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Passive constructions in English to Finnish machine translation[1]

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Abstract

The formation of passive constructions is different in English and Finnish. English has Finnish are similar in forming so called true passives, without subject in the constructions. However, the languages differ in forming passive constructions with agent. Finnish does not have this feature, but English uses it profusely. This causes problems in translation. Translation becomes even more difficult, when the passive form with agent is covertly embedded in the main clause. This report describes how various forms of English passive constructions can be translated into Finnish.

Keywords: *machine translation, passive constructions.*

1 Introduction

English and Finnish are similar in that both have true passive constructions. Both languages have their own ways of forming these passives, but the basic elements are rather similar. A passive verb form of English maps to the corresponding verb form in Finnish. The word order does not change in translation.

The situation is entirely different in passive constructions with agent. Because Finnish does not have a corresponding form, this type of passive constructions must be converted into active form, and it, in addition to heavy modification of words, also involves reordering of words.

The constructions, where the passive structure with agent is embedded as a relative clause within the main clause, are even more complex to translate. Below is a description of each type of structures, and on how they can be translated.

We will demonstrate the processing phases in each passive type using the same basic sentence found in news media.

2 True passive sentences

True passives are such that the verb structure does not have a proper subject. The object functions as a grammatical subject. In (1) is a disambiguated analysis of a simple passive sentence. Also lexical glosses in Finnish have been added.

(1)
```
"<*data>"
      "data" { *tieto N1-F } %SUBJ CAPINIT N PL NOM
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST PL
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN
```

The translation of this sentence is quite simple. Only the instructions on how each word should be translated need to be added (2).

(2)
```
"<*data>"
      "data" { *tieto N1-F } %SUBJ CAPINIT N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST PL
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN PL PASS-PAST
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN PL PASS-PAST
```

We see that 'data' should be in partitive. Both verbs should have a past passive form. The inflection tags are then converted into corresponding surface forms and annexed to the end of the lemma (3).

(3)
```
"<*data>"
      "data" { *tiet:o+oja :N1-F } %SUBJ CAPINIT N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
      "gather" { koo:ta+ttiin :V74-D } O-PAR %-FMAINV V PL PASS-PAST
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso:ida+itiin :V62 } O-PAR %-FMAINV V PL PASS-PAST
```

No further modifications to Finnish words are needed. Only the end part of the lemma is substituted with the new suffix (4).

(4)

```
"<*data>"
      "data" { *tietoja } %SUBJ CAPINIT N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
      "gather" { koottiin } O-PAR %-FMAINV V PL PASS-PAST
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoitiin } O-PAR %-FMAINV V PL PASS-PAST
```

The word order needs no modifications, and the final translated sentence can be produced easily (5).

(5)
Tietoja koottiin ja analysoitiin.

3 Passive structure in main clause with agent

If we extend the above sentence to include also the agent and some other arguments, we get the analysed and disambiguated form as in (6). Note that the system removes English articles.

(6)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST PL
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<and>"
      "and" { ja } %CC CC
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<help>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM
```

```
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Because the sentence has an agent structure, the main verbs cannot be translated with passive forms. The whole structure must be treated as an active sentence. Therefore, we have to add appropriate inflection tags (7).

(7)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN SG PAST
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG SG PAST
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<and>"
      "and" { ja } %CC CC
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<help>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF 3INF-ILL
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS PL PAR
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM PAR
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3 PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
```

```
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN PASS-PRES SG
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Then we convert the inflection tags into surface form and move them to the end of the stems (8).

(8)

```
"<data>"
      "data" { tiet:o+oja :N1-F } %SUBJ N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
      "gather" { koo:ta+si :V74-D } O-PAR %-FMAINV V PAST SG
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso:ida+i :V62 } O-PAR %-FMAINV V PAST SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö :N4-A FRONT } %<P N SG NOM NOM
"<and>"
      "and" { ja } %CC CC
"<they>"
      "they" { n:e :Np12 FRONT } %SUBJ PRON PERS NOM PL3 NOM
"<help>"
      "help" { autt:aa+avat :V56-C } O-PAR %+FMAINV V PRES PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt:ää+amaan :V53-C FRONT } O-ACC %-FMAINV V INF SG
3INF-ILL
"<daily>"
      "daily" { päivittäi:nen+sia :N38 FRONT } %A> A ABS +set PL PAR
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toimint:o+oja :N1-J } %OBJ N PL PAR
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n:e+iitä :Np12 FRONT } %SUBJ PRON PERS PL3 PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi:ta+taan :V69 } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

This sentence contains the word 'koota' that undergoes a gradation process. This is demonstrated in (9).

(9)

