<P
    "work|pension|saaja { recipient } HUM" C2 C3 N PL ABL @<P
    "work|pension|saaja { winner } HUM" C2 C3 N PL ABL @<P
"<.>"
    "." **CLB
"<*anna>"
    "antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 @+FMAINV
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
    "työnantaja" { employer } N SG ALL POS-SG2 @<P
"<.>"
    "." **CLB
"<*työntekijöidesi>"
    "työntekijä" { employee } N INITCAP PL GEN POS-SG2 @A>
    "työntekijä" { worker } N INITCAP PL GEN POS-SG2 @A>
"<eläketurva>"
    "pension|turva { security }" C3 N SG NOM @SUBJ
    "pension|turva { defence }" C3 N SG NOM @SUBJ
    "pension|turva { indemnification }" C3 N SG NOM @SUBJ
"<on>"
    "olla" { be } O-LOC1 V HAVE PRES SG @+FMAINV
    "olla" { have } O-LOC1 V HAVE PRES SG @+FMAINV
    "olla" { be } O-LOC1 V HAVE PRES PL @+FMAINV
    "olla" { have } O-LOC1 V HAVE PRES PL @+FMAINV
    "olla" { be } O-LOC1 V VMOD BE PRES SG3 @+FMAINV
    "olla" { have } O-LOC1 V VMOD BE PRES SG3 @+FMAINV
"<sinun>"
    "sinä" { you } PRON PERS SG2 GEN @A>
"<vastuullasi>"
    "vastuu" { responsibility } N SG ADE POS-SG2 @<P
    "vastuu" { accountability } N SG ADE POS-SG2 @<P
    "vastuu" { liability } N SG ADE POS-SG2 @<P
"<.>"
    "." **CLB
"<*saat>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES SG2 @+FMAINV
    "saada" { dissuade } TRV V INITCAP TRV VMOD PRES SG2
@+FMAINV
    "saada" { elicit } TRV V INITCAP TRV VMOD PRES SG2 @+FMAINV
"<nopeamman>"
    "nopea" { kwick } A CMP SG GEN @A>
```

"<palvelun>"
 "palvelu" { service } N SG GEN @A>
"<ajanvarauksella>"
 "time|varaus { reservation }" C2 N SG ADE @<P
 "time|varaus { reserve }" C2 N SG ADE @<P
"<.>"
 "." **CLB
"<*on>"
 "olla" { be } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
 "olla" { have } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
 "olla" { be } O-LOC1 V INITCAP HAVE PRES PL @+FMAINV
 "olla" { have } O-LOC1 V INITCAP HAVE PRES PL @+FMAINV
 "olla" { be } O-LOC1 V INITCAP VMOD BE PRES SG3 @+FMAINV
 "olla" { have } O-LOC1 V INITCAP VMOD BE PRES SG3 @+FMAINV
"<erilaisia>"
 "erilainen" { various } A PL PAR @A>
 "erilainen" { different } A PL PAR @A>
"<välineitä>"
 "väline" { medium } N PL PAR @PCOMPL-S
"<hampaanpoistoon>"
 "tooth|poisto { removal }" C1 N SG ILL @<P
"<.>"
 "." **CLB
"<*hampaanhoidon>"
 "tooth|hoito { cure }" INITCAP C1 N SG GEN @A>
 "tooth|hoito { nurture }" INITCAP C1 N SG GEN @A>
"<hinnalle>"
 "hinta" { price } N SG ALL @PCOMPL-S
 "hinta" { toll } N SG ALL @PCOMPL-S
"<tulee>"
 "tulla" { come } V PRES SG3 @+FMAINV
 "tulla" { shall } V PRES SG3 @+FMAINV
 "tulla" { WILL } V PRES SG3 @+FMAINV
"<asettaa>"
 "asettaa" { set } TRV V TRV INF @-FMAINV
 "asettaa" { set } TRV V TRV PRES SG3 @+FMAINV
"<raja>"
 "raja" { limit } N SG ACC-N @OBJ
 "raja" { frontier } N SG ACC-N @OBJ
"<.>"
 "." **CLB
"<*hampaidenvalkaisutuotteiden>"
 "tooth|whitening|tuote { product }" INITCAP C1 C2 N PL GEN
@A>
 "tooth|whitening|tuote { artifact }" INITCAP C1 C2 N PL GEN
@A>
 "tooth|whitening|tuote { goods }" INITCAP C1 C2 N PL GEN @A>
"<määrälle>"
 "määrä" { amount } N SG ALL @PCOMPL-S
"<ei>"
 "ei" { not } NEG SG @ADVL

