

Multiword expressions in English to Swahili machine translation: Adjectives

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Abstract

The report deals with descriptive multiword adjectives in the context of English to Swahili machine translation. These descriptions often have more than one section, which inflect according to the noun class system of Swahili. The report handles all adjective types and shows how the correct surface form can be produced in each case.

Key Words: *multiword expressions, multiword adjectives, machine translation.*

1 Introduction

Swahili language is, as all other Bantu languages, poor in true lexical adjectives. This has turned out to be a big problem in lexicography, and in language use in general. When a suitable adjective is missing, Swahili speakers often resort to using English adjectives, without even trying to adapt them into Swahili phonotax. In the long run this is not acceptable, if Swahili is wanted to be a competitive language among world languages.

While we are still waiting for the massive work to be done in coining new Swahili vocabulary, we must dispense with intermediate methods. That is, we must use descriptive means in conveying the meanings of adjectives in Swahili. The descriptive expressions are, however, more difficult to handle than normal adjectives, because they often have more than one inflecting part. Normal adjectives are either inflecting or non-inflecting. The non-inflecting ones need no attention, and the inflecting adjectives need the appropriate class prefix to be added. Here we show, how we can handle also the complex descriptive multiword adjectives. This report is an extension to Technical Report No (46).

We take a look at how descriptive adjective formation can be handled. This can be studied only in context, because adjectives inflect according to the head noun. When inspecting the adjective conversion lexicon, we find most of the construction types described in Technical Report No (46).

The report deals with two methods of producing surface forms in these complex structures.

On one method, we use specific codes for each inflection type, such as G plus number for the structures with *-a*, and O plus number for structures with *-enye*. Both of these code types are converted to the surface form in its own paradigm, without considering the type of the abstract form, to which it is attached.

In the other method, we use only the noun class identification as the code. These codes are of the type number plus SG or number plus PL for all types of abstract words. These codes do not correspond directly to any single surface form. They only give instructions on how the surface form should be constructed in each context. For example, the code 1SG may correspond to such surface forms as *m*, *mw*, *a*, and *ye*. The context defines, which one is selected in each case. This method suits in cases, where no ambiguity exists in the structure. Unambiguous abstract words are such as *-a*, *-enye*, *-li-*, *-si-*, *-na-*+verb, *-li-*+verb, and *-si-*+verb. This method greatly simplifies rule writing for adding inflection tags, when only one type of tag is needed.

2 Adjectival expressions formed with -a

The adjective lexicon has 8019 adjectives. A total of 3037 of them are formed using the *-a* construction, 1035 have the structure with *-enye*, 2144 with one of the TAM markers *-na-*, *-li-* and *-si-*. The rest, that is about 1800, are ordinary adjectives, either inflecting or non-inflecting.

Typical examples with the genitive connector *-a* are in (1) below.

(1)
"<spiritual>"
 "spiritual" { -a kiroho } %A> A ABS
"<teacher>"
 "teacher" { 1SG 2PL alimu } HUM %NH N SG NOM
.
"<spiritual>"
 "spiritual" { -a kiroho } %A> A ABS
"<father>"
 "father" { 9SG 10PL baba } HUM %NH N SG NOM
.
"<spiritual>"
 "spiritual" { -a kiroho } %A> A ABS
"<leader>"
 "leader" { 7SGki 8PLvi ongozi } HUM %NH N SG NOM
.
"<last>"
 "last" { -a mwisho } %DN> DET
"<tree>"
 "tree" { 3SG 4PL ti } %NH N SG NOM
.
"<terrifying>"
 "terrifying" { -a kuogofya } %A> A ABS
"<event>"
 "event" { 5SG 6PL tukio } %NH N SG NOM
.
"<permanent>"
 "permanent" { -a kudumu } %A> A ABS
"<colour>"
 "colour" { 9SG 10PL rangi } %NH N SG NOM
.
.

```
"<permanent>"  
    "permanent" { -a kudumu } %A> A ABS  
"<place>"  
    "place" { 16SG mahali } %NH N SG NOM  
.
```

