Direct Translation

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Natural Language Processing

Agenda

- Direct MT

- Enlgish to Hindi Translation

- Examples

Direct MT

- System carries out word-by-word translation with a help of bilingual dictionary, followed by syntactic rearrangement.

- Rely mainly on a large bilingual dictionary.

- Designed for specific source and target language pair.

- Performance depends on:

  - The quality and quantity of source-target language dictionary

  - Morphological analysis

  - Text processing software

  - Word-by-word translation with minor grammatical adjustments on word order

Direct MT

- Direct translation is thus based on a large bilingual dictionary;

  - each entry in the dictionary can be viewed as a small program whose job is to translate one word.

- After the words are translated, simple reordering rules can apply.

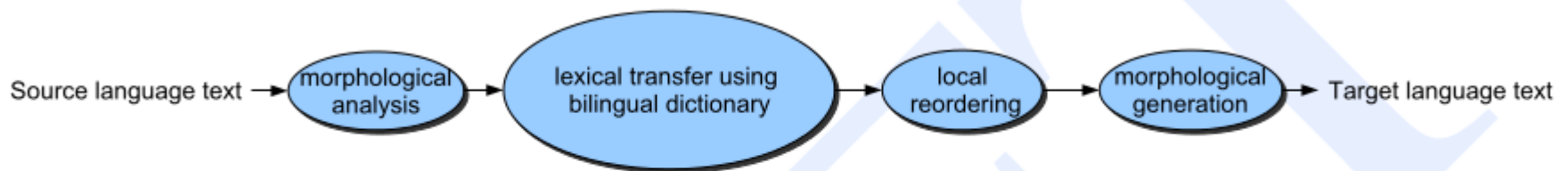 - for example for moving adjectives after nouns when translating from English to French.

Source language text → morphological analysis → lexical transfer using bilingual dictionary → local reordering → morphological generation → Target language text

Figure 25.5 Direct machine translation. The major component, indicated by size here, is the bilingual dictionary.

Direct MT – Dictionary

function DIRECT_TRANSLATE_MUCH/MANY(word) **returns** Russian translation

if preceding word is *how* **return** *skol'ko*
else if preceding word is *as* **return** *stol'ko zhe*
else if word is *much*
  if preceding word is *very* **return** nil
  else if following word is a noun **return** *mnogo*
else /* word is many */
  if preceding word is a preposition and following word is a noun **return** *mnogii*
  else return *mnogo*

Figure 25.7 A procedure for translating *much* and *many* into Russian, adapted
Hutchins' (1986, pg. 133) discussion of Panov 1960. Note the similarity to decisi

English → Spanish

- Step 2: spanish translation

- Step 3: switch the adjective-noun ordering

Input:	Mary didn't slap the green witch
After 1: Morphology	Mary DO-PAST not slap the green witch
After 2: Lexical Transfer	Maria PAST no dar una bofetada a la verde bruja
After 3: Local reordering	Maria no dar PAST una bofetada a la bruja verde
After 4: Morphology	Maria no dió una bofetada a la bruja verde

Figure 25.6 An example of processing in a direct system

English → Hindi Direct MT

- Remove morphological inflections to get the root form of the source language words.

- Look-up bilingual dictionary to get the target language words.

- Change the word order to that of target language.

  Eg: S-V-O to S-O-V structure
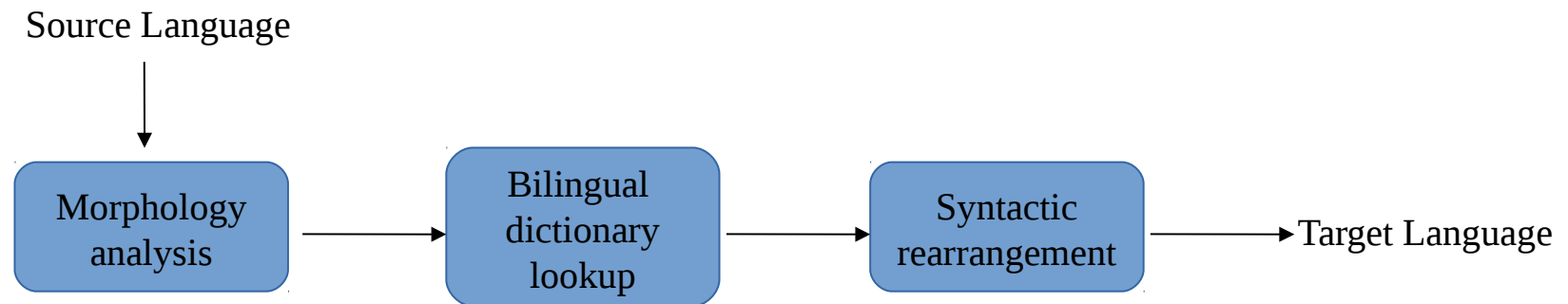
Bilingual dictionary

this is Hindi translation from English text. ⟶ यह अंग्रेजी से हिंदी अनुवाद पाठ है।

English → Hindi

English → Hindi

- Source langauge:

  Sita slept in the garden.