```
"ei" { no } NEG SG @ADVL
"<ole>"
  "olla" { be } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
  "olla" { have } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
"<rajaa>"
  "raja" { limit } N SG PAR @PCOMPL-S
  "raja" { frontier } N SG PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*on>"
  "olla" { be } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
  "olla" { have } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
  "olla" { be } O-LOC1 V INITCAP HAVE PRES PL @+FMAINV
  "olla" { have } O-LOC1 V INITCAP HAVE PRES PL @+FMAINV
  "olla" { be } O-LOC1 V INITCAP VMOD BE PRES SG3 @+FMAINV
  "olla" { have } O-LOC1 V INITCAP VMOD BE PRES SG3 @+FMAINV
"<monenlaisia>"
  "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
  "tooth|whitening|metodi { method }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*hampaidenvalkaisuliuskaille>"
  "tooth|whitening|liuska { sheet }" INITCAP C1 C2 N PL ALL
@PCOMPL-S
"<asetetaan>"
  "asettaa" { set } TRV V TRV PASS-PRES @FMAINV
"<tuontitulli>"
  "import|tulli { duty }" C2 N SG ACC-N @OBJ
"<.>"
  "." **CLB
```

We perform semantic disambiguation to the reading. The result is in (7).

(7)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "work|incapability|pension|saaja { beneficiary } HUM"
INITCAP C1 C2 C3 N SG ADE @SUBJ
"<on>"
  "olla" { have } O-LOC1 V HAVE PRES SG @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG ACC-N @OBJ
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV INITCAP @ADVL
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
"<tarvitaan>"
```


"tarvita" { need } V TRV PASS-PRES @FMAINV
"<eläkkeensaajille>"
"pension|saaja { beneficiary } HUM" C3 N PL ALL @<P
"<.>"
"." **CLB
"<*saamme>"
"saada" { get } TRV V INITCAP TRV VMOD PRES PL1 @+FMAINV
"<palautetta>"
"palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
"work|pension|saaja { beneficiary } HUM" C2 C3 N PL ABL @<P
"<.>"
"." **CLB
"<*anna>"
"antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 @+FMAINV
"<palautetta>"
"palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
"työnantaja" { employer } N SG ALL POS-SG2 @<P
"<.>"
"." **CLB
"<*työntekijöidesi>"
"työntekijä" { employee } N INITCAP PL GEN POS-SG2 @A>
"<eläketurva>"
"pension|turva { security }" C3 N SG NOM @SUBJ
"<on>"
"olla" { be } O-LOC1 V HAVE PRES SG @+FMAINV
"<sinun>"
"sinä" { you } PRON PERS SG2 GEN @A>
"<vastuullasi>"
"vastuu" { responsibility } N SG ADE POS-SG2 @<P
"<.>"
"." **CLB
"<*saat>"
"saada" { get } TRV V INITCAP TRV VMOD PRES SG2 @+FMAINV
"<nopeamman>"
"nopea" { kwick } A CMP SG GEN @A>
"<palvelun>"
"palvelu" { service } N SG GEN @A>
"<ajanvarauksella>"
"time|varaus { reservation }" C2 N SG ADE @<P
"<.>"
"." **CLB
"<*on>"
"olla" { be } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
"<erilaisia>"
"erilainen" { various } A PL PAR @A>
"<välineitä>"
"väline" { medium } N PL PAR @PCOMPL-S
"<hampaanpoistoon>"
"tooth|poisto { removal }" C1 N SG ILL @<P

```
"<.>"
    "." **CLB
"<*hampaanhoidon>"
    "tooth|hoito { cure }" INITCAP C1 N SG GEN @A>
"<hinnalle>"
    "hinta" { price } N SG ALL @PCOMPL-S
"<tulee>"
    "tulla" { shall } V PRES SG3 @+FMAINV
"<asettaa>"
    "asettaa" { set } TRV V TRV INF @-FMAINV
"<raja>"
    "raja" { limit } N SG ACC-N @OBJ
"<.>"
    "." **CLB
"<*hampaidenvalkaisutuotteiden>"
    "tooth|whitening|tuote { product }" INITCAP C1 C2 N PL GEN
@A>
"<määrälle>"
    "määrä" { amount } N SG ALL @PCOMPL-S
"<ei>"
    "ei" { not } NEG SG @ADVL
"<ole>"
    "olla" { be } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
"<rajaa>"
    "raja" { limit } N SG PAR @PCOMPL-S
"<.>"
    "." **CLB
"<*on>"
    "olla" { be } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
"<monenlaisia>"
    "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
    "tooth|whitening|metodi { method }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
    "." **CLB
"<*hampaidenvalkaisuliuskoille>"
    "tooth|whitening|liuska { sheet }" INITCAP C1 C2 N PL ALL
@PCOMPL-S
"<asetetaan>"
    "asettaa" { set } TRV V TRV PASS-PRES @FMAINV
"<tuontitulli>"
    "import|tulli { duty }" C2 N SG ACC-N @OBJ
"<.>"
    "." **CLB
```

Now when semantic disambiguation has been done, we can join the last section of the translated compound into the compound itself. We can also convert the nouns into plural form when needed. (8).