In the examples above, the adjectives have no tag to show how they should inflect. The tags must be added using content-sensitive rules. Tags are added in (2).

```
(2)  
"<spiritual>"  
    "spiritual" { -a kiroho } %A> A ABS G-1  
"<teacher>"  
    "teacher" { 1SG alimu } HUM %NH N SG NOM  
.  
"<spiritual>"  
    "spiritual" { -a kiroho } %A> A ABS G-1  
"<father>"  
    "father" { 9SG baba } HUM %NH N SG NOM  
.  
"<spiritual>"  
    "spiritual" { -a kiroho } %A> A ABS G-1  
"<leader>"  
    "leader" { 7SGki ongozi } HUM %NH N SG NOM  
.  
"<last>"  
    "last" { -a mwisho } %DN> DET G-3  
"<tree>"  
    "tree" { 3SG ti } %NH N SG NOM  
.  
"<terrifying>"  
    "terrifying" { -a kuogofya } %A> A ABS G-5  
"<event>"  
    "event" { 5SG tukio } %NH N SG NOM  
.  
"<permanent>"  
    "permanent" { -a kudumu } %A> A ABS G-9  
"<colour>"  
    "colour" { 9SG rangi } %NH N SG NOM  
.  
"<permanent>"  
    "permanent" { -a kudumu } %A> A ABS G-16  
"<place>"  
    "place" { 16SG mahali } %NH N SG NOM  
.
```

The inflection tag added to the end of each adjective gets its form according to the noun class of its head, which is the noun after it. We see that the tag G-1 was added to all three cases, where the head is a human being, regardless the class of the noun. Here the semantic affiliation (HUM) overrides the formal classification.

We process the examples further and move the tags to correct places (3).

```
(3)
"<spiritual>"
  "spiritual" { G-1+-a kiroho } %A> A ABS
"<teacher>"
  "teacher" { 1SG alimu } HUM %NH N SG NOM
.
"<spiritual>"
  "spiritual" { G-1+-a kiroho } %A> A ABS
"<father>"
  "father" { 9SG baba } HUM %NH N SG NOM
.
"<spiritual>"
  "spiritual" { G-1+-a kiroho } %A> A ABS
"<leader>"
  "leader" { 7SGki ongozi } HUM %NH N SG NOM
.
"<last>"
  "last" { G-3+-a mwisho } %DN> DET
"<tree>"
  "tree" { 3SG ti } %NH N SG NOM
.
"<terrifying>"
  "terrifying" { G-5+-a kuogofya } %A> A ABS
"<event>"
  "event" { 5SG tukio } %NH N SG NOM
.
"<permanent>"
  "permanent" { G-9+-a kudumu } %A> A ABS
"<colour>"
  "colour" { 9SG rangi } %NH N SG NOM
.
"<permanent>"
  "permanent" { G-16+-a kudumu } %A> A ABS
"<place>"
  "place" { 16SG mahali } %NH N SG NOM
.
```

The Swahili glosses are converted to surface form in (4).

```
(4)
"<spiritual>"
  "spiritual" { wa kiroho } %A> A ABS
"<teacher>"
  "teacher" { mw+alimu } HUM %NH N SG NOM
.
"<spiritual>"
  "spiritual" { wa kiroho } %A> A ABS
"<father>"
```

```
"father" { baba } HUM %NH N SG NOM
.
"<spiritual>"
  "spiritual" { wa kiroho } %A> A ABS
"<leader>"
  "leader" { ki+ongozi } HUM %NH N SG NOM
.
"<last>"
  "last" { wa mwisho } %DN> DET
"<tree>"
  "tree" { m+ti } %NH N SG NOM
.
"<terrifying>"
  "terrifying" { la kuogofya } %A> A ABS
"<event>"
  "event" { tukio } %NH N SG NOM
.
"<permanent>"
  "permanent" { ya kudumu } %A> A ABS
"<colour>"
  "colour" { rangi } %NH N SG NOM
.
"<permanent>"
  "permanent" { pa kudumu } %A> A ABS
"<place>"
  "place" { mahali } %NH N SG NOM
.
```

After rearranging the word order we get the final translation (5).

(5)

Mwalimu wa kiroho.
Baba wa kiroho.
Kiongozi wa kiroho.
Mti wa mwisho.
Tukio la kuogofya.
Rangi ya kudumu.
Mahali pa kudumu.

If we put the above examples into plural, we get the translation as in (6).

(6)

Walimu wa kiroho.
Baba wa kiroho.
Viongozi wa kiroho.
Miti ya mwisho.
Matukio ya kuogofya.
Rangi za kudumu.
Mahali pa kudumu.