```
"<data>"
      "data" { tiet:o+oja :N1-F } %SUBJ N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
      "gather" { kok%o:ta+si :V74-D } O-PAR %-FMAINV V PAST SG
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso:ida+i :V62 } O-PAR %-FMAINV V PAST SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö :N4-A FRONT } %<P N SG NOM NOM
"<and>"
      "and" { ja } %CC CC
"<they>"
      "they" { n:e :Np12 FRONT } %SUBJ PRON PERS NOM PL3 NOM
"<help>"
      "help" { autt:aa+avat :V56-C } O-PAR %+FMAINV V PRES PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt:ää+amaan :V53-C FRONT } O-ACC %-FMAINV V INF SG
3INF-ILL
"<daily>"
      "daily" { päivittäi:nen+sia :N38 FRONT } %A> A ABS +set PL PL PAR
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toimint:o+oja :N1-J } %OBJ N PL PAR
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n:e+iitä :Np12 FRONT } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi:ta+taan :V69 } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Then we have to take care of the front/back vowel concordance. The example in (10) demonstrates this.

(10)

```
"<data>"
      "data" { tiet+oja } %SUBJ N PL PAR
"<were>"
      "be" { NOGLOSS } %+FAUXV V PAST SG
"<gathered>"
```

```
      "gather" { kok%o+si } O-PAR %-FMAINV V PAST SG
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso+i } O-PAR %-FMAINV V PAST SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö } %<P N SG NOM NOM
"<and>"
      "and" { ja } %CC CC
"<they>"
      "they" { n:e } %SUBJ PRON PERS NOM PL3 NOM
"<help>"
      "help" { autt+avat } O-PAR %+FMAINV V PRES PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt+ämään } O-ACC %-FMAINV V INF SG 3INF-ILL
"<daily>"
      "daily" { päivittäi+siä } %A> A ABS +set PL PL PAR
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toimint+oja } %OBJ N PL PAR
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n+iitä } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi+taan } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Now when the Finnish words are in correct surface form, we have to consider whether the word order needs changes. The sentence is a bit intricate, because the word order can be thought of in two ways. If the emphasis is on the true object 'data', the current word order is acceptable. However, in Finnish the default word order is that the subject precedes the verb. If this is the case, the word order must be drastically changed.

We may approach the word order problem by taking a close look at the source text. Why has the writer used the passive structure with agent instead of the normal active structure? Does the 'data' have special emphasis? If this is the case, then the translation does not need changes in word order. By keeping the original word order, the emphasis on 'data' is carried to the target language. We take this interpretation and leave the original word order. The final translation is in (11).

(11)
Tietoja kokosi ja analysoi yksikkö ja ne auttavat keskittämään päivittäisiä poliisitoimintoja sinne missä niitä tarvitaan eniten.

4 Passive structure in embedded relative clause with agent

Things become particularly complex when we have an embedded relative clause that has passive with agent. The translation of such structures involves a large number of modifications in various phases of the translation process. There are two ways of approaching the translation. One way is to convert the expression into relative structure and treat the whole sentence as a unit, which includes an embedded relative clause. Another method is to express the embedded element as a participial phrase construction. We first look at the first possibility. A simple sentence with such structure is in (12).

(12)
The data gathered and analysed by the unit helps to focus the daily police activities to where they are needed the most.

The first problem is that English is such a worn-out language, that it does not bother whether there is a relative pronoun or not. Here the writer has happily omitted the pronoun. When this is done, we immediately face another problem. The verb forms 'gathered' and 'analysed' can be past tense forms or participial forms. Then we have the word 'data', which actually is a plural of the Latin 'datum', but which the ignorant people have commonly started to treat as a singular form. If we translate 'data' as 'tiedot' (plural of tieto), back to its original meaning, we have to convert its interpretation to plural. This also affects the form of the relative pronoun, that has to be added in Finnish translation. On the top of this comes the complex reordering procedure of the constituents. The example sentence is analysed and disambiguated in (13).

(13)
```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
```

```
      "activity" { toiminto N1-J } %OBJ N PL NOM
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

In the next phase, we have to add the missing relative pronoun as well as to control whether singular and plural tags are correct for Finnish translation (14).

(14)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN @SG
"<which>"
      "which" { , joka Np13 } <REL> ACC PL
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG @SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3 @PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Note that the added relative pronoun 'which' is in a wrong place , after the verb. This is a purely technical solution, because it is computationally less heavy to add the pronoun after the verb than before it. It will be treated as a special case, not to be mixed with genuine relative pronouns, and finally transferred to the correct place. Next, we will add inflection tags (15).