(8)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "{ work|incapability|pension|beneficiary } HUM" INITCAP C1
C2 C3 N SG ADE @SUBJ
"<on>"
  "olla" { has } O-LOC1 V HAVE PRES SG @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG ACC-N @OBJ
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV INITCAP @ADV
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
"<tarvitaan>"
  "tarvita" { is needed } V TRV PASS-PRES @FMAINV
"<eläkkeensaajille>"
  "{ pension|beneficiaries } HUM" C3 N PL ALL @<P
"<.>"
  "." **CLB
"<*saamme>"
  "saada" { get } TRV V INITCAP TRV VMOD PRES PL1 @+FMAINV
"<palautetta>"
  "palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
  "{ work|pension|beneficiaries } HUM" C2 C3 N PL ABL @<P
"<.>"
  "." **CLB
"<*anna>"
  "antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 @+FMAINV
"<palautetta>"
  "palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
  "työnantaja" { employer } N SG ALL POS-SG2 @<P
"<.>"
  "." **CLB
"<*työntekijöidesi>"
  "työntekijä" { employee } N INITCAP PL GEN POS-SG2 @A>
"<eläketurva>"
  "{ pension|security }" C3 N SG NOM @SUBJ
"<on>"
  "olla" { is } O-LOC1 V HAVE PRES SG @+FMAINV
"<sinun>"
  "sinä" { your } PRON PERS SG2 GEN @A>
"<vastuullasi>"
  "vastuu" { responsibility } N SG ADE POS-SG2 @<P
"<.>"
  "." **CLB
```

```
"<*saat>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES SG2 @+FMAINV
"<nopeamman>"
    "nopea" { kwicker } A CMP SG GEN @A>
"<palvelun>"
    "palvelu" { service } N SG GEN @A>
"<ajanvarauksella>"
    "{ time|reservation }" C2 N SG ADE @<P
"<.>"
    "." **CLB
"<*on>"
    "olla" { is } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
"<erilaisia>"
    "erilainen" { various } A PL PAR @A>
"<välineitä>"
    "väline" { media } N PL PAR @PCOMPL-S
"<hampaanpoistoon>"
    "{ tooth|removal }" C1 N SG ILL @<P
"<.>"
    "." **CLB
"<*hampaanhoidon>"
    "{ tooth|cure }" INITCAP C1 N SG GEN @A>
"<hinnalle>"
    "hinta" { price } N SG ALL @PCOMPL-S
"<tulee>"
    "tulla" { shall } V PRES SG3 @+FMAINV
"<asettaa>"
    "asettaa" { set } TRV V TRV INF @-FMAINV
"<raja>"
    "raja" { limit } N SG ACC-N @OBJ
"<.>"
    "." **CLB
"<*hampaidenvalkaisutuotteiden>"
    "{ tooth|whitening|products }" INITCAP C1 C2 N PL GEN @A>
"<määrälle>"
    "määrä" { amount } N SG ALL @PCOMPL-S
"<ei>"
    "ei" { not } NEG SG @ADVL
"<ole>"
    "olla" { be } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
"<rajaa>"
    "raja" { limit } N SG PAR @PCOMPL-S
"<.>"
    "." **CLB
"<*on>"
    "olla" { is } O-LOC1 V INITCAP HAVE PRES SG @+FMAINV
"<monenlaisia>"
    "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
    "{ tooth|whitening|methods }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
```

