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Pattern Recognition based on Hierarchical Structure Blended with Multilayer Perceptrons for Predicting Different Styles

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***Abstract*— Pattern Recognition is one of the most evolving and pompous area coming under machine learning. This project describes conversion of images of typewritten character into machine encoded character. Recognition of characters relies on hierarchical structure which was used during the training of dataset. By comparing previous recognition methods hierarchical structure has the advantage of path tracing and fast searching by taking the sub trees of structure developed after training .Characters in a single image is taken as dataset and on training the individual characters in the image will be stored in a tree following the concept of binary tree in data structure. The added feature of this proposal when comparing previous methods is implementation of neural network for better prediction and deducing the difficulty in collecting handwritten letter or characters in different styles. Both training and testing relies on human mode of learning and inference. Human intelligence is based on neural network substrate and so artificial neural networks have long held promise in the field of machine learning and artificial intelligence.**

Index Terms- Pattern Recognition; Optical Character Recognition; Hierarchical Structure;Learning; Inference;

I. INTRODUCTION

The basic and momentous feature of human being is recognition. Human being can recognize things using different methods likely to be call as senses. Sense of feeling involves sense of touch, sense of vision, sense of sound. In computer literature the sense of identifying things collectively known as pattern recognition[7] We the people are blessed with recognition power and can learn things very fast. Despite significant efforts, research regarding computational modeling of machine consciousness is very limited. Among various technical, philosophical and computational difficulties, the primary reason is the difficulty in understanding consciousness and related abstract notions like thought, attention, and awareness . It is very difficult to teach a system[15] to recognize things like humans do. Assume brain is cutting into two hemisphere, the research result has proved that the left hemisphere focus on analytical skills and language skills while right hemisphere's point of concentration is on copying designs, discrimination of shapes ,understanding geometric shapes, intelligence etc.Most of the computer engineers are concentrating to build systems to work in an analytical method and still we forget the fact that analytical methods can only give limited opportunities to us. If we concentrate to design the system as our right brain do, we will get fruitful information from it that helps us to satisfy current requirements and future requirements too. The right brain easily gets into learning things and makes inferences on it. Pattern recognition comes from the branch of intelligence [7][8] where it focuses on recognition of patterns and regularities in data. Traditional pattern recognition[1][11][12] use large training set and the critical thing that might consider is the selection of data in training set which will highly influence the output. The pattern identification follows either supervised learning[1] or unsupervised learning and also there exist a third mode of learning known as semi supervised learning. Supervised learning requires labeled[3][13] training data, whereas unsupervised doesn't requires any labeled data. Third mode of learning stands in between supervised and unsupervised.

In machine learning, pattern recognition is the assignment of a label to a given input value. Patten recognition[2][9] has become one of the most popular and pompous area for machine learning as well other fields. The farthest goal of recognition is to extract the patterns according to some criteria. The main steps in pattern recognition are preprocessing, feature extraction and classification. Some examples include fingerprint verification, face recognition. Preprocessing is the primary step. The main intention is to remove or filter the noise, smoothing, and normalization to correct the image. Some of the preprocessing ste ps also include segmentation to correctly segment the data from its background. The decisive step is feature extraction. Actually good features obeys intra class variance and inter class variance. But the problem is curse of dimensionality [13]. Certainly we have certain methods to delineate this problem like selection of representative features, feature extraction [3] by transforming the features to another etc. And we have robust recognition systems which is independent of size, orientation and location of feature[14]. The final step is classification, focus on identifying categories based on some training data. The data being categorized classifies according to trained data and so training patterns must be crucial. We must be careful and selective on training data otherwise result might be unacceptable. Clustering, regression, anomaly detection[1] are comes under classification[1][2]. We can implement the same on various fields like psychology, psychiatry, ethology, cognitive science and traffic flow.

The potential of teaching by and with computers has been recognized since their inception. Intelligent tutoring systems[15] came early into 1970 in the form of domain expertise as well as pedagogic element. Student modeling is the process of building a model of student's organization of knowledge in subject domain Enormous successes have been achieved through the modeling of biological and natural intelligence, resulting in so-called "intelligent systems". These intelligent algorithms include artificial neural networks, evolutionary computation [2][4], swarm intelligence, artificial immune systems, and fuzzy systems.

Here in this paper we seek the concept of learning computer using daily seen patterns of letters and subsequently apply inference on the same. Suppose when an American comes to India first he might be wonder of a new contraption which runs on three wheels. From their tourist guide he will learn that it is an autorikshaw. After this incident he can also see several autorikshaws comes in different shapes different colors etc. of After seeing certain examples he can recognize autorikshaws even if they consist of slight variations. He doesn't need seeing large number of autos to recognize it. We here apply the same logic and use hierarchical structure to store the learned things and on every learning we strengthen the power of learning by incrementing the count of occurrence of node . Like the above mentioned contraption slight variations of patterns doesn't affect much more like humans.

