CLASSIFICATION OF STONE INSCRIPTION USING DECISION TREE SUPPORT SYSTEM

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ABSTRACT

This paper is intended to develop the Decision Support System of Myanmar Literature shown by Myanmar Stone Inscriptions using Decision Tree and Sensitively Analysis. ***Myanmar nationals have Myanmar Language, religion and culture. When the origin of Myanmar Language and writing is searched stone inscriptions is found. Myanmar alphabets are sculptured on stones through five eras. In this paper, we present a classification based on the decision tree approach having the objective of classifying ancient era with the uncertainty that may occur in a classification problem. Describing some methods to classify ancient era using Myanmar alphabets sculptured on stones and getting classification methods are based probability analysis.***

Keywords: Machine learning, Statistical Decision Support, Stone-Script.

1.INTRODUCTION

All researchers who have studied the origin and development of the Myanmar script accept that its source was the Brahmi script which flourished in India from about 500 B.C to over 300 A.D. Myanmar are members of Tibet-Myanmar nationalities. The origin of Myanmar is Kan Su Province form north-western part of China.

In Myanmar Thinbongyi (primer), there are thirty-three consonants. They are named according to their form and nature. In the Myanmar Thinbongyi (primer), there are thirty-eight Thinbons, consonants and vowels.

Consonants are not clear when recited only by themselves. Consonant sounds become clear when they combine with vowel sounds. Consonants are sounds produced by partially or completely blocking air in its passage from the lungs through the vocal tract.

Vowels are sounds produced not by blocking air in its passage from the lungs through the vocal tract. In the original Thinbongyi, there are twenty-two vowels. It is necessary to be correct in place of articulation, means of articulation and manner of articulation in reciting Myanmar Language [1].

In this way, consonants have also changed their types by eras. Therefore this paper takes places of itemizing and maintaining records of Myanmar Stone Inscriptions through eras. An organization can have its exact report in time by using the package and it is a great improvement to store data by computerization. Decision analysis is concerned with decisions under uncertainty and where there are multiple objectives. Decision analysis tackles a problem by decomposing it into more manageable parts. A unique feature of Decision Analysis is how this decomposition is carried out.

Decision tree learning is a method for approximating discrete-valued functions that is robust to noisy data and capable of learning disjunctive expressions. This method can search a completely expressive hypothesis space and thus avoid the difficulties of restricted hypothesis spaces. Their inductive bias is a preference for small trees over large trees. Learned trees can also be re-represented as sets of if-then rules to improve human readability. Decision trees are one of the most widely used classification techniques especially in artificial intelligent. A decision tree is composed of decision points, alternatives, chance point state of nature and payoff. At a decision point, usually designated by a square, the decision maker must select one alternative course of action from a finite number of available ones. These are shown as branches emerging out of the right side of the decision point. A chance point, designated by a circle, indicates that a chance event is expected at this point in the process. That is one of a finite number of states of nature is expected to occur. The assumed probabilities of the states are nature rewritten above the branches. Each state of nature may be followed a payoff, a decision point, or by another chance point. Decision analysis terminology refers to the outcome resulting from making a certain decision and the occurrence of a particular state of nature as the payoff.

2.RELATED WORK

Zied klouedi et.al presented an algorithm for building decision trees in an uncertain environment. The theory of belief functions are used in this algorithm in order to represent the uncertainty about the parameters of the classification problem [10].

Kent e.Holisinger proposed the quantitative approach to decision making. He briefly described the Statistical Decision theory and the decision tree, the most basic technique in decision theory. He concluded that Decision theory provides a useful framework to explore alternatives and quantitative analyses which must be viewed as explorations of possibilities [5].

P.Vannoorenberghe et.al investigates the induction of decision trees based on belief functions theory. They described decision tree for multiple classes. This method consists in combining trees obtained from various two classes [8].

Mie Mie Khin et.al described the methods to classify ancient ear. They considered getting classification methods are based on bays classifier. They conclude that Native baysin method is accurate in probability decision theory [6].

3. DECISION THEORY

Decisions may be categorized as being either programmed or non-programmed. In a programmed decision, the rules for making the decision are explicit. That is, given a certain set of actions will be taken. Programmed decisions are given often incorporated into transaction processing systems, and thus computer systems can make those decisions without human intervention [3]. In designing information system is very important to isolate decisions that can be programmed, thereby relieving human beings of the necessity of making those routine day-to-day decisions.

