A Comparative Study on Various Virtual Assistance Technologies over Newly Proposed Intelligent Hologram

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Abstract— **Intelligent assistance technologies are becoming very popular in the field of digital arena. There exists various Artificial Intelligent Systems. In this paper, a comparative study has been done based on the technologies used in various digital intelligent assistants. Here, a new idea has been proposed based on the learning patterns of human behaviour which is to be implemented in Hologram using Artificial Neural Network.**

Keywords— *ANN, Hologram, Self-Organized Mapping*

I. INTRODUCTION

In the present days, various Artificial Intelligent (AI) Assistance technologies are becoming very popular. Some of these are Google Assistant, Gate Box, GoogleDuplex etc. But all of these technologies are based on Voice Recognition System, partial ANN and smart gadgets [1, 2, 3, 4 & 5]. The proposed topic is an approach towards training of the Artificial Neural Network (ANN) based on the behavioural pattern of human being and then this method will be implemented in a hologram. Implementation in a hologram will give a virtual effect which may provide an essence of virtual reality. Japan introduced one technology which is named as GateBox having one holographic character for giving assistance for various purpose wise weather forecasting, switching lights etc. Technologies like Google Assistant, Google Duplex, Gate Box uses various AI learning techniques like deep learning, recurrent network and also various sensors and other smart gadgets [4 & 5] which may be much more expensive for daily use.

In this paper, the proposed topic aims an approach towards developing an intelligent hologram which will be fully intelligent and play an effective role in storing the behaviour and learning pattern of human brain. To accomplish the task and Hybrid Artificial Neural Network will be developed which will be trained for a set of predefined behavioural and learning patterns of human brain. The trained ANN is capable of taking responses if new set of questions are given as input. And a comparison is done based on the technologies used in the previously developed Assistant technologies.

II. ARTIFICIAL NEURAL NETWORK

An Artificial Neural Network is an information processing system which is modelled depending upon the characteristic features of a biological neural network. It has been developed by generalizing mathematical models of human cognition and neural biology [12].

III. VIRTUAL ASSISTANCE SYSTEMS AND THEIR TECHNOLOGY

Virtual Assistant services are some software agents which are developed for performing various tasks in our everyday life. As of 2017, the popularity and usage of various virtual assistance services are increasing rapidly in the present digital arena [15]. Some of these systems are Google Assistant, Google duplex, Gate Box etc. These mentioned systems are based on voice recognition, some rules of Artificial Intelligence and also dependent upon some gadgets for assisting in various purposes [1, 2, 3 & 4].

Some of the Virtual Assistance technologies are discussed below –

3.1 Google Assistant

Google Assistant is a conversational voice activated digital assistant that can support by interacting on behalf of a user in order to receive contextual information. For performing various tasks, Google assistant uses Artificial Intelligence (AI) technologies where natural language processes and machine learning is used to understand what the user is saying and to give proper response on the given language input. Google Assistance uses deeper level of AI [1, 2 & 3].

3.2 Google Duplex

Google Duplex is a voice assistant system which is based on Artificial Neural Network and is trained with recurrent neural network. It is used in highly specialized task and plays a very effective role in speech recognition technology [2].

3.3 Gate Box

Gate Box is a small scale projection technology

with diverse range of sensors. It has a holographic cartoon character named "Azuma Hikari" which is virtually assisting in various tasks of its owner. The technology is equipped with sensors such as camera, human sensors, Wi-Fi, Bluetooth, infrared in order to recognize master's face,

movement and for various communication purposes [4 & 5].

Some of the learning rules used in various Virtual Assistance services are deep learning, recurrent type of network and uses various smart gadgets.[1, 2, 3, 4 & 5]. Deep learning is a type of machine learning algorithm that achieves great power and flexibility to represent the world with variety of concepts[17].The main strategy of deep learning algorithm is to divide the problem into various parts and then the learning process is done for which the efficiency increases. But Deep learning possess some dependencies which are

i) **Data dependency**: Deep Learning requires high scale of data otherwise the performance of the learning process decreases.

ii) **Hardware dependency:** Deep learning algorithms are highly dependent on high end machines. Because the GPUs which are included in Deep learning algorithm are used for the optimization of large amount of matrix multiplication operations [17].

iii) **Feature Engineering:** The process of putting domain knowledge in creation of feature extraction to reduce the complexity of data and making patterns more visible requires more time as well as it is expensive [17].