```
"." **CLB
"<*hampaidenvalkaisuliuskoiille>"
  "{ tooth|whitening|sheets }" INITCAP C1 C2 N PL ALL @PCOMPL-
S
"<asetetaan>"
  "asettaa" { set } TRV V TRV PASS-PRES @FMAINV
"<tuontitulli>"
  "{ import|duty }" C2 N SG ACC-N @OBJ
"<.>" "." **CLB
```

The next step is to convert Finnish case tags into corresponding English equivalents. Most of them are prepositions, and some do not need any marking.

Because there is often more than one translation alternative, we have to make disambiguation based on context. Therefore, we must cascade the readings (9).

(9)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "{ work|incapability|pension|beneficiary } HUM" INITCAP C1
C2 C3 N SG ADE { with } @SUBJ
  "{ work|incapability|pension|beneficiary } HUM" INITCAP C1
C2 C3 N SG ADE { on } @SUBJ
  "{ work|incapability|pension|beneficiary } HUM" INITCAP C1
C2 C3 N SG ADE { NOGLOSS } @SUBJ
"<on>"
  "olla" { has } O-LOC1 V HAVE PRES SG { it } @+FMAINV
  "olla" { has } O-LOC1 V HAVE PRES SG { NOGLOSS } @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG ACC-N @OBJ
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL { for } @<P
  "toimeentulo" { livelihood } N SG ILL { to } @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV INITCAP @ADVL
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
"<tarvitaan>"
  "tarvita" { is needed } V TRV PASS-PRES @FMAINV
"<eläkkeensaajille>"
  "{ pension|beneficiaries } HUM" C3 N PL ALL { for } @<P
  "{ pension|beneficiaries } HUM" C3 N PL ALL { to } @<P
"<.>"
  "." **CLB
"<*saamme>"
  "saada" { get } TRV V INITCAP TRV VMOD PRES PL1 { we }
@+FMAINV
  "saada" { get } TRV V INITCAP TRV VMOD PRES PL1 { NOGLOSS }
@+FMAINV
```

```
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
    "{ work|pension|beneficiaries } HUM" C2 C3 N PL ABL { from }
@<P
"<.>"
    "." **CLB
"<*anna>"
    "antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 { you }
@+FMAINV
    "antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 { NOGLOSS }
@+FMAINV
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
    "työnantaja" { employer } N SG ALL { for , to } POS-SG2 {
your } @<P
    "työnantaja" { employer } N SG ALL { for , to } POS-SG2 {
NOGLOSS } @<P
"<.>"
    "." **CLB
"<*työntekijöidesi>"
    "työntekijä" { employee } N INITCAP PL GEN { of } POS-SG2 {
your } @A>
    "työntekijä" { employee } N INITCAP PL GEN { of } POS-SG2 {
NOGLOSS } @A>
"<eläketurva>"
    "{ pension|security }" C3 N SG NOM @SUBJ
"<on>"
    "olla" { is } O-LOC1 V HAVE PRES SG { it } @+FMAINV
    "olla" { is } O-LOC1 V HAVE PRES SG { NOGLOSS } @+FMAINV
"<sinun>"
    "sinä" { your } PRON PERS SG2 GEN { of } @A>
"<vastuullasi>"
    "vastuu" { responsibility } N SG ADE { with } POS-SG2 { your
} @<P
    "vastuu" { responsibility } N SG ADE { with } POS-SG2 {
NOGLOSS } @<P
    "vastuu" { responsibility } N SG ADE { on } POS-SG2 { your }
@<P
    "vastuu" { responsibility } N SG ADE { on } POS-SG2 {
NOGLOSS } @<P
    "vastuu" { responsibility } N SG ADE { NOGLOSS } POS-SG2 {
your } @<P
    "vastuu" { responsibility } N SG ADE { NOGLOSS } POS-SG2 {
NOGLOSS } @<P
"<.>"
    "." **CLB
"<*saat>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES SG2 { you }
@+FMAINV
```

```
"saada" { get } TRV V INITCAP TRV VMOD PRES SG2 { NOGLOSS }
@+FMAINV
"<nopeamman>"
  "nopea" { kwicker } A CMP SG GEN { of } @A>
"<palvelun>"
  "palvelu" { service } N SG GEN { of } @A>
"<ajanvarauksella>"
  "{ time|reservation }" C2 N SG ADE { with } @<P
  "{ time|reservation }" C2 N SG ADE { on } @<P
  "{ time|reservation }" C2 N SG ADE { NOGLOSS } @<P
"<.>"
  "." **CLB
"<*on>"
  "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { it } @+FMAINV
  "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { NOGLOSS }
@+FMAINV
"<erilaisia>"
  "erilainen" { various } A PL PAR @A>
"<välineitä>"
  "väline" { media } N PL PAR @PCOMPL-S
"<hampaanpoistoon>"
  "{ tooth|removal }" C1 N SG ILL { for } @<P
  "{ tooth|removal }" C1 N SG ILL { to } @<P
"<.>"
  "." **CLB
"<*hampaanhoidon>"
  "{ tooth|cure }" INITCAP C1 N SG GEN { of } @A>
"<hinnalle>"
  "hintaa" { price } N SG ALL { for } @PCOMPL-S
  "hintaa" { price } N SG ALL { to } @PCOMPL-S
"<tulee>"
  "tulla" { shall } V PRES SG3 { he } @+FMAINV
  "tulla" { shall } V PRES SG3 { she } @+FMAINV
  "tulla" { shall } V PRES SG3 { it } @+FMAINV
  "tulla" { shall } V PRES SG3 { NOGLOSS } @+FMAINV
"<asettaa>"
  "asettaa" { set } TRV V TRV INF @-FMAINV
"<raja>"
  "raja" { limit } N SG ACC-N @OBJ
"<.>"
  "." **CLB
"<*hampaidenvalkaisutuotteiden>"
  "{ tooth|whitening|products }" INITCAP C1 C2 N PL GEN { of }
@A>
"<määrälle>"
  "määrä" { amount } N SG ALL { for } @PCOMPL-S
  "määrä" { amount } N SG ALL { to } @PCOMPL-S
"<ei>"
  "ei" { not } NEG SG @ADVL
"<ole>"
  "olla" { be } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
```

```
"<rajaa>"
  "raja" { limit } N SG PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*on>"
  "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { it } @+FMAINV
  "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { NOGLOSS }
@+FMAINV
"<monenlaisia>"
  "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
  "{ tooth|whitening|methods }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*hampaidenvalkaisuluskoille>"
  "{ tooth|whitening|sheets }" INITCAP C1 C2 N PL ALL { for }
@PCOMPL-S
  "{ tooth|whitening|sheets }" INITCAP C1 C2 N PL ALL { to }
@PCOMPL-S
"<asetetaan>"
  "asettaa" { set } TRV V TRV PASS-PRES @FMAINV
"<tuontitulli>"
  "{ import|duty }" C2 N SG ACC-N @OBJ
"<.>"
  "." **CLB
```

Now we must disambiguate again. The result is in (10).