(15)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN SG @PRES
"<which>"
      "which" { , joka Np13 } <REL> ACC PL
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG SG @PRES
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM @NOM
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3 PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF PL @3INF-ILL
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM @ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3 PL @PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL SG
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN @PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

The verb forms 'gathered' and 'analysed' will be translated here with present tense. This is sheer guessing, however, because there is no method for finding out whether they should be translated with present tense, or with past tense, or with perfect tense, or even with past perfect tense. Any interpretation is possible. And this confusion is due to the omission of the relative pronoun. If it were present, there would be no confusion, because the relative pronoun would force the writer to formulate the verbs explicitly.

Given that our choice is acceptable, we can process the sentence further. In (16) the inflection tags have been converted to surface form and joined to the corresponding lemmas (16).

(16)

```
"<data>"
      "data" { tiet:o+ot :N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koo:ta+aa :V74-D } O-PAR %-FMAINV V PRES SG
"<which>"
      "which" { , jo:ka+tka :Np13 } <REL> ACC PL
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso:ida+i :V62 } O-PAR %-FMAINV V PRES SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö :N4-A FRONT } %<P N SG NOM NOM
"<helps>"
      "help" { autt:aa+avat :V56-C } O-PAR %+FMAINV V PRES SG3 +aa PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt:ää+amaan :V53-C FRONT } O-ACC %-FMAINV V INF PL
3INF-ILL
"<daily>"
      "daily" { päivittäi:nen+set :N38 FRONT } %A> A ABS PL
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toimint:o+ot :N1-J } %OBJ N PL ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n:e+iitä :Np12 FRONT } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi:ta+taan :V69 } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

The sentence is further modified by applying gradation rules (17).

(17)

```
"<data>"
      "data" { tied%:o+ot :N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { kok%o:ta+aa :V74-D } O-PAR %-FMAINV V PRES SG
"<which>"
      "which" { , jo:ka+tka :Np13 } <REL> ACC PL
"<and>"
```

```
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso:ida+i :V62 } O-PAR %-FMAINV V PRES SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö :N4-A FRONT } %<P N SG NOM NOM
"<helps>"
      "help" { autt:aa+avat :V56-C } O-PAR %+FMAINV V PRES SG3 +aa PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt:ää+amaan :V53-C FRONT } O-ACC %-FMAINV V INF PL
3INF-ILL
"<daily>"
      "daily" { päivittäi:nen+set :N38 FRONT } %A> A ABS PL
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminn%:o+ot :N1-J } %OBJ N PL ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n:e+iitä :Np12 FRONT } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi:ta+taan :V69 } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Then we apply front/back vowel concordance rules (18).

(18)

```
"<data>"
      "data" { tied%+ot } %SUBJ N PL NOM
"<gathered>"
      "gather" { kok%o+aa } O-PAR %-FMAINV V PRES SG
"<which>"
      "which" { , jo+tka } <REL> ACC PL
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analyso+i } O-PAR %-FMAINV V PRES SG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikk:ö } %<P N SG NOM NOM
"<helps>"
      "help" { autt+avat } O-PAR %+FMAINV V PRES SG3 +aa PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskitt+ämään } O-ACC %-FMAINV V INF PL 3INF-ILL
```

```
"<daily>"
      "daily" { päivittäi+set } %A> A ABS PL
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminn%+ot } %OBJ N PL ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { n+iitä } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvi+taan } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Finally, there is the problem of reordering the constituents. First, we have move the relative pronoun in front of the verb. Then we have to make the passive sentence with agent into active sentence and change the word order accordingly. In order to know what we have to do we move the sentence to a single line (19).

(19)

```
( N { tiedot } %SUBJ PL NOM ) ( V { kokoaa } O-PAR %-FMAINV PRES SG ) (
<REL> { , jotka } ACC PL ) ( CC { ja } %CC ) ( V { analysoi } O-PAR %-
FMAINV PRES SG ) ( AG-PART { NOGLOSS } %ADVL ) ( N { yksikkö } %<P SG NOM
NOM ) ( V { auttavat } O-PAR %+FMAINV PRES SG3 +aa PL ) ( { NOGLOSS }
%INFMARK> INFMARK> ) ( INF { keskittämään } O-ACC %-FMAINV V PL 3INF-ILL
) ( A { päivittäiset } %A> ABS PL ) ( N { poliisitoiminnot } %OBJ PL ACC
) ( PREP { sinne } %ADVL ) ( WH { missä } %ADVL ADV ) ( PRON { niitä }
%SUBJ PERS PL3 PL PAR ) ( V { NOGLOSS } %+FAUXV PRES SG ) ( PASS-PRES {
tarvitaan } O-PAR %-FMAINV V SG +tsee ) ( PRON { eniten } %ADVL SUP SG )
```

Now when the whole sentence is on a single line, it is possible to write a rule for reordering the words (20).

(20)

