International Journal of Research In Science & Engineering
Volume: 3 Issue: 2 March-April 2017
e-ISSN: 2394-8299
p-ISSN: 2394-8280

EXPERT SYSTEMS WITH GENETICS PROBABILITY

Nelly Astuti Hasibuan[1], Kusnita Yusmiarti[2], Fince Tinus Waruwu[3], Robbi Rahim[4]

[1]*Departement of Computer Engineering, STMIK Budi Darma, Indonesia, nelly.ahsb@gmail.com*
[2]*Departement of Computer Engineering, AMIK Lembah Dempo, Indonesia, kusnita2306@gmail.com*
[3]*Departement of Computer Engineering, STMIK Budi Darma, Indonesia, fincedav@gmail.com*
[4]*Independent Researcher, Indonesia, usurobbi85@zoho.com*

ABSTRACT

Genetics Probability theory is used in biology to determine the possible value of genetic or stem the influence of the derivatives. The influence of genes inherited from the mother to the gametes, fertilization of the ovum by a spermatozoon and gathering back in the genes in the zygote cause a variety of combinations in which each combination has a probability or chance. An expert system has resulted in the value of the likelihood of an event by looking at the effect of the value of facts (evidence) to the value of the hypothesis. By harnessing genetic probability theory were any possible value that occurs in an event can be calculated.

Keyword: Expert System, Genetic Probability, Combination Algorithm, Theory Probability

1. INTRODUCTION

Expert systems are computerized systems of human intelligence in resolving problems like an expert. Expert systems should be able to solve the problem that has been challenging and thus require special skills of persons. An expert system adopts human knowledge and mimics every aspect of human ability in drawing a conclusion or decision-making processes; an expert can do the end of an event or issue by comparing their knowledge with the fact that in such an event. Adopted by the awareness of a computer to be processed by the inference engine building, thus forming the composition of knowledge called the rule and will be stored in a container called a Rule Base or Knowledge Base.

The rule base knowledge base or the next will be processed by the fact that obtained from an issue or event resulting in a wide range of possibilities, due to the large variety of opportunities that arise then the necessary inferences to perform calculations to determine the value of possibilities, where every possibility that appears definite connection or influence each other. The calculation of the value of possibility can be done by using the theory of probability or chance. Genetic probability theory is the theory of the possibility of a calculated value that can be quite simple. By using genetic probability theory, calculating the value of opportunities in drawing conclusions would still consider the influence derived from each of possibility that appears. Thus if the genetic probability theory applied in expert system, then the withdrawal process will be easier and the conclusions drawn will be maximized

2. THEORIES

There is two (2) law of probability used for genetic analysis. The first law, the Law of the result of multiplying (the product rule) is used to predict the probability of two or more independent events occurring together. Two or more events are called independent (independent) if the occurrence or non-occurrence of anyone does not affect the probability of the occurrence of any other event. If two separate events occur with a likelihood of successive p and q, then the probability of occurrence of both

simultaneously is the (p) (q). In other words, the joint probability is the result of multiplying the probability of events are independent. If the word 'and' is used or applied in writing an answer to a question in the form of words, usually required multiplication probabilities be independent [1].

The second law is the law Summation (the sum rule) is used to predict the probability of two events that will occur independently of each other, and the probability is the sum of the probability of each of the events [2], by using both the legal value of the likelihood of an event can be described as follows:

a. The possibility of the occurrence of an event that is expected is the same as the ratio of the number of such events by the total number of events; the possibilities value may be formulated as follows:

$$K(p) = \frac{p}{p+q}$$

b. The possibility of the occurrence of two or more events simultaneously equal to the product of the magnitude of the possibilities of each event, the possibilities value may be formulated as follows:

$$K_{(p+q)} = K_{(p)} * K_{(q)}$$

c. The possibility of the occurrence of two or more events are interrelated (alternative) is equal to the sum of the magnitude of the possibilities of each event, the possibilities value may be formulated as follows:

$$K_{(p\ or\ q)} = K_{(p)} + K_{(q)}$$

Description as follows:

p : Event p
q : Event q
K(p) : Value possibility of events p
$K_{(p+q)}$: The value of p and q potential events occur simultaneously
$K_{(p\ or\ q)}$: Value potential events p and q are interlinked