(10)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "{ work|incapability|pension|beneficiary } HUM" INITCAP C1
C2 C3 N SG ADE { NOGLOSS } @SUBJ
"<on>"
  "olla" { has } O-LOC1 V HAVE PRES SG { it } @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG ACC-N @OBJ
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL { for } @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV INITCAP @ADVL
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
"<tarvitaan>"
  "tarvita" { is needed } V TRV PASS-PRES @FMAINV
"<eläkkeensaajille>"
  "{ pension|beneficiaries } HUM" C3 N PL ALL { for } @<P
"<.>"
  "." **CLB
```



```
"<*saamme>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES PL1 { we }
@+FMAINV
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
    "{ work|pension|beneficiaries } HUM" C2 C3 N PL ABL { from }
@<P
"<.>"
    "." **CLB
"<*anna>"
    "antaa" { give TRV } V INITCAP TRV VMOD IMP SG2 { NOGLOSS }
@+FMAINV
"<palautetta>"
    "palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
    "työnantaja" { employer } N SG ALL { for , to } POS-SG2 {
your } @<P
"<.>"
    "." **CLB
"<*työntekijöidesi>"
    "työntekijä" { employee } N INITCAP PL GEN { of } POS-SG2 {
your } @A>
"<eläketurva>"
    "{ pension|security }" C3 N SG NOM @SUBJ
"<on>"
    "olla" { is } O-LOC1 V HAVE PRES SG { it } @+FMAINV
"<sinun>"
    "sinä" { your } PRON PERS SG2 GEN { of } @A>
"<vastuullasi>"
    "vastuu" { responsibility } N SG ADE { on } POS-SG2 {
NOGLOSS } @<P
"<.>"
    "." **CLB
"<*saat>"
    "saada" { get } TRV V INITCAP TRV VMOD PRES SG2 { you }
@+FMAINV
"<nopeamman>"
    "nopea" { kwicker } A CMP SG GEN { of } @A>
"<palvelun>"
    "palvelu" { service } N SG GEN { of } @A>
"<ajanvarauksella>"
    "{ time|reservation }" C2 N SG ADE { with } @<P
"<.>"
    "." **CLB
"<*on>"
    "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { it } @+FMAINV
"<erilaisia>"
    "erilainen" { various } A PL PAR @A>
"<välineitä>"
    "väline" { media } N PL PAR @PCOMPL-S
```

```
"<hampaanpoistoon>"
  "{ tooth|removal }" C1 N SG ILL { for } @<P
"<.>"
  "." **CLB
"<*hampaanhoidon>"
  "{ tooth|cure }" INITCAP C1 N SG GEN { of } @A>
"<hinnalle>"
  "hinta" { price } N SG ALL { for } @PCOMPL-S
"<tulee>"
  "tulla" { shall } V PRES SG3 { NOGLOSS } @+FMAINV
"<asettaa>"
  "asettaa" { set } TRV V TRV INF @-FMAINV
"<raja>"
  "raja" { limit } N SG ACC-N @OBJ
"<.>"
  "." **CLB
"<*hampaidenvalkaisutuotteiden>"
  "{ tooth|whitening|products }" INITCAP C1 C2 N PL GEN { of }
@A>
"<määrälle>"
  "määrä" { amount } N SG ALL { for } @PCOMPL-S
"<ei>"
  "ei" { not } NEG SG @ADVL
"<ole>"
  "olla" { be } O-LOC1 V VMOD BE NEG-PRES @+FMAINV
"<rajaa>"
  "raja" { limit } N SG PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*on>"
  "olla" { is } O-LOC1 V INITCAP HAVE PRES SG { it } @+FMAINV
"<monenlaisia>"
  "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
  "{ tooth|whitening|methods }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
  "." **CLB
"<*hampaidenvalkaisuliuskoiden>"
  "{ tooth|whitening|sheets }" INITCAP C1 C2 N PL ALL { for }
@PCOMPL-S
"<asetetaan>"
  "asettaa" { set } TRV V TRV PASS-PRES @FMAINV
"<tuontitulli>"
  "{ import|duty }" C2 N SG ACC-N @OBJ
"<.>"
  "." **CLB
```

Because all features in target language cannot be processed by means of transfer, we must use also adding and replace rules for adding appropriate words. The result of this process is in (11). The added glosses below are marked with red colour.

(11)

```
"<*työkyvyttömyyseläkkeensaajalla>"
  "{ work|incapability|pension|beneficiary } HUM" CAP C1 C2 C3
N SG ADE { NOGLOSS } @SUBJ { the }
"<on>"
  "olla" { has } O-LOC1 V HAVE PRES SG { NOGLOSS } @+FMAINV
"<mahdollisuus>"
  "mahdollisuus" { chance } N SG ACC-N @OBJ { a }
"<toimeentuloon>"
  "toimeentulo" { livelihood } N SG ILL { for } @<P
"<.>"
  "." **CLB
"<*enemmän>"
  "enemmän" { more } ADV CAP @ADVL
"<tukea>"
  "tuki" { subsidy } N SG PAR @OBJ
"<tarvitaan>"
  "tarvita" { needed } V TRV PASS-PRES @FMAINV { there will be
}
"<eläkkeensaajille>"
  "{ pension|beneficiaries } HUM" C3 N PL ALL { to } @<P
"<.>"
  "." **CLB
"<*saamme>"
  "saada" { get } TRV V CAP TRV VMOD PRES PL1 { we } @+FMAINV
"<palautetta>"
  "palaute" { feedback } N SG PAR @OBJ
"<työeläkkeensaajilta>"
  "{ work|pension|beneficiaries } HUM" C2 C3 N PL ABL { from }
@<P
"<.>"
  "." **CLB
"<*anna>"
  "antaa" { give TRV } V CAP TRV VMOD IMP SG2 { NOGLOSS }
@+FMAINV
"<palautetta>"
  "palaute" { feedback } N SG PAR @OBJ
"<työnantajallesi>"
  "työnantaja" { employer } N SG ALL { to } POS-SG2 { your }
@<P
"<.>"
  "." **CLB
"<*työntekijöidesi>"
  "työntekijä" { employee } N CAP PL GEN { of } POS-SG2 { your
} @A>
"<eläketurva>"
  "{ pension|security }" C3 N SG NOM @SUBJ { the }
"<on>"
  "olla" { is } O-LOC1 V HAVE PRES SG { NOGLOSS } @+FMAINV
"<sinun>"
  "sinä" { your } PRON PERS SG2 GEN { NOGLOSS } @A>
```