```
:( N { tiedot } %SUBJ PL NOM ) :( <REL> { , jotka } ACC PL ) :( N {
yksikkö } %<P SG NOM NOM ) :( V { kokoaa } O-PAR %-FMAINV PRES SG ) :( CC
{ ja } %CC ) ( V { analysoi } O-PAR %-FMAINV PRES SG ) ( V { auttavat }
O-PAR %+FMAINV PRES SG3 +aa PL ) ( { NOGLOSS } %INFMARK> INFMARK> ) ( INF
{ keskittämään } O-ACC %-FMAINV V PL 3INF-ILL ) ( A { päivittäiset } %A>
ABS PL ) ( N { poliisitoiminnot } %OBJ PL ACC ) ( PREP { sinne } %ADVL )
( WH { missä } %ADVL ADV ) ( PRON { niitä } %SUBJ PERS PL3 PL PAR ) ( V {
NOGLOSS } %+FAUXV PRES SG ) ( PASS-PRES { tarvitaan } O-PAR %-FMAINV V SG
+tsee ) ( PRON { eniten } %ADVL SUP SG )
```

In (20), the relative pronoun has been moved in front of the verb and preceded with a comma. The agent has been moved before the main verbs and treated as the subject of the relative clause. The word 'tiedot' is the subject of the main clause, and the main verb 'auttavat' is in plural, as it should be. The final translation is in (21).

(21)
Tiedot, jotka yksikkö kokoaa ja analysoi, auttavat keskittämään päivittäiset poliisitoiminnot sinne missä niitä tarvitaan eniten.

5 Embedded relative clause with agent translated with participial phrase

The example sentence in (6) can also be translated with the participial phrase structure. In this solution, no embedded relative clause is involved. Formally, the verb forms 'gathered' and 'analysed', which are participial verb forms, should be translated with the third infinitive and its appropriate case forms. Syntactically these forms are no longer verbs, but rather adjective modifiers, and they behave as adjectives. The analysis of English text does not offer any clue to conversion. It must be done with the help of context. Below we will follow this path. Let us see first whether the codes for singular and plural are correct for the new translation (22).

(22)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

We see in (22) that the two verbs, which should be treated as adjectives, have no number information. In this new interpretation, those verbs get the number code from the preceding noun which they modify. Also, the number code of 'help' must be changed. The result is in (23).

(23)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN @PL
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG @PL
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3 @PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Now when the number codes are correct for the new translation, we can add inflection codes (24).

(24)

```
"<data>"
      "data" { tieto N1-F } %SUBJ N PL NOM
"<gathered>"
      "gather" { koota V74-D } O-PAR %-FMAINV V EN PL @3INF-NOM
"<and>"
      "and" { ja } %CC CC
```

```
"<analysed>"
      "analyse" { analysoida V62 } O-PAR %-FMAINV V EN-AG PL @3INF-NOM
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikkö N4-A FRONT } %<P N SG NOM @GEN
"<helps>"
      "help" { auttaa V56-C } O-PAR %+FMAINV V PRES SG3 PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittää V53-C FRONT } O-ACC %-FMAINV V INF PL @3INF-ILL
"<daily>"
      "daily" { päivittäinen N38 FRONT } %A> A ABS
"<police>"
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminto N1-J } %OBJ N PL NOM @ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { ne Np12 FRONT } %SUBJ PRON PERS NOM PL3 PL @PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES PL SG
"<needed>"
      "need" { tarvita V69 } O-PAR %-FMAINV V EN @PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

The inflection codes can then be converted to surface form, joined to the stem. Also vowel concordance and gradation can be implemented (25).

