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Review on Language Translator Using Quantum Neural Network (QNN)

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Abstract:

This paper presents machine translation based on machine learning, which learns the semantically correct corpus. The machine learning process based on Quantum Neural Network (QNN) is used to recognizing the corpus pattern in realistic way. It translates on the basis of knowledge gained during learning by entering pair of sentences from source to target language. By taking help of this training data it translates the given text. own text.The paper consist study of a machine translation system which converts source language to target language using quantum neural network. Rather than comparing words semantically QNN compares numerical tags which is faster and accurate. In this tagger tags the part of sentences discretely which helps to map bilingual sentences.

Keywords — **Machine Learning, Quantum Neural Network, Semantic Translation, Syntactic Translation, Three Numeric Code.**

I. INTRODUCTION

Language translation comes into scene when a person needs to filter some information from another language that he doesn't know. Long before literatures are translated to other language by a person who knows both languages. In this computer era software's are used for multilingual translation. Various attempts are driven to translate the script more semantically. The journey from simple word translation to complex sentence translation has been carried out more accurately by researchers.

Various techniques are available for translating. Quantum Neural Network (QNN) is one of them. It has a property to gain knowledge from instances by recognizing their behaviour. QNN is a technique loosely based on human brain functioning. This model uses rearranging the tagged parts of speech and do their alignment. QNN is effective to encode into discrete levels of possibility. It is knowledge based translation technique as it needs training data for translation. Multilevel activation function is used rather than using ordinary sigmoid function which is used in conventional neural networks.

Machine translation system is major part in Natural Language Processing(NLP). Many of the machine translation systems stands on the basis of rearrangements of words in sentences. Dictionaries can be used to finding out the relation between bilingual words. This procedures consist of relationship between two languages can be derived after aligning the text upto the level of semantic standards.

II. RELATED WORK

Many authors have worked on language translation using different models, Machine translation using Markovian Model is a type of model which is based on phrases based rather than words based. It combines with the table which is based on phrases to phrases translation. In this model to translate a text into its targeted translation model parameters must be present at that particular time. With model inference, the objective of extracting id done for all tables, functions ,etc[1].

Rule based model-includes all three translation models like inter lingual machine translation, dictionary based machine translation

and transfer based machine translation. This model is generally used in the creation of dictionaries and grammar programs. This model gives more information about the syntactics of the source and target language. In this model lexical selection rules should be written for all cases of ambiguity. This model must also have inaccurate input to be the part of the source language analyzer in order to cope with it[1].

ANN simulates large volume of biological neurons' properties like self adaptability, conduction and and output, spatial weight aggregation. Output of ANN depends on present input of system not on previous moments. The memory output of biological nerve depends on spatial aggregation and temporal cumulative effect [10].

Hop-field Neural Network (HNN) is a form of recurrent neural network. It is a full connection neural network made of neurons with symmetrical synaptic connection. Hopfield networks works as content-addressable memory systems with binary threshold nodes [9].

This type of machine translation approach generates translation using various statistical methods which are based on bilingual text corpora. By using such corpora good results can be achieved by translating similar texts. This approach get inspired by a model called as noisy channel model and this was used as a statistical tool by research community[3][4].

III. METHODOLOGY

A. QNN

It gives us the new understanding of brain function and unprecedented possibilities in creating new system for information processing, solving intractable problem etc. It has the ability to learn from examples by recognizing their patterns. This model uses reordering of words for parts of speech tagging and do their alignment during the machine translation.

QNN is effective to classify intermediate data, because QNN has inherently fuzzy properties which can encode the sample information into discrete levels of certainty or uncertainty.

The advantage of this technique is -

If the translation is wrong, then it can be corrected and taught proper translation by a user without any expert technical knowledge of how computer stores and represent values.

The superposition state in hidden layer is present. Such hidden layer neuron can reflect more states and magnitude.