Note that two of the examples are identical in singular and plural. The word *baba* is the same in singular and plural, and because the form of the genitive connector is *wa* in singular and plural, both sentences are identical. The noun *mahali* does not have a plural.

3 Adjectival expressions formed with *-enye*

The meaning of the word *-enye* is 'which has' and its meaning is much the same as of the genitive connector *-a*. Alternative constructions can often be used. Examples of this structure are in (7).

(7)

```
"<able>"
    "able" { -enye uwezo } %A> A ABS
"<teacher>"
    "teacher" { 1SG 2PL alimu } HUM %NH N SG NOM
.
"<able>"
    "able" { -enye uwezo } %A> A ABS
"<leader>"
    "leader" { 7SGki 8PLvi ongozi } HUM %NH N SG NOM
.
"<multi-party>"
    "multi-party" { -enye vyama vingi } %A> A ABS
"<system>"
    "system" { 3SG 4PL fumo } %NH N SG NOM
.
"<shameful>"
    "shameful" { -enye aibu } %A> A ABS
"<deed>"
    "deed" { 5SG 6PL tendo } %NH N SG NOM
.
"<sceptical>"
    "sceptical" { -enye mashaka } %A> A ABS
"<enterprise>"
    "enterprise" { 9SG 10PL shughuli } %NH N SG NOM
.
"<dirty>"
    "dirty" { -enye taka } A-INFL %A> A ABS
"<place>"
    "place" { 16SG mahali } %NH N SG NOM
.
```

In the similar way as we did with the construction *-a*, we add the inflection tags of the adjective. Note that the set of tags is here different than with *-a* above, because also the inflection is slightly different (8).

(8)

```
"<able>"
  "able" { -enye uwezo } %A> A ABS 0-2
"<teachers>"
  "teacher" { 1SG alimu } HUM %NH N SG NOM
.
"<able>"
  "able" { -enye uwezo } %A> A ABS 0-2
"<leaders>"
  "leader" { 7SGki ongozi } HUM %NH N SG NOM
.
"<multi-party>"
  "multi-party" { -enye vyama vingi } %A> A ABS 0-3
"<system>"
  "system" { 3SG fumo } %NH N SG NOM
.
"<shameful>"
  "shameful" { -enye aibu } %A> A ABS 0-5
"<deed>"
  "deed" { 5SG tendo } %NH N SG NOM
.
"<sceptical>"
  "sceptical" { -enye mashaka } %A> A ABS 0-9
"<enterprise>"
  "enterprise" { 9SG shughuli } %NH N SG NOM
.
"<dirty>"
  "dirty" { -enye taka } A-INFL %A> A ABS 0-16
"<place>"
  "place" { 16SG mahali } %NH N SG NOM
.
```

The translation of the structures in singular are in (9).

(9)

Mwalimu mwenye uwezo.
Kiongozi mwenye uwezo.
Mfumo mwenye vyama vingi.
Tendo lenye aibu.
Shughuli yenye mashaka.
Mahali penye taka.

The plural translations of the same structures are in (10).

(10)

Walimu wenye uwezo.
Viongozi wenye uwezo.
Mifumo yenye vyama vingi.
Matendo yenye aibu.
Shughuli zenye mashaka.

Mahali penye taka.

The reader may wonder why the form of inflection tags is not the same in all cases. There are tags with G plus number, O plus number, and number plus SG or PL. All three types work and produce the same result. Only the processing method with each of them is different.

4 Adjectival expressions formed with the verbal particles *-li-* and *-si-*

Relative structures with the verb substitutes *-li-* and *-si-* have been abundantly used for describing adjectives. In adjectives they do not have an inherent inflection code. The code must be added with context-sensitive rules. This is demonstrated in (11).