II.RELATED STUDIES

Most of the models require complete dataset at hand a priori is indispensible for them to properly accomplish a given task .A retraining phase with the use of an up-to-date dataset ought to be reciprocally executed whenever a new data needs to be incorporated. A progressive learning of the new pattern will in essence modify the initial trained model. Segmentation methods used to segment the words into letters so that subsequent process of recognition will be easy. MSER method[14] segments the image to find out the words in whole image and have demonstrated very promising performance in many real projects. The main advantage of MSER-based methods over traditional connected component based methods roots in the usage of the MSERs algorithm for character extraction –the MSERs algorithm is able to detect most characters[5]even when the image is in low quality. Robust text detection in natural scene images[14][10][11][9] extract Maximally Stable Extremal Regions (MSERs) as character candidates using the strategy of minimizing regularized variations. Character candidates are grouped into text candidates[8] by the single-link clustering algorithm. Hierarchical structure follows a pyramidal structure has an advantage that similar patterns follows the same path so several patterns can be kept together.

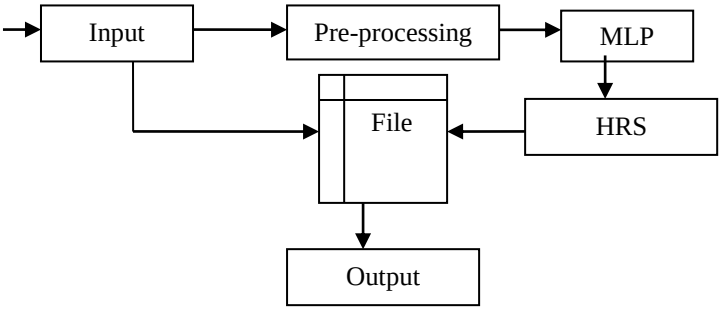
III.PROPOSED SYSTEM

By incorporating several steps in image processing, we propose a novel method for pattern recognition. The method do not necessitate a complete dataset to be available at hand; yet, they use the available dataset initially and then use the perceptrons for predicting different possible inputs . The method starts its rehearsal process from scratch with an empty tree. During the training process based on novelty of new incoming training pattern the structure of the system will be reconstructed. Every input is considered as fixed number of pixels. The things we must place in our mind is that the input to our system is an output of MSER. The architecture goes through two levels like every machine learning systems. In learning level the system learns the pattern according to our current dataset and construct the structure of the system accordingly, and also it doesn't produce any output during this time. The second level is the inference phase.

IV.SOLUTION METHODOLOGY

All modules of the proposed method are outlined by this section where the principal constituents of framework are specifically apportioned to four subsections as follows: A)Architecture B)Preprocessing; C) Hierarchical structure; D) Learning and inference; E)algorithm

A. Architecture



B. Preprocessing

Preprocessing is the primary part of every image preprocessing as much importance of training dataset in data mining. Image pre-processing can significantly increase the reliability of an optical inspection. Several filter operations which intensify or reduce certain image details enable an easier or faster evaluation. After some basic filtrations like everyone knows(binary to gray, noise filtration), apply the inputs to MLP(multi layer perceptrons) for predicting the different styles of given input. We are considering this because two reasons . First the difficulty in collecting the handwritten letters. Second, this method helps us to approximate the styles of large deviated input to a comfortable pattern

C. Hierarchical Structure

The trained structure compose of collection of nodes where each node contains several information fields can be call as tree. And the training starts from an empty tree Node preserves information of its parent ,children, x the reference point led to generation of child node etc. Each node has an additional field count that tells us the number of occurrence of the node in every learning. The leaf node contains original pattern which will be set by human or machine itself. For simplicity we consider binary images as patterns.

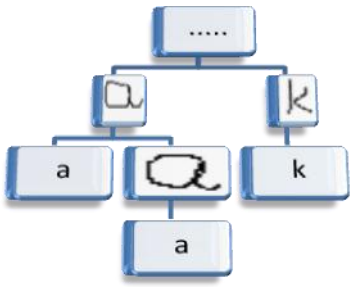


Figure 2. Illustration

D. Learning & Inference

On the very first learning first pattern will be stored at root and when the second pattern comes for learning make comparison with pattern in root. Consider the letter is made up of points and each point can be represented as (x ,y). Begin our comparison with least x ,y value then increment y value. only after the last y value with same x value increment x value. This process continues till last x, y point. If comparison of points with same points in node shows difference leads to creation of two child and where the difference felt will be stored at parent. The same procedure follows for every learning. The leaf of every node contains original pattern .Thus on every time of learning the structure is reconstructing. The traversal through nodes during learning will be counted and count will be stored at same node. This implies the human learning as the number of traversing through same concept boosting our memory power.

The previous phase just performed learning and doesn't produce anything as output. Here in this phase perform sensing on exhausted patterns, then output the original pattern according to the similarity. This phase do the same type of point comparison as in learning phase and traverse through the nodes to reach the leaf for output it. During comparison when felt large difference it just make one move back to node and select one of path having greater similarity and the number of count in node is high. This implies human mode of inference as the human will select the pattern in which he felt the greater similarity.

