Machine Translation – Introduction

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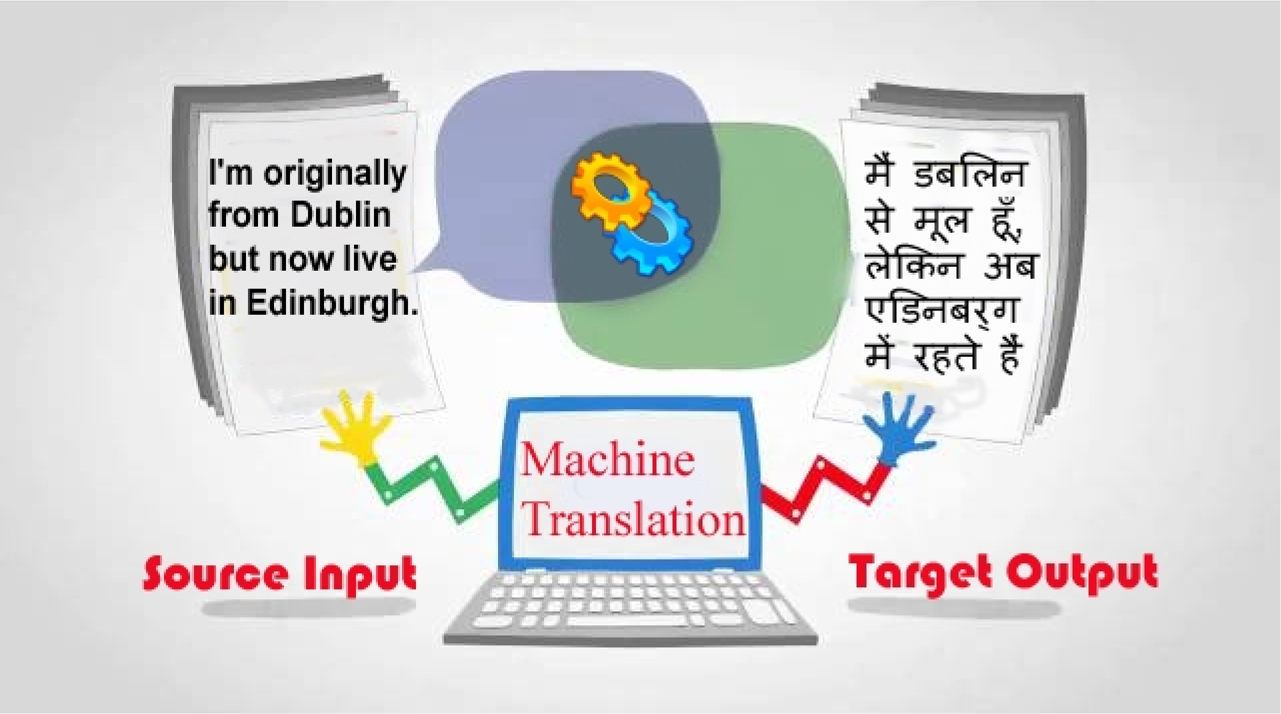
Natural Language Processing

Agenda

- Machine translation – introduction
- Problems in MT
- Indian Languages characteristics
- Approaches in MT

Machine translation

- The use of computers to automate some or all of the process of translating from one language to another.
- Translation in its full generality – difficult !


I'm originally from Dublin but now live in Edinburgh.
मैं डबलिन से मूल हूँ, लेकिन अब एडिनबर्ग में रहते हैं
Machine Translation
Source Input
Target Output

Machine translation

- Existing state-of-the art MT systems, compromise on:
  - Complete automatic
  - High quality
  - General purpose translation
- Automatic, high quality system – sublanguages.
- Automatic general-purpose systems – rough translation.

Problems in MT

- Structural and stylistic differences among languages
  - Word order
  - Word sense
  - Pronoun resolution
  - Idioms
  - Ambiguity

Word order

- Arangement of words in a sentences varies.
- English: subject, verb, object – SVO format
- Indian languages: object usually preceds verb.
- Some indian languages are free word-order form.

E: Sita slept in the garden

Sita thoongivittal poongavil

T: *Sita poongavil thoongivittal*

Word sense

- Sense of word in one language differ in sense of another language.
- T1: *Malargalai pol thangai urangugiraal.*

  E1: Like sister sleeps with flowers. (from google translator)

  T2: *Aaru maname aaru, antha aandavan kattalai aaru.*

  E2: Six six mind, the lord of six (from google translator)

- Resolving pronominal references

Idioms

- Idioms are composed of words – does not directly contribute to their meaning.
- Replacing words in idiom with words from target language can lead to funny / nonsensical translations.
- E1: *The old man finally kicked the bucket.*

  T1: *Palaiya manithan iruthiyaaga vaali udhaithaar.*

  T2: *thaayai pola pillai, noolai pola selai.*

  E2: *As mother and child, as the sari thread.*

Ambiguity

- Certain languages do not permit certain ambiguities.
- Consider the PP ambiguity:

  the man saw the girl with a telescope.
- Inorder to translate, the PP ambiguity must be resolved.

Manithan oru tholainoki moolam pen paarthen. (google translator)

Indian languages – characteristics

- Indian languages are categorized into four broad families:
- Indo – Aryan (Hindi, Bangla, Asamiya, Punjabi, Marathi, Gujrathi, Oriya)
- Dravidian (Tamil, Telugu, Malayalam, Kannada)
- Austro – Asian
- Tibetan – Burmese

Indian languages – characteristics

- Indian languages have SOV as the default sentence structure.
- Indian languages are free word order.
  - Words can be moved freely with in a sentence.

    Raman Seethaiya kandaan.

    Seethaiya kandaan Raman.
- Indian languages have a rich set of morphological variants.
  - Adjectives undergo morphological changes depending upon number and gender.

Indian languages – characteristics

- Indian language uses post-position case markers instead of prepositions.
- Indian languages makes use of verb complexes consisting of sequences of verbs.
  - Gender information is also contained in verb group.
  - Aux. Verb provides tense, aspect and modality.
- Eg:

  Hindi: *ga raha hai. khel rahi hai*

Indian languages – characteristics

- Sometimes adjectives are also modified to agree with gender.

  Hindi: achcha ladka, achchi ladki

- Tamil – agglutinative! Words = stem + grammatical info.

- Words formed from root by adding more (two or more) affixes:

  pakuthy – sandhi – viharam – idainilai – sa:riyai – vikuthy

  stem – junction – variation – middle part – enunciator – terminator

- In tamil, verb carries information about tense, aspect, modality and gender.

- Tamil: *OdikkONdirunthiruppAn* = 11 affixes !

  pO + n + An = pOnAn

  pO + kiRu + An = pOkiRAn , pO + v + An = pOvAn

MT approaches

- Direct translation
- Rule-based
  - Transfer
  - Interlingua
- Corpus-based
  - Example-based
  - Statistical
- Knowledge-based

References

- *Natural Language Processing and Information Retrieval*, Tanveer Siddiqui, Tiwari, Oxford
- *Speech and Language Processing*, Daniel Jurafsky, Martin, Pearson, 2006.