```
"<vastuullasi>"
    "vastuu" { responsibility } N SG ADE { on } POS-SG2 {
NOGLOSS } @<P
"<.>"
    "." **CLB
"<*saat>"
    "saada" { get } TRV V CAP TRV VMOD PRES SG2 { you } @+FMAINV
"<nopeamman>"
    "nopea" { kwicker } A CMP SG ACC @A>
"<palvelun>"
    "palvelu" { service } N SG ACC @OBJ { a }
"<ajanvarauksella>"
    "{ time|reservation }" C2 N SG ADE { with } @<P
"<.>"
    "." **CLB
"<*on>"
    "olla" { there are }
"<erilaisia>"
    "erilainen" { various } A PL PAR @A>
"<välineitä>"
    "väline" { media } N PL PAR @PCOMPL-S
"<hampaanpoistoon>"
    "{ tooth|removal }" C1 N SG ILL { for } @<P
"<.>"
    "." **CLB
"<*hampainhoidon>"
    "{ tooth|cure }" CAP C1 N SG GEN { of } @A> { the }
"<hinnalle>"
    "hinta" { price } N SG ALL { to } @PCOMPL-S { the }
"<tulee>"
    "tulla" { shall } V PRES SG3 { NOGLOSS } @+FMAINV { be }
"<asettaa>"
    "asettaa" { set } TRV V TRV INF @-FMAINV
"<raja>"
    "raja" { limit } N SG ACC-N @OBJ { a }
"<.>"
    "." **CLB
"<*hampaidenvalkaisutuotteiden>"
    "{ tooth|whitening|products }" CAP C1 C2 N PL GEN { of } @A>
{ the }
"<määrälle>"
    "määrä" { amount } N SG ALL { to } @PCOMPL-S { the }
"<ei>"
    "ei" { NOGLOSS }
"<ole>"
    "olla" { there is no } V
"<rajaa>"
    "raja" { limit } N SG PAR @PCOMPL-S
"<.>"
    "." **CLB
```

```
"<*on>"
    "olla" { there are }
"<monenlaisia>"
    "monenlainen" { many kinds of } A PL PAR @A>
"<hampaidenvalkaisumetodeja>"
    "{ tooth|whitening|methods }" C1 C2 N PL PAR @PCOMPL-S
"<.>"
    "." **CLB
"<*hampaidenvalkaisuliuskalle>"
    "{ tooth|whitening|sheets }" CAP C1 C2 N PL ALL { to }
@PCOMPL-S { the }
"<asetetaan>"
    "asettaa" { set } TRV V TRV PASS-PRES @FMAINV { there will
be }
"<tuontitulli>"
    "{ import|duty }" C2 N SG ACC-N @OBJ { a }
"<.>"
    "." **CLB
```

Now when we have all English words in the form where they should be, we remove all unnecessary material, such as the Finnish word-forms and base forms. We also enclose each reading with brackets and convert the text into a sentence-per-line format (12). This is done for making the reordering of words possible.

(12)

```
( N { work|incapability|pension|beneficiary } HUM" CAP C1 C2 C3
SG ADE @SUBJ { the } ) ( V { has } O-LOC1 HAVE PRES SG @+FMAINV )
( N { chance } SG ACC-N @OBJ { a } ) ( N { livelihood } SG ILL {
for } @<P ) **CLB

( ADV { more } CAP @ADVL ) ( N { subsidy } SG PAR @OBJ ) ( V {
needed } PASS-PRES @FMAINV { there will be } ) ( N {
pension|beneficiaries } HUM" C3 PL ALL { to } @<P ) **CLB

( V { get } CAP VMOD PRES PL1 { we } @+FMAINV ) ( N { feedback }
SG PAR @OBJ ) ( N { work|pension|beneficiaries } HUM" C2 C3 PL ABL
{ from } @<P ) **CLB

( V { give } CAP VMOD IMP SG2 @+FMAINV ) ( N { feedback } SG PAR
@OBJ ) ( N { employer } SG ALL { to } POS-SG2 { your } @<P ) **CLB

( N { employee } CAP PL GEN { of } POS-SG2 { your } @A> ) ( N {
pension|security } C3 SG NOM @SUBJ { the } ) ( V { is } O-LOC1
HAVE PRES SG @+FMAINV ) ( { your } PRON PERS SG2 GEN @A> ) ( N {
responsibility } SG ADE { on } POS-SG2 @<P ) **CLB