Non-programmed decisions deal with non-repetitive and ill-defined problems, and require human decision making [4]. Non-programmed decisions are made at all levels within an organization, including operational, technical, and strategic levels. However, as one moves to higher levels of decision making, a greater percentage of decisions made are non-programmed.

Programmed decisions require timely, accurate, and reliable information, whereas non- programmed decisions require a great deal of flexibility with the information system to gain information to make a non-programmed decision [7].

Decision trees classify instances by sorting them down the tree from the root to some leaf node, which provides the classification of the instance. Each node in the tree specifies a test of some *attribute* of the instance, and each branch descending [9].

3.1. Basic Algorithm

Most algorithms that have been developed for learning decision trees are variations as on a core algorithm that employs a top-down, greedy search through the space of possible decision trees.

This algorithm, ID3, learns decision trees by constructing them top-down; each instance attribute is evaluated using a statistical test to determine how well it alone classifies the training examples. The best attribute is selected and used as the test at the root node of the tree. A descendant of the root node is then created for each possible value of this attribute.

In many decision-making situations, it is possible to obtain probability estimates for each of the possible states of nature. When such probabilities are available, the expected value approach can be used to identify the best decision alternative. The expected value approach evaluates each decision alternative in terms of its expected value. The decision alternative that is recommended is the one that provides the best expected value. Let us first define the expected value of a decision alternative and then show how it can be used for the decision problem.

4. RESULTS

In this system, input data is scanning data and one sentence or one sheet of stone inscription. This stone inscription includes vowels, consonants and original vowels. To classify this stone inscription, decision maker needs to know the relevant character of different eras. When one character is chosen, era relevant characters are viewed and decision maker chooses appropriate era and it is counted increase one time.

Figure 1. Input form of stone inscription

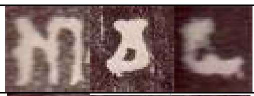
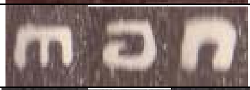
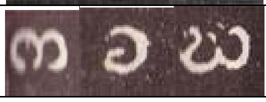
Myanmar stone inscriptions developed step by step in AD 12 to AD 20. It is showed in Fig 2.

Figure 2. Development hand writing character between eras

Table 1 shows the development of Myanmar alphabets and Myanmar alphabets sculptured on stones through six eras.

Table 1. Difference character form between eras

Eras	Symbol character

Bagan era	
Pinya era	
Innwa era	
Taunggo era	
Nyanungyan era	
Konbaung era	

This simple, data is one sheet stone inscription and total count number is 24 characters. The result of state nature shows in table 2.

Table 2. State of Nature

Decision Alternatives	Possible Counting		
	Consonants (S1)	**Basic Vowels (S2)**	**Original Vowels (S3)**
Bagan era	3	3	4
Pinya era	2	2	1
Innwa era	0	5	0
Taunggo era	1	1	1
Nyaungyan	0	0	0
KonBaung era	1	0	0

Let N = the number of possible states of nature
$P(s_j)$ = the probability of state of nature s_j
$P(s_j) \geq 0$ for all states of nature

$$\sum_{j=1}^{N} P(s_j) = 1 \quad \text{................(1)}$$

The expected value (EV) of decision alternative d_j is defined as follows;

$$EV(d_i) = \sum_{j=1}^{N} P(S_j) V(d_i, S_j) \quad \text{............(2)}$$

V (*di,S j*) = payoff values

The expected value of a decision alternative is the sum of weighted payoffs for the alternative. The weight for a payoff is the probability of the associated state of nature and therefore the probability that the payoff occurs.

Suppose Stone Inscription Department management believe that s_1,s_2 and s_3 are state of nature, have 0.29 probability of occurrence and that s_2, state of nature, has a 0.46 probability and that s_3, state of nature, has a 0.25 probability and P(s1) = 0.29 , P(s2) = 0.46 and P(s3)=0.25 .Using the payoff values $V(d_i, s_j)$ shown in equation (2), expected values for the three decision alternatives can be calculated.

$EV(d_1)$ =3.25, $EV(d_2)$=1.75,
$EV(d_3)$ =2.30, $EV(d_4)$ = 1,
$EV(d_5)$ = 0, $EV(d_6)$ = 0.29

We consider that stone inscription is Bagan era.

Thus, according to the expected value approach, since d_1 has the highest expected value (3.25), d_1 is the recommended decision. The calculations required to identify the decision alternative with the best expected value can be conveniently carried out on a decision tree.