Recurrent neural network possess feedback loop where the output neurons are presented into input neurons and there could be neurons with self-feedback loop also. [12&15] Recurrent neural network possess high complexity in computation.

Supervised Learning is that type of learning where the input patterns are associated with desired target output. As it is a feed forward network and the desired output is known previously [12&15], its computational complexity is less.

IV.   NEWLY PROPOSED METHOD

In the proposed method, an approach is taken towards developing an intelligent hologram which will be fully intelligent and play an effective role in storing the behaviour and learning pattern of human brain and the Artificial Neural Network will be trained by using supervised learning rule.

V.   PROPOSED METHOLOGY

Some performance and technical analysis will be carried out on the already existing models in order to find their limitations and performance. Then the steps which are to be followed for accomplishing the proposed approach are explained below.

5.1 Behavioural Analysis of Human Being

In this phase, various behavioural features of human being will be analysed which will be the source of input neurons.

5.2 Detection of Learning Pattern

From the various behavioural features of human being analysed from the previous step, the learning pattern of a human being will be detected.

5.3 Preprocessing Of Input Patterns

Input patterns collected from the detection of various learning patterns should go through some Pre-processing methods in order to acquire some efficient input data set. The two processes which will be followed in this phase are-

5.3.1 *Binarization*

In this process, the input learning patterns will be converted into binary matrices.

5.3.2 *Noise Removal*

In case of recording of sound and video files, various unwanted videos are also recorded that affects the quality and accuracy of the input patterns for the training purpose. So, in this process, the unwanted noises are to be removed.

5.4 Feature Extraction

In this phase, the common input features will be extracted which are to be forwarded to the next phase for the classification of the common input neurons.

5.5 Clustering of Patterns

In this phase, classification of similar input neurons will be done using Self Organized map (SOM) in which the input neurons will compete with each other in order to produce a winner output neuron[6] which is shown in Fig1.And this winner input neuron will be forwarded as input towards the learning phase.

5.6 Learning of ANN

In this phase, the winner output neuron will be forwarded as input towards the learning process. Here the network will be trained using a supervised learning process [11&12].

- Preferred Leaning Rule

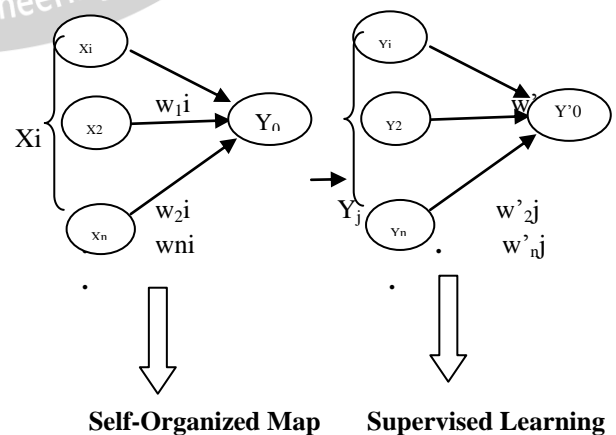 Hybrid ANN (Hybrid Artificial Neural Network) = Self-Organized Map (SOM) + Supervised Learning Rule

Self-Organized Map   Supervised Learning

Fig 1. Hybrid ANN

5.7 Implementation in a Hologram

In this phase, projection of the Hybrid   ANN will be carried out by developing an intelligent hologram. This initiative of visualization will enhance the proposed system by giving an essence of virtual reality. The prototype of a hologram is shown in Fig 2.
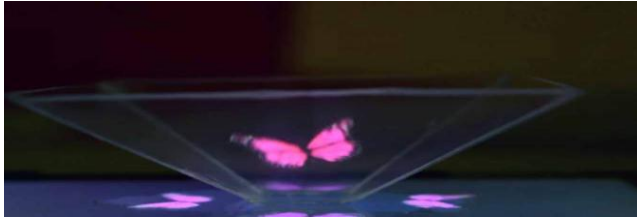

Fig2. Prototype of a hologram (image source: https://techmzy.wordpress.com/2016/01/07/tips-turn-your-phone-into-a-3d-hologram-projector-awesome/

VI.   CONCLUSION

In our proposed method, the patterns of the human behaviour will be trained by developing a hybrid ANN which will be a combination of Self-Organized Mapping (SOM) and a supervised learning ANN. By using Self Organized Mapping and supervised learning, clustering will be done for efficient classification of input patterns and learning performance irrespective of numbers of input datasets provided for learning purpose. And the proposed system will be less expensive also.

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