(11)

```
"<unwise>"
    "unwise" { -si- na akili } A-REL %A> A ABS 1SG
"<person>"
    "person" { 1SG tu } HUM %NH N SG NOM
.
"<unoriginal>"
    "unoriginal" { -si- -a asili } A-REL %A> A ABS 3SG
"<plant>"
    "plant" { 3SG mea } %NH N SG NOM
.
"<irregular>"
    "irregular" { -si- -a kawaida } A-REL %A> A ABS 5SG
"<deed>"
    "deed" { 5SG tendo } %NH N SG NOM
.
"<unstable>"
    "unstable" { -si- imara } A-REL %A> A ABS 7SG
"<chair>"
    "chair" { 7SG ti } %NH N SG NOM
.
"<unscientific>"
    "unscientific" { -si- -a kisayansi } A-REL %A> A ABS 9SG
"<work>"
    "work" { 9SG kazi } %NH N SG NOM
.
"<food-secure>"
    "food-secure" { -li- salama kwa vyakula } A-REL %A> A ABS
9SG
"<policy>"
    "policy" { 9SG sera } %NH N SG NOM
.
"<food-insecure>"
    "food-insecure" { -si- salama kwa vyakula } A-REL %A> A ABS
9SG
"<policy>"
    "policy" { 9SG sera } %NH N SG NOM
```



```
.  
"<unrivalled>"  
    "unrivalled" { -si- na kifani } A-REL %A> A ABS 11SG  
"<achievement>"  
    "achievement" { 11SG fanisi } %NH N SG NOM  
.
```

Note that in two of the above examples there are two abstract strings, *-si-* and *-a*, which must be converted into surface form. There is a single inflection code at the end of the line, and this code helps to produce the correct prefixes and suffixes to each empty slot. This will be demonstrated below. The inflection code is moved to appropriate places (12).

```
(12)  
"<unwise>"  
    "unwise" { 1SG -si- na akili } A-REL %A> A ABS  
"<person>"  
    "person" { 1SG tu } HUM %NH N SG NOM  
.  
"<unoriginal>"  
    "unoriginal" { 3SG -si- 3SG -a asili } A-REL %A> A ABS  
"<plant>"  
    "plant" { 3SG mea } %NH N SG NOM  
.  
"<irregular>"  
    "irregular" { 5SG -si- 5SG -a kawaida } A-REL %A> A ABS  
"<deed>"  
    "deed" { 5SG tendo } %NH N SG NOM  
.  
"<unstable>"  
    "unstable" { 7SG -si- imara } A-REL %A> A ABS  
"<chair>"  
    "chair" { 7SG ti } %NH N SG NOM  
.  
"<unscientific>"  
    "unscientific" { 9SG -si- 9SG -a kisayansi } A-REL %A> A ABS  
"<work>"  
    "work" { 9SG kazi } %NH N SG NOM  
.  
"<food-secure>"  
    "food-secure" { 9SG -li- salama kwa vyakula } A-REL %A> A  
ABS  
"<policy>"  
    "policy" { 9SG sera } %NH N SG NOM  
.  
"<food-insecure>"  
    "food-insecure" { 9SG -si- salama kwa vyakula } A-REL %A> A  
ABS  
"<policy>"  
    "policy" { 9SG sera } %NH N SG NOM  
.
```

```
"<unrivalled>"  
    "unrivalled" { 11SG -si- na kifani } A-REL %A> A ABS  
"<achievement>"  
    "achievement" { 11SG fanisi } %NH N SG NOM  
.  
.
```

The examples above show that the inflection code was moved in front of each abstract word. In two of them it was moved into two places. Now the conversion can be done in the same way as it was done with multiword nouns (13).

```
(13)  
"<unwise>"  
    "unwise" { asiye na akili } A-REL %A> A ABS  
"<person>"  
    "person" { m+tu } HUM %NH N SG NOM  
.  
"<unoriginal>"  
    "unoriginal" { usio wa asili } A-REL %A> A ABS  
"<plant>"  
    "plant" { m+mea } %NH N SG NOM  
.  
"<irregular>"  
    "irregular" { lisilo la kawaida } A-REL %A> A ABS  
"<deed>"  
    "deed" { tendo } %NH N SG NOM  
.  
"<unstable>"  
    "unstable" { kisicho imara } A-REL %A> A ABS  
"<chair>"  
    "chair" { ki+ti } %NH N SG NOM  
.  
"<unscientific>"  
    "unscientific" { isiyo ya kisayansi } A-REL %A> A ABS  
"<work>"  
    "work" { kazi } %NH N SG NOM  
.  
"<food-secure>"  
    "food-secure" { iliyo salama kwa vyakula } A-REL %A> A ABS  
"<policy>"  
    "policy" { sera } %NH N SG NOM  
.  
"<food-insecure>"  
    "food-insecure" { isiyo salama kwa vyakula } A-REL %A> A ABS  
"<policy>"  
    "policy" { sera } %NH N SG NOM  
.  
"<unrivalled>"  
    "unrivalled" { usio na kifani } A-REL %A> A ABS  
"<achievement>"  
    "achievement" { u+fanisi } %NH N SG NOM
```