E. Algorithm

(assume points are of two dimensional)
Input: (x,y)
Output: recognized pattern

step1.learning()
step2.if(root==NULL)
step3.store input at root i.e., root=input.
Step3.else for all(x, y)
Step4.loop for all $x_{(p,i)}(i = 0\ to\ n)$
Step5. { for all $y_{(p,j)}(j = 0\ to\ n)$
Step6. Compare $(x_{(pi)}y_{(pi)})with(x_{(si)}y_{(si)})$
Step7. If $(|(x_{(pi)}y_{(pi)}) - (x_{(si)}y_{(si)})| > 0)$
Step8. { $node_k count = node_k count + 1$
Step9. Split and create child.
Step10. Each child stores remaining points.}
Step11. Store original pattern at leaf.
step12.Inference()
step13.if(root==NULL)
step14. return error..
Step15.else for all(x, y)
Step16.loop for all $x_{(p,i)}(i = 0\ to\ n)$
Step17. { for all $y_{(p,j)}(j = 0\ to\ n)$
Step18. Compare $(x_{(pi)}y_{(pi)})with(x_{(si)}y_{(si)})$
Step19. If $(|(x_{(pi)}y_{(pi)}) - (x_{(si)}y_{(si)})| > 0)$
Step20. { $node_k = node_k - 1$
Step21 Select(path having greater similarity&&$node_{k+1}\ count\ is\ high$)
Step22. Continue from step15 till reach leaf.}
Step23. Output leaf node.

V.CONCLUSION

This paper explains a novel method of pattern recognition using hierarchical structure relies on concept of human intelligence. Most of the models require complete dataset at hand a priori is indispensible for them to properly accomplish a given task. The method do not necessitate a complete dataset to be available at hand; yet, they use the available dataset initially and then use the perceptrons for predicting different possible inputs .That isHere we are using few pattern initially and gradually collecting more patterns during learning by apply the inputs to MLP(multi layer perceptrons) for predicting the different styles of given input. The paper swept through two phases like every machine learning systems. The initial phase likely to be call as learning phase which implies the human learning by making comparison on learned patterns. The count of node will be increment on every traversing through the node which implies the concept of boosting our memory power. The second phase makes inference on exhausted patterns by selecting path having greater similarity and outputting the data at the leaf. This implies human mode of inference as the human will select the pattern in which he felt the greater similarity.

Most often complex problems are solved by human based on the concepts , whatever he or she have learned from studies of natural systems. If the hypothesis space for a learning problem is very large, then the construction of a learned model can take a large number of training examples and long training times. The above described structure will give output only rely on what it has been learned. Application of probabilistic methods helps to speculate and create unseen things and which will opens bright future for computational intelligence

VI. REFERENCES

[1] Data Mining: Concepts and Techniques 2nd ed. Jiawei Han and Micheline Kamber
[2] Handwritten Optical character recognition http://en.wikipedia. org/wiki / Optical_character_recognition.
[3] M.A. Hall, "Correlation-Based Feature Subset Selection for Machine Learning," PhD dissertation, Univ. of Waikato, 1999.
[4] Je_ Hawkins and Sandra Blakeslee. On Intelligence. Henry Holt and Company, New York, 2004.
[5] Gonzalez, R.C., and Woods, R.E., 2004. Digital Image Processing (2nd edition), Pearson Education.
[6] Je_ Hawkins and Dileep George. Hierarchical temporal memory: Concepts, theory and terminology. http://www.numenta.com/Numenta_HTM_Concepts.pdf, 2006.

[7] An overview of Pattern Recognition Elie SALIBA, Albert DIPANDAUniversity of Burgundy

[8] Chirag I Patel, Ripal Patel, Palak Patel Handwritten Character Recognition using Neural Network International Journal of Scientific & Engineering Research Volume 2, Issue 5, May-2011.

[9] C. Merino-Gracia, K. Lenc, and M. Mirmehdi, "A head-mounted device for recognizing text in natural scenes," in *Proc. Int.Workshop CBDAR*, Beijing, China, 2011, pp. 29–41

[10] L. Neumann and J. Matas, "Text localization in real-world images using efficiently pruned exhaustive search," in *Proc. ICDAR*,Beijing, China, 2011, pp. 687–691.

[11] L. Neumann and J. Matas, "Real-time scene text localization and recognition," in *Proc. IEEE Conf. CVPR*, Providence, RI, USA, 2012, pp. 3538–3545.

[12] Ivan Kastelan, Sandra Kukolj, VukotaPekovic: " Extraction of Text on TV Screen using Optical Character Recognition, SISY 2012 2012 IEEE 10th Jubilee International Symposium on Intelligent Systems and Informatics • September 20-22, 2012.

[13] Qinbao song, Jingjie Ni, and Guangtao Wang A Fast Clustering Based Feature subset selection algorithm for High Dimensional Data,IEEETransactions on Knowledge and Data Engineering, vol 25 No 1, January 2013 .

[14] Robust Text Detection in Natural Scene Images Xu-Cheng Yin, *Member, IEEE,* Xuwang Yin, Kaizhu Huang, and Hong-Wei Hao

[15] Philippe Fournier-Viger, Roger Nkambou, Engelbert Mephu Nguifo, Andre´ Mayers, and Usef Faghihi A Multiparadigm Intelligent Tutoring System for Robotic Arm Training