This system is tested with different form of Myanmar Stone Inscription. This experiment is more than ten time and all answers are right. Probability theory is exactly classify these tests and easily classified their related ears. In this case, decision maker must be experience skills and knowledge.

4.1. Sensitively Analysis

One approach to sensitively analysis is to consider different probabilities for the state of nature and then recomputed the expected value for each of the decision alternatives repeating several times [2].

Obviously, we could continue to modify the probabilities of the state of nature and begin to learn more about how search changes affect the recommended decision. The only drawback to this approach is that there will be numerous calculations required to evaluate the effect of several possible changes in the state of nature probabilities.

For the special case of decision analysis with two state of nature, the sensitivity analysis computations can be eased substantially through the use of a graphical procedure. Let us demonstrate this procedure by further analyzing the stone Inscriptions Decision problem. In this section begin by denoting the probability of state of nature consonants (s_1) and vowels (basic vowels and original vowels - s_2). That is,

$p(s_1) = p$
Thus,
$p(s_2) = 1 - p(s_1) = 1-p$

The expected value for Decision alternative d_1 can then be written as a function of *p*.

$EV(d_1) = -4p+7$, $EV(d_2) = -p+3$,
$EV(d_3) = -5p+5$, $EV(d_4) = -p+2$,
$EV(d_5) = 0$, $EV(d_6) = p$

Thus, this section have developed two set of three linear equations that express the expected value of the six decisions alternatives as a function of the probability of state of nature s_1.

In equation 2 and 3,
Thus $-p+3 = -5p-5$,
$p = 0.5$

Whenever, $p = 0.5$, each decision alternatives will provide the same expected value in this section can now conclude that for $p<0.5$, decision alternatives d_1 provides the largest expected value, and that for $p>0.5$, decision alternatives d_1 provides the largest expected value. Since p is simply the probability of state of nature s_1 and $(1-p)$ is the probability of state of nature s_2. In this section, how changes in the state of nature probabilities affect the recommended decision alternatives can be found. With a different sensitivity analysis graph, d_1 could be the best decision alternative for certain value of p .

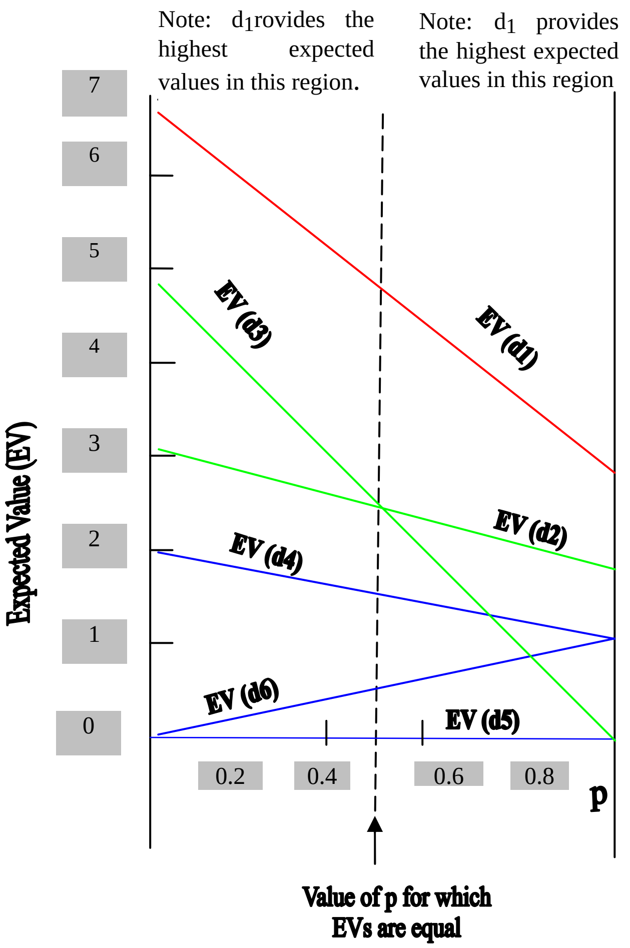


Figure 3. Expected value as a function of p

5. CONCLUSION

In this paper, we describe the method of probabilistic approach and show the expected value results. In our result, probability decision theory makes the uncertainty problem accurate. But, this case depends on the amount of dataset. This decision will support the study of historical and cultural significances of the inscription. Further studies are to classify the result using other machine learning technique and image recognition approach.

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