The processing of the plural forms of the above examples is described below. The inflection tags are first added (14).

```
(14)
"<unwise>"
    "unwise" { -si- na akili } A-REL %A> A ABS 2PL
"<persons>"
    "person" { 2PL tu } HUM %NH N PL NOM
.
"<unoriginal>"
    "unoriginal" { -si- -a asili } A-REL %A> A ABS 4PL
"<plants>"
    "plant" { 4PL mea } %NH N PL NOM
.
"<irregular>"
    "irregular" { -si- -a kawaida } A-REL %A> A ABS 6PL
"<deeds>"
    "deed" { 6PL tendo } %NH N PL NOM
.
"<unstable>"
    "unstable" { -si- imara } A-REL %A> A ABS 8PL
"<chairs>"
    "chair" { 8PL ti } %NH N PL NOM
.
"<unscientific>"
    "unscientific" { -si- -a kisayansi } A-REL %A> A ABS 10PL
"<works>"
    "work" { 10PL kazi } %NH N PL NOM
.
"<food-secure>"
    "food-secure" { -li- salama kwa vyakula } A-REL %A> A ABS
10PL
"<policies>"
    "policy" { 10PL sera } %NH N PL NOM
.
"<food-insecure>"
    "food-insecure" { -si- salama kwa vyakula } A-REL %A> A ABS
10PL
"<policies>"
    "policy" { 10PL sera } %NH N PL NOM
.
"<unrivalled>"
    "unrivalled" { -si- na kifani } A-REL %A> A ABS 10PL
"<achievements>"
    "achievement" { 10PL fanisi } %NH N PL NOM
.
```

Then the inflection tags are moved to appropriate places (15).

(15)

```
"<unwise>"
  "unwise" { 2PL -si- na akili } A-REL %A> A ABS
"<persons>"
  "person" { 2PL tu } HUM %NH N PL NOM
.
"<unoriginal>"
  "unoriginal" { 4PL -si- 4PL -a asili } A-REL %A> A ABS
"<plants>"
  "plant" { 4PL mea } %NH N PL NOM
.
"<irregular>"
  "irregular" { 6PL -si- 6PL -a kawaida } A-REL %A> A ABS
"<deeds>"
  "deed" { 6PL tendo } %NH N PL NOM
.
"<unstable>"
  "unstable" { 8PL -si- imara } A-REL %A> A ABS
"<chairs>"
  "chair" { 8PL ti } %NH N PL NOM
.
"<unscientific>"
  "unscientific" { 10PL -si- 10PL -a kisayansi } A-REL %A> A
ABS
"<works>"
  "work" { 10PL kazi } %NH N PL NOM

"<food-secure>"
  "food-secure" { 10PL -li- salama kwa vyakula } A-REL %A> A
ABS
"<policies>"
  "policy" { 10PL sera } %NH N PL NOM
.
"<food-insecure>"
  "food-insecure" { 10PL -si- salama kwa vyakula } A-REL %A> A
ABS
"<policies>"
  "policy" { 10PL sera } %NH N PL NOM
.
"<unrivalled>"
  "unrivalled" { 10PL -si- na kifani } A-REL %A> A ABS
"<achievements>"
  "achievement" { 10PL fanisi } %NH N PL NOM
.
```

The abstract words are converted to surface words, using the tag moved in front of each word (16).

(16)

```
"<unwise>"
  "unwise" { wasio na akili } A-REL %A> A ABS
"<persons>"
  "person" { wa+tu } HUM %NH N PL NOM
.
"<unoriginal>"
  "unoriginal" { isiyo ya asili } A-REL %A> A ABS
"<plants>"
  "plant" { mi+mea } %NH N PL NOM
.
"<irregular>"
  "irregular" { yasiyo ya kawaida } A-REL %A> A ABS
"<deeds>"
  "deed" { ma+tendo } %NH N PL NOM
.
"<unstable>"
  "unstable" { visivyo imara } A-REL %A> A ABS
"<chairs>"
  "chair" { vi+ti } %NH N PL NOM
.
"<unscientific>"
  "unscientific" { zisizo za kisayansi } A-REL %A> A ABS
"<works>"
  "work" { kazi } %NH N PL NOM
.
"<food-secure>"
  "food-secure" { zilizo salama kwa vyakula } A-REL %A> A ABS
"<policies>"
  "policy" { sera } %NH N PL NOM
.
"<food-insecure>"
  "food-insecure" { zisizo salama kwa vyakula } A-REL %A> A
ABS
"<policies>"
  "policy" { sera } %NH N PL NOM
.
"<unrivalled>"
  "unrivalled" { zisizo na kifani } A-REL %A> A ABS
"<achievements>"
  "achievement" { fanisi } %NH N PL NOM
.
```

The final translations in singular and plural are in (17 and 18).