( V { get } CAP VMOD PRES SG2 { you } @+FMAINV ) ( A { kwicker }
CMP SG ACC @A> ) ( N { service } SG ACC @OBJ { a } ) ( N {
time|reservation } C2 SG ADE { with } @<P ) **CLB
```

({ there are }) (A { various } PL PAR @A>) (N { media } PL
PAR @PCOMPL-S) (N { tooth|removal } C1 SG ILL { for } @<P)
**CLB

(N { tooth|cure } CAP C1 SG GEN { of } @A> { the }) (N { price
} SG ALL { to } @PCOMPL-S { the }) (V { shall } PRES SG3
@+FMAINV { be }) (V { set } INF @-FMAINV) (N { limit } SG ACC-
N @OBJ { a }) **CLB

(N { tooth|whitening|products } CAP C1 C2 PL GEN { of } @A> {
the }) (N { amount } SG ALL { to } @PCOMPL-S { the }) () ({
there is no } V) (N { limit } SG PAR @PCOMPL-S) **CLB

({ there are }) (A { many kinds of } PL PAR @A>) (N {
tooth|whitening|methods } C1 C2 PL PAR @PCOMPL-S) **CLB

(N { tooth|whitening|sheets } CAP C1 C2 PL ALL { to } @PCOMPL-S
{ the }) (V { set } PASS-PRES @FMAINV { there will be }) (N {
import|duty } C2 SG ACC-N @OBJ { a }) **CLB

A set of successively applied reordering rules move the words to correct places (13).

(13)

(N { the } { work|incapability|pension|beneficiary } HUM" CAP C1
C2 C3 SG ADE @SUBJ) (V { has } O-LOC1 HAVE PRES SG @+FMAINV) (N { a } { chance } SG ACC-N @OBJ) (N { for } { livelihood } SG
ILL @<P) **CLB

(ADV { more } CAP @ADVL) (N { subsidy } SG PAR @OBJ) (V {
there will be } { needed } PASS-PRES @FMAINV) (N { to } {
pension|beneficiaries } HUM" C3 PL ALL @<P) **CLB

(N { we } { get } CAP VMOD PRES PL1 @+FMAINV) (N { feedback }
SG PAR @OBJ) (N { from } { work|pension|beneficiaries } HUM" C2
C3 PL ABL @<P) **CLB

(V { give } CAP VMOD IMP SG2 @+FMAINV) (N { feedback } SG PAR
@OBJ) (N { to } { your } { employer } SG ALL POS-SG2 @<P)
**CLB

(N { the } { pension|security } C3 SG NOM @SUBJ) (N { of } {
your } { employee } CAP PL GEN POS-SG2 @A>) (V { is } O-LOC1
HAVE PRES SG @+FMAINV) { on } { your } PRON PERS SG2 GEN @A>) (N { responsibility } SG ADE POS-SG2 @<P) **CLB

(N { you } { get } CAP VMOD PRES SG2 @+FMAINV) (A { a } {
kwicker } CMP SG ACC @A>) (N { service } SG ACC @OBJ) (N {
with } { time|reservation } C2 SG ADE @<P) **CLB

({ there are }) (A { various } PL PAR @A>) (N { media } PL
PAR @PCOMPL-S) (N { for } { tooth|removal } C1 SG ILL @<P)
**CLB

(N { to } { the } { price } SG ALL @PCOMPL-S) (N { of } { the
} { tooth|cure } CAP C1 SG GEN @A>) (V { shall } PRES SG3
@+FMAINV { be }) (V { set } INF @-FMAINV) (N { a } { limit }
SG ACC-N @OBJ) **CLB

(N { to } { the } { amount } SG ALL @PCOMPL-S) (N { of } { the
} { tooth|whitening|products } CAP C1 C2 PL GEN @A>) () ({
there is no } V) (N { limit } SG PAR @PCOMPL-S) **CLB

({ there are }) (A { many kinds of } PL PAR @A>) (N {
tooth|whitening|methods } C1 C2 PL PAR @PCOMPL-S) **CLB

(N { to } { the } { tooth|whitening|sheets } CAP C1 C2 PL ALL
@PCOMPL-S) (V { there will be } { set } PASS-PRES @FMAINV) (N
{ a } { import|duty } C2 SG ACC-N @OBJ) **CLB

In this stage we must make sure that the capitalisation of words is correctly made. If the first letter of the word was capitalised in the source text, the tag INITCAP was added. The system has also two other types of capital marking. If the word with capital initial is inside the sentence, the tag is CAP. If all letters are capitalised, the tag is ALLCAP.

When the words of target language are reordered, these original tag markings do not hold any more. We convert the first letter of the translated sentence to upper case. Other case encodings of the original text do not have effect on translation (14).

(14)

(N { The } { work|incapability|pension|beneficiary } HUM" CAP C1
C2 C3 SG ADE @SUBJ) (V { has } O-LOC1 HAVE PRES SG @+FMAINV) (N
{ a } { chance } SG ACC-N @OBJ) (N { for } { livelihood } SG
ILL @<P) { . }
(ADV { More } CAP @ADVL) (N { subsidy } SG PAR @OBJ) (V {
there will be } { needed } PASS-PRES @FMAINV) (N { to } {
pension|beneficiaries } HUM" C3 PL ALL @<P) { . }
(N { We } { get } CAP VMOD PRES PL1 @+FMAINV) (N { feedback }
SG PAR @OBJ) (N { from } { work|pension|beneficiaries } HUM" C2
C3 PL ABL @<P) { . }
(V { Give } CAP VMOD IMP SG2 @+FMAINV) (N { feedback } SG PAR
@OBJ) (N { to } { your } { employer } SG ALL POS-SG2 @<P) { .
}
(N { The } { pension|security } C3 SG NOM @SUBJ) (N { of } {
your } { employee } CAP PL GEN POS-SG2 @A>) (V { is } O-LOC1
HAVE PRES SG @+FMAINV) { on } { your } PRON PERS SG2 GEN @A>) (N
{ responsibility } SG ADE POS-SG2 @<P) { . }
(N { You } { get } CAP VMOD PRES SG2 @+FMAINV) (A { a } {
kwicker } CMP SG ACC @A>) (N { service } SG ACC @OBJ) (N {
with } { time|reservation } C2 SG ADE @<P) { . }

({ There are }) (A { various } PL PAR @A>) (N { media } PL
PAR @PCOMPL-S) (N { for } { tooth|removal } C1 SG ILL @<P) { .
}
(N { To } { the } { price } SG ALL @PCOMPL-S) (N { of } { the
} { tooth|cure } CAP C1 SG GEN @A>) (V { shall } PRES SG3
@+FMAINV { be }) (V { set } INF @-FMAINV) (N { a } { limit }
SG ACC-N @OBJ) { . }
(N { To } { the } { amount } SG ALL @PCOMPL-S) (N { of } { the
} { tooth|whitening|products } CAP C1 C2 PL GEN @A>) () ({
there is no } V) (N { limit } SG PAR @PCOMPL-S) { . }
({ There are }) (A { many kinds of } PL PAR @A>) (N {
tooth|whitening|methods } C1 C2 PL PAR @PCOMPL-S) { . }
(N { To } { the } { tooth|whitening|sheets } CAP C1 C2 PL ALL
@PCOMPL-S) (V { there will be } { set } PASS-PRES @FMAINV) (N
{ a } { import|duty } C2 SG ACC-N @OBJ) { . }

When words are in correct form and in correct order, we can retain only target language words (15).

(15)
{ The }
{ work|incapability|pension|beneficiary }
{ has }
{ a }
{ chance }
{ for }
{ livelihood }
{ . }
{ More }
{ subsidy }
{ there will be }
{ needed }
{ to }
{ pension|beneficiaries }
{ . }
{ We }
{ get }
{ feedback }
{ from }
{ work|pension|beneficiaries }
{ . }
{ Give }
{ feedback }
{ to }
{ your }
{ employer }
{ . }
{ The }
{ pension|security }
{ of }
{ your }

{ employee }
{ is }
{ on }
{ your }
{ responsibility }
{ . }
{ You }
{ get }
{ a }
{ kwicker }
{ service }
{ with }
{ time|reservation }
{ . }
{ There are }
{ various }
{ media }
{ for }
{ tooth|removal }
{ . }
{ To }
{ the }
{ price }
{ of }
{ the }
{ tooth|cure }
{ shall }
{ be }
{ set }
{ a }
{ limit }
{ . }
{ To }
{ the }
{ amount }
{ of }
{ the }
{ tooth|whitening|products }
{ there is no }
{ limit }
{ . }
{ There are }
{ many kinds of }
{ tooth|whitening|methods }
{ . }
{ To }
{ the }
{ tooth|whitening|sheets }
{ there will be }
{ set }
{ a }