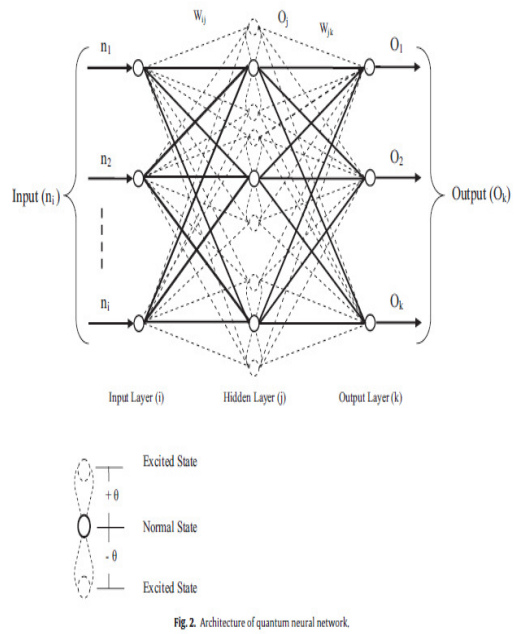

Fig 1 Architecture of Quantum Neural Network.

The sigmoid function with various graded levels has been used as activation function for each hidden neuron and is denoted as :

$$sgm(x) = \frac{1}{n_s}\sum_{r=1}^{n_s}\left(1/(1+\exp(-x \pm \theta^r))\right)$$

Given,

r- level, n_s- number of grades, Θ^r- difference of quantum interval.

B. Machine Translation System

Computational linguistic which belongs to natural language processing (NLP) is machine translation. Machine translation faces issues like lexical, syntactic and structural ambiguity, discourses, multiple shades of meaning and induction. It consist two parts:

1) Syntactic Translation:

As script passes through machine translator it first goes into syntactic translation module for analyzation purpose. As each language has different grammar rules the MT system should know syntactic differences between grammars. This module forks sentence into several phrases on the basis of patterns.

2) Semantic Translation:

The output of syntactic translation module is then given to the semantic translation module to deal with the meaning. This module objectifies transfer of literal meaning while translating source language. It plays crucial role in machine translation because the correct meaning of every word is necessary in the process. This module directly maps word of source language to its associate meaning in target language using lexicons. Its also takes care of ambiguous words.

C. *Three Address Code Technique*

Many researchers on Machine Translation are using Natural Language Processing for building a translation system which will help them to translate multiple languages from source language to destination language from the time the computers were introduced. In this they have introduce the importance of QNN to perform machine translation with the help of pattern matching to increase the accuracy for the information gained. In this they have found a new way to rearrange the works of the sentences based on parts of speech tagging i.e POS Tagging and the right spacing and alignment[5].

In this they have used a unique three numerical codes technique for part of speech because rules for parts of speech is not dependent of the meaning of the words and the system must gain knowledge for symbolic manipulation. To re-arrange the translated words to make some grammatical meaning this technique is used by them. There may be some situation when the input sentence and the targeted sentence are having different number of words. So in this situation they have used an extra three numerical code i.e .000 for giving a word some alignment [1][2].

Parts of Speech	Three Numerical Codes
Noun	.100
Pronoun	.102
Gerund	.103
Verb	.110
Helping Verb	.111
Adverb	.112
Article	.123
Adjective	.130
Preposition	.140
Conjunction	.170
Interjection	.180
Negative Words	.220

TABLE 1

IV. ALGORITHM

A. *Complex to Simple Sentence Conversion*

Consider a sentence as input with N number of words. Each word information is based on token.

1. The input sentence is scanned first whether it is simple or complex one.
2. If it is simple then convert
3. Else
4. It is complex sentence
5. Then remove the interrogative sentences is removed if present.
6. Remove all negative to simplify the sentence
7. Then divide sentence into sub-sentence based on conjunction
8. Pass each sub-sentence through QNN based MTS.
9. Apply Grammar Rules
10. Add interrogative word if removed at step 5.
11. Add negative sentence if removed at step 6.
12. Merge the sub-sentences, if split at step 7.
13. Apply Semantic Translation.
14. Exit.

V. CONCLUSIONS

The sentence which is to be converted into English is stored in temporary memory. The given sentence get analyses and converted into the targeted language. In this paper we have studied how to build an effective language translator using quantum neural network(QNN).

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