- (17)
Mtu asiye na akili.
Mmea usio wa asili.
Tendo lisilo la kawaida.
Kiti kisicho imara.
Kazi isiyo ya kisayansi.

Sera iliyo salama kwa vyakula.
Sera isiyo salama kwa vyakula.
Ufanisi usio na kifani.

(18)
Watu wasio na akili.
Mimea isiyo ya asili.
Matendo yasiyo ya kawaida.
Viti visivyo imara.
Kazi zisizo za kisayansi.
Sera zilizo salama kwa vyakula.
Sera zisizo salama kwa vyakula.
Fanisi zisizo na kifani.

5 Adjectival expressions formed with verbal relative prefixes

There is a large number of adjectives formed using the relative prefix attached to the verb. The TAM markers, after which the relative mark is located, are *-na-*, *-li-*, and *-si-*. Note that although the verb substitutes *-li-* and *-si-* discussed above are formally identical with the TAM markers discussed here, their function is totally different. Here we deal with real verbs with full inflection paradigms. Also here we add the inflection tags to the multiword adjectives.

5.1 Referring to past action

First we deal with adjectives referring to past action, First, the inflection tags are added (19).

(19)
"<enraged>"
 "enraged" { -li-kasirishwa } A-REL %A> A ABS DEF 1SG
"<teacher>"
 "teacher" { 1SG alimu } HUM %NH N SG NOM DEF
.
"<discarded>"
 "discarded" { -li-achwa } A-REL %A> A ABS DEF 3SG
"<approach>"
 "approach" { 3SG kabala } %NH N SG NOM DEF
.
"<improvised>"
 "improvised" { -li-faraguliwa } A-REL %A> A ABS DEF 5SG
"<solution>"
 "solution" { 5SG suluhisho } %NH N SG NOM DEF
.
"<investigated>"
 "investigated" { -li-chunguzwa } A-REL %A> A ABS DEF 9SG
"<case>"
 "case" { 9SG kesi } %NH N SG NOM DEF

```
.  
"<fertilised>"  
    "fertilised" { -li-rutubishwA } A-REL %A> A ABS DEF 11SG  
"<soil>"  
    "soil" { 11SG dongo } %NH N SG NOM DEF  
.  
"<fertilized>"  
    "fertilized" { -li-rutubishwa } A-REL %A> A ABS DEF 16SG  
"<place>"  
    "place" { 16SG mahali } %NH N SG NOM DEF  
.
```

The inflection tags are moved in front of the verb (20).

```
(20)  
"<enraged>"  
    "enraged" { 1SG -li-kasirishwa } A-REL %A> A ABS DEF  
"<teacher>"  
    "teacher" { 1SG alimu } HUM %NH N SG NOM DEF  
.  
"<discarded>"  
    "discarded" { 3SG -li-achwa } A-REL %A> A ABS DEF  
"<approach>"  
    "approach" { 3SG kabala } %NH N SG NOM DEF  
.  
"<improvised>"  
    "improvised" { 5SG -li-faraguliwa } A-REL %A> A ABS DEF  
"<solution>"  
    "solution" { 5SG suluhisho } %NH N SG NOM DEF  
.  
"<investigated>"  
    "investigated" { 9SG -li-chunguzwa } A-REL %A> A ABS DEF  
"<case>"  
    "case" { 9SG kesi } %NH N SG NOM DEF  
.  
"<fertilised>"  
    "fertilised" { 11SG -li-rutubishwA } A-REL %A> A ABS DEF  
"<soil>"  
    "soil" { 11SG dongo } %NH N SG NOM DEF  
.  
"<fertilized>"  
    "fertilized" { 16SG -li-rutubishwa } A-REL %A> A ABS DEF  
"<place>"  
    "place" { 16SG mahali } %NH N SG NOM DEF  
.
```