```
{ import|duty }  
{ . }
```

The segments of the compound words were kept together up to this point. Now they can be separated, and the translated text can be converted to the sentence-per-line format (16). The compound word sections are in red.

(16)

*The **work incapability pension beneficiary** has a chance for livelihood.*
*More subsidy there will be needed to **pension beneficiaries**.*
*We get feedback from **work pension beneficiaries**.*
*Give feedback to your **employer**.*
*The **pension security** of your employee is on your responsibility.*
*You get a kwicker service with **time reservation**.*
*There are various media for **tooth removal**.*
*To the price of the **tooth cure** shall be set a limit.*
*To the amount of the **tooth whitening products** there is no limit.*
*There are many kinds of **tooth whitening methods**.*
*To the **tooth whitening sheets** there will be set an import duty.*

Note that in the last example the words ‘a import’ was converted to ‘an import’. The control of the correct form of the indefinite article was left to the phase, where the translated text is almost ready. It is easy to control here, because the form of the article depends on the first letter of the following word.

There is one example, where compound was translated as a single word. *Työn|antaja* was translated as ‘employer’. This is one example of cases, where section-by-section translation is not possible.

4 Conclusion

The above phase-to-phase description of the translation process of compound nouns in context is no doubt boring. It requires careful planning, and it also involves disambiguation in several phases.

Our first question was whether various case forms in compound segment, and their singular/plural variations, affect the translation. Our cases above show, that at least in these examples it had no effect. Where Finnish uses a genitive form or a plural form in the segment, in English it is translated with plain gloss.

The last segment of the compound, on the other hand, causes problems, because the Finnish case forms are translated using a variety of prepositions in English. The selection of the preposition requires context sensitive rules.