(25)

```
"<data>"
      "data" { tiedot } %SUBJ N PL NOM
"<gathered>"
      "gather" { kokoamat } O-PAR %-FMAINV V PL 3INF-NOM
"<and>"
      "and" { ja } %CC CC
"<analysed>"
      "analyse" { analysoimat } O-PAR %-FMAINV V PL 3INF-NOM
"<by>"
      "by" { NOGLOSS } AG-PART %ADVL PREP
"<unit>"
      "unit" { yksikön } %<P N SG NOM GEN
"<helps>"
      "help" { auttavat } O-PAR %+FMAINV V PRES SG3 +aa PL
"<to>"
      "to" { NOGLOSS } %INFMARK> INFMARK>
"<focus>"
      "focus" { keskittämään } O-ACC %-FMAINV V INF PL 3INF-ILL
"<daily>"
      "daily" { päivittäiset } %A> A ABS PL
"<police>"
```

```
      "police" { poliisi-- } COMP %A> N NOM SG
"<activities>"
      "activity" { toiminnot } %OBJ N PL ACC
"<to>"
      "to" { sinne } %ADVL PREP
"<where>"
      "where" { missä } %ADVL ADV WH
"<they>"
      "they" { niitä } %SUBJ PRON PERS PL3 PL PAR
"<are>"
      "be" { NOGLOSS } %+FAUXV V PRES SG
"<needed>"
      "need" { tarvitaan } O-PAR %-FMAINV V SG +tsee PASS-PRES
"<most>"
      "much" { eniten } %ADVL PRON SUP SG
```

Now when the Finnish words are in correct form, we have to implement the correct word order. The sentence is converted to one line format (26).

(26)

```
( N { tiedot } %SUBJ PL NOM ) ( V { kokoamat } O-PAR %-FMAINV PL 3INF-NOM
) ( CC { ja } %CC ) ( V { analysoimat } O-PAR %-FMAINV PL 3INF-NOM ) (
AG-PART { NOGLOSS } %ADVL ) ( N { yksikön } %<P SG NOM NOM ) ( V {
auttavat } O-PAR %+FMAINV PRES SG3 +aa PL ) ( { NOGLOSS } %INFMARK>
INFMARK> ) ( INF { keskittämään } O-ACC %-FMAINV V PL 3INF-ILL ) ( A {
päivittäiset } %A> ABS PL ) ( N { poliisitoiminnot } %OBJ PL ACC ) ( PREP
{ sinne } %ADVL ) ( WH { missä } %ADVL ADV ) ( PRON { niitä } %SUBJ PERS
PL3 PL PAR ) ( V { NOGLOSS } %+FAUXV PRES SG ) ( PASS-PRES { tarvitaan }
O-PAR %-FMAINV V SG +tsee ) ( PRON { eniten } %ADVL SUP SG )
```

The reordering rule converts the constituents to the order as in (27).

(27)

```
:( N { yksikkö } %<P SG NOM NOM ) :( V { kokoamat } O-PAR %-FMAINV PL
3INF-NOM ) ( CC { ja } %CC ) ( V { analysoimat } O-PAR %-FMAINV PL 3INF-
NOM ) :( N { tiedot } %SUBJ PL NOM ) ( V { auttavat } O-PAR %+FMAINV PRES
SG3 +aa PL ) ( { NOGLOSS } %INFMARK> INFMARK> ) ( INF { keskittämään } O-
ACC %-FMAINV V PL 3INF-ILL ) ( A { päivittäiset } %A> ABS PL ) ( N {
poliisitoiminnot } %OBJ PL ACC ) ( PREP { sinne } %ADVL ) ( WH { missä }
%ADVL ADV ) ( PRON { niitä } %SUBJ PERS PL3 PL PAR ) ( V { NOGLOSS }
%+FAUXV PRES SG ) ( PASS-PRES { tarvitaan } O-PAR %-FMAINV V SG +tsee ) (
PRON { eniten } %ADVL SUP SG )
```

When we remove unnecessary tags, we get the final translation (28).

(28)

Yksikön kokoamat ja analysoimat tiedot auttavat keskittämään päivittäiset poliisitoiminnot sinne missä niitä tarvitaan eniten.

6 Discussion

Above we have shown how different types of passive constructions can be translated from English to Finnish. Here we sum them up briefly.

The true passive constructions, which have no subject, are straightforward to translate. No reordering of words is needed.

The passive constructions with agent are an alternative way of construing the sentence. They can always be converted to active form in English. Finnish does not have the agent structure. Hence such constructions must be converted to active form. The use of agentic structure in English is obviously related to emphasis on the object in sentence. The same effect in Finnish can be achieved using inverted word order, so that the object comes before the main verb and the subject after it. But in any case, the sentence must be converted into active form.

Relative structures with agent, embedded into the main clause, are complex to translate, because they require modifications in several points of the process. They can be translated by using explicit relative structure, whereby the embeddedness of the relative clause becomes clear. They can also be translated using the participial phrase construction, whereby the verb(s) of the embedded clause are interpreted as adjectives, or alternatively as third infinitive forms (what they are structurally). On the syntactic level, however, they behave as adjectives.

In sum, different kinds of solutions can be chosen, and it is hard to say whether one solution is better than another. Using rule-based approaches in translation all kinds of translation problems can be solved.