Then the empty morpheme slots are filled with appropriate surface prefixes (21).

```
(21)  
"<enraged>"
```

```

    "enraged" { aliyekasirishwa } A-REL %A> A ABS DEF
"<teacher>"
    "teacher" { mw+alimu } HUM %NH N SG NOM DEF
.
"<discarded>"
    "discarded" { ulioachwa } A-REL %A> A ABS DEF
"<approach>"
    "approach" { m+kabala } %NH N SG NOM DEF
.
"<improvised>"
    "improvised" { lililofaraguliwa } A-REL %A> A ABS DEF
"<solution>"
    "solution" { suluhisho } %NH N SG NOM DEF
.
"<investigated>"
    "investigated" { iliochunguzwa } A-REL %A> A ABS DEF
"<case>"
    "case" { kesi } %NH N SG NOM DEF
.
"<fertilised>"
    "fertilised" { uliorutubishwa } A-REL %A> A ABS DEF
"<soil>"
    "soil" { u+dongo } %NH N SG NOM DEF
.
"<fertilized>"
    "fertilized" { paliorutubishwa } A-REL %A> A ABS DEF
"<place>"
    "place" { mahali } %NH N SG NOM DEF
.

```

In plural, the process is as described below. Plural inflection tags are added (22).

(22)

```

"<enraged>"
    "enraged" { -li-kasirishwa } A-REL %A> A ABS DEF 2PL
"<teachers>"
    "teacher" { 2PL alimu } HUM %NH N PL NOM DEF
.
"<discarded>"
    "discarded" { -li-achwa } A-REL %A> A ABS DEF 4PL
"<approaches>"
    "approach" { 4PL kabala } %NH N PL NOM DEF
.
"<improvised>"
    "improvised" { -li-faraguliwa } A-REL %A> A ABS DEF 6PL
"<solutions>"
    "solution" { 6PL suluhisho } %NH N PL NOM DEF
.
"<investigated>"
    "investigated" { -li-chunguzwa } A-REL %A> A ABS DEF 10PL
"<cases>"

```



```
"case" { 10PL kesi } %NH N PL NOM DEF
.
"<fertilised>"
  "fertilised" { -li-rutubishwa } A-REL %A> A ABS DEF 6PL
"<soils>"
  "soil" { 6PL dongo } %NH N PL NOM DEF
.
"<fertilized>"
  "fertilized" { -li-rutubishwa } A-REL %A> A ABS DEF 16SG
"<places>"
  "place" { 16SG mahali } %NH N PL NOM DEF
.
```

All inflection tags above are plural tags, except for *mahali*, which does not have plural. The surface forms are in (23).

```
(23)
"<enraged>"
  "enraged" { waliokasirishwa } A-REL %A> A ABS DEF
"<teachers>"
  "teacher" { w+alimu } HUM %NH N PL NOM DEF
.
"<discarded>"
  "discarded" { iliyoachwa } A-REL %A> A ABS DEF
"<approaches>"
  "approach" { mi+kabala } %NH N PL NOM DEF
.
"<improvised>"
  "improvised" { yaliyofaraguliwa } A-REL %A> A ABS DEF
"<solutions>"
  "solution" { ma+suluhisho } %NH N PL NOM DEF
.
"<investigated>"
  "investigated" { zilizochunguzwa } A-REL %A> A ABS DEF
"<cases>"
  "case" { kesi } %NH N PL NOM DEF
.
"<fertilised>"
  "fertilised" { yaliyorutubishwa } A-REL %A> A ABS DEF
"<soils>"
  "soil" { ma+dongo } %NH N PL NOM DEF
.
"<fertilized>"
  "fertilized" { paliporutubishwa } A-REL %A> A ABS DEF
"<places>"
  "place" { mahali } %NH N PL NOM DEF
.
```

The full translations in singular and plural are in (24 and 25).

(24)
Mwalimu aliyekasirishwa.
Mkabala ulioachwa.
Suluhisho lililofaraguliwa.
Kesi iliyochunguzwa.
Udongo uliorutubishwa.
Mahali paliporutubishwa.

(25)
Walimu waliokasirishwa.
Mikabala iliyoachwa.
Masuluhisho yaliyofaraguliwa.
Kesi zilizochunguzwa.
Madongo yaliyorutubishwa.
Mahali paliporutubishwa.

5.2 Referring to present action

The adjective may be referring also to present action. In this case the TAM marker is *-na-*. Although this marker formally refers to present action, it is frequently used also in situations, where no reference to time is apparent.