- Word translation:

  Sita soyi mein baag

- Syntactic rearrangement:

  Sita baag mein soyi
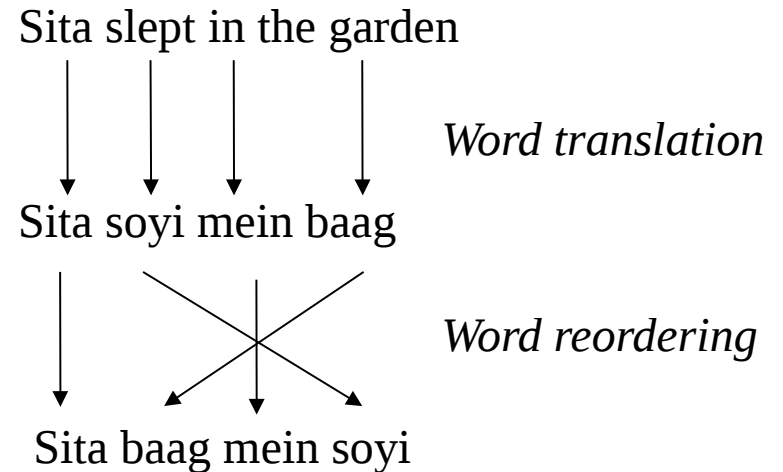
Sita slept in the garden

Word translation

Sita soyi mein baag

Word reordering
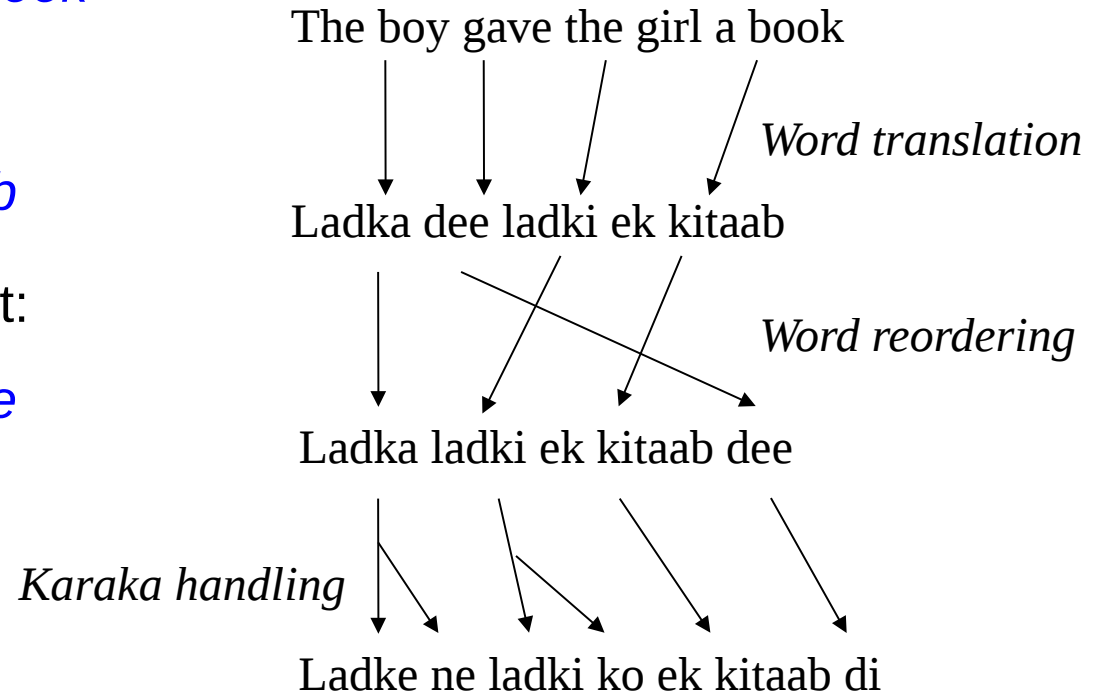
Sita baag mein soyi

English → Hindi

- Source langauge:

  the boy gave the girl a book

- Word translation:

  ladka dee ladki ek kitaab

- Syntactic rearrangement:

  ladka ladki ek kitaab dee

The boy gave the girl a book

Word translation

Ladka dee ladki ek kitaab

Word reordering

Ladka ladki ek kitaab dee

Karaka handling

Ladke ne ladki ko ek kitaab di

English → Tamil

- Source langauge:

  sita slept in the garden

- Word translation:

  sita thoongivittal poongavil

- Syntactic rearrangement:

  sita poongavil thoongivittal

Sita slept in the garden

Word translation

Sita thoongivittal poongavil

Word reordering

Sita poongavil thoongivittal
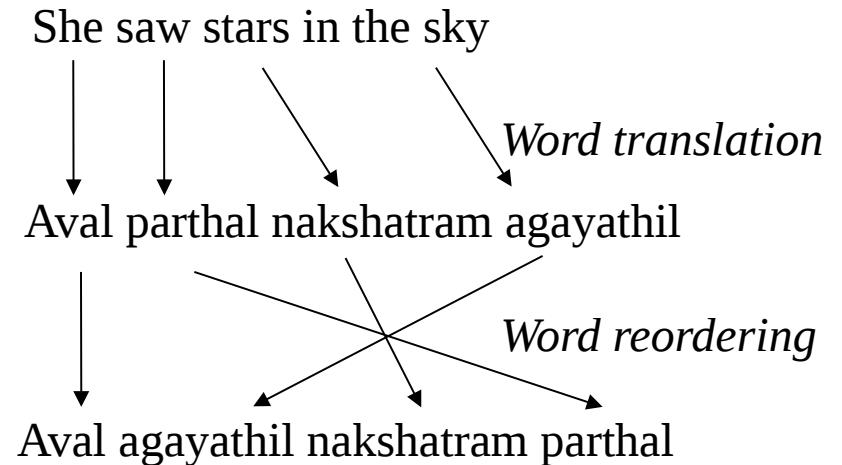
English → Tamil

- Source langauge:

  She saw stars in the sky

- Word translation:

  Aval parthal nakshatram agayathil

- Syntactic rearrangement:

  aval agayathil nakshatram parthal

She saw stars in the sky

Word translation

Aval parthal nakshatram agayathil

Word reordering

Aval agayathil nakshatram parthal

English → Tamil

- Source langauge:

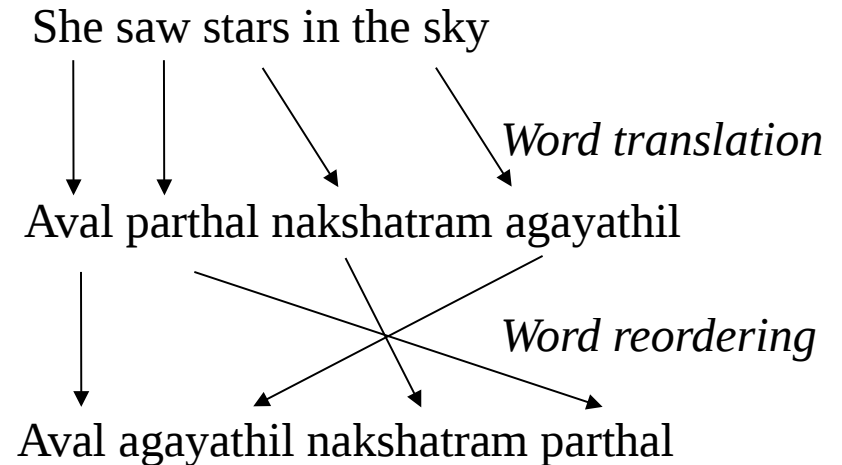 *She saw stars in the sky*

- Word translation:

  Aval parthal nakshatram agayathil

- Syntactic rearrangement:

  aval agayathil nakshatram parthal

She saw stars in the sky

Word translation

Aval parthal nakshatram agayathil

Word reordering

Aval agayathil nakshatram parthal

References

- *Natural Language Processing and Information Retrieval*, Tanveer Siddiqui, Tiwari, Oxford

- *Speech and Language Processing*, Daniel Jurafsky, Martin, Pearson, 2006.