The inflection tags are added as above (26).

(26)
"<playing>"
 "playing" { -na-cheza } A-REL %A> A ABS DEF 1SG
"<child>"
 "child" { 1SG toto } %NH N SG NOM DEF
.
"<guiding>"
 "guiding" { -na-ongoza } A-REL %A> A ABS DEF 3SG
"<principle>"
 "principle" { 3SG simamo } %NH N SG NOM DEF
.
"<understandable>"
 "understandable" { -na-eleweka } A-REL %A> A ABS DEF 5SG
"<question>"
 "question" { 5SG swali } %SUBJ N SG NOM DEF
.
"<unifying>"
 "unifying" { -na-unganisha } A-REL %A> A ABS DEF 7SG
"<thing>"
 "thing" { 7SG tu } %NH N SG NOM DEF
.
"<measurable>"
 "measurable" { -na-pimika } A-REL %A> A ABS DEF 9SG
"<effort>"
 "effort" { 9SG juhudi } %NH N SG NOM DEF

```
.  
"<upcoming>"  
    "upcoming" { -na-jitokeza } A-REL %A> A ABS DEF 11SG  
"<freedom>"  
    "freedom" { 11SG huru } %NH N SG NOM DEF  
.
```

Intermediate phases are now left out, and only the final translation in singular and plural is in (27 and 28).

(27)
Mtoto anayecheza.
Msimamo unaoongoza.
Swali linaloeleweka.
Kitu kinachounganisha.
Juhudi inayopimika.
Uhuru unaojitokeza.

(28)
Watoto wanaocheza.
Misimamo inayoongoza.
Maswali yanayoeleweka.
Vitu vinavyounganisha.
Juhudi zinazopimika.
Uhuru unaojitokeza.

5.3 Referring to negation

The third possibility to use the relative prefix in describing adjectives is in connection with the TAM marker *-si-*. The process with this marker is very similar with the markers described above. Again, we add inflection tags to adjectives (29).

```
(29)  
"<non-elected>"  
    "non-elected" { -si-chaguliwa } A-REL %A> A ABS DEF 1SG  
"<member>"  
    "member" { 1SG anachama } HUM %NH N SG NOM DEF  
.  
"<untrained>"  
    "untrained" { -si-fundishwa } A-REL %A> A ABS DEF 3SG  
"<plant>"  
    "plant" { 3SG mea } %SUBJ N SG NOM DEF  
.  
"<unreached>"  
    "unreached" { -si-fikiwa } A-REL %A> A ABS DEF 5SG  
"<object>"  
    "object" { 5SG lengo } %SUBJ N SG NOM DEF  
.
```

```
"<unwashed>"
    "unwashed" { -si-oshwa } A-REL %A> A ABS DEF 7SG
"<material>"
    "material" { 7SG faa } %NH N SG NOM DEF
.
"<undefined>"
    "undefined" { -si-wekwa dhahiri } A-REL %A> A ABS DEF 9SG
"<target>"
    "target" { 9SG shabaha } %NH N SG NOM DEF
.
"<uncontaminated>"
    "uncontaminated" { -si-chafuka } A-REL %A> A ABS DEF 16SG
"<place>"
    "place" { 16SG mahali } %NH N SG NOM DEF
.
```

The translations of the singular and plural forms are in (30 and 31).

(30)

Mwanachama asiyechaguliwa.
Mmea usiofundishwa ni.
Lengo lisilofikiwa ni.
Kifaa kisichooshwa.
Shabaha isiyowekwa dhahiri.
Mahali pasipochafuka.

(31)

Wanachama wasiochaguliwa.
Mimea isiyofundishwa.
Malengo yasiyofikiwa.
Vifaa visivyooshwa.
Shabaha zisizowekwa dhahiri.
Mahali pasipochafuka.

6 Conclusion

Swahili language is in a development phase, where a large number of concepts have no direct lexical representation. Therefore, instead of direct lexical words, explanative descriptions have been used, at least in dictionary compilation. These descriptions are usually multiword expressions, which are often difficult to handle, because parts of the expressions inflect according to noun classes.

The solution proposed here is to list such expressions in abstract form, where only the stable part is present, and the inflecting slots are presented with dash (-). By so doing it is possible to convert each slot into appropriate surface form. The report shows that this works without fault in all types of multiword expressions.