A. Expert System

Professor Edward Feigenbaum of Stanford University defines an expert system as a clever computer program (Intelligent Computer Program) that utilizes knowledge (knowledge) and the inference procedure (inference procedure) to solve a problem that is quite difficult to require special skills of humans [3], conformity with the above definition, it can be explained Expert systems are artificial intelligence software that adopts the knowledge of experts with the aim to solve the problems of expertise to produce a decision based on the conclusion obtained. In expert systems, expert knowledge stored in the knowledge base in the form of rule. Rule from now on referred to expert knowledge hypothesis (H) in which each will have a value hypothesis known as the certainty that the value of an expert. Next rule or hypothesis will be formed into a question that must be answered by the user.

The expert system will be used by the user to know the answer to the problems that it faces. Users are required to provide input into the system in the form of the fact that experienced by the object to be a problem. The fact that the problems experienced by the object shall be referred to the evidence (E). Evidence obtained from the user answers the question that is built on the rule or hypothesis stored. Every respond to the user will have a value of certainty or commonly called the user value.

Therefore it can be concluded that the expert system, there are two (2) grades is considered the interplay of the problem-solving process to a conclusion or decision that hypothesis (expert value) and evidence (user value).

The end of the expert system is formulated as follows:

$$K[H,E]_i = K[H]_i * K[E]_i$$

Description :

$K[H,E]_i$: Possible hypotheses affected evidence
$K[H]_i$: Possible hypotheses
$K[E]_i$: Possible evidence

Hypothesis (expert value) and evidence (user value) as described previously is the value of certainty that requires problem-solving techniques certainty or probability theory.

3. RESULT AND DISCUSSION

Genetic probability theory with both the law as described previously has produced three formulas to determine the possible value or the value of the certainty of an event. If the formula is applied to solve the problem:

1. For a single premise

   If there are two (2) events, namely p and q, then:

   $K(p) = \frac{H(p)*E(p)}{H(p)*E(p)+H(q)*E(q)}$ and

   $K(q) = \frac{H(q)*E(q)}{H(p)*E(p)+H(q)*E(q)}$ or can be inferred

   $K(i) = \frac{H(i)*E(i)}{\sum_{i=1}^{n} H(i)*E(i)}$

2. For the premise compound

   If there are two (2) events that p and q are happening simultaneously then:

$$K_{(p+q)} = K_{(p)} * K_{(q)}$$
$$= \frac{H(p)*E(p)}{\sum_{p=1}^{n} H(p)*E(p)} * \frac{H(q)*E(q)}{\sum_{q=1}^{n} H(q)*E(q)}$$

If there are two (2) events, namely p and q which is connected then:

$$K_{(p+q)} = K_{(p)} + K_{(q)}$$
$$= \frac{H(p)*E(p)}{\sum_{p=1}^{n} H(p)*E(p)} + \frac{H(q)*E(q)}{\sum_{q=1}^{n} H(q)*E(q)}$$

Example:

1. It is known that there are three (3) symptoms of the disease tungro in rice plants include: The size of dwarf plants (G1)
2. The leaves turn yellow to orange from top to base (G2)
3. The old leaves are brown spots puncture marks (G3)

Hypothesis probability value for each symptom obtained from experts is as follows:

G1 = 0,6 ➔ H_1
G1 = 0,4 ➔ H_2
G1 = 0,6 ➔ H_3

Diagnosis of a farmer provides the answer to the hypothesis in question as follows:

G1 = 0,4 ➔ E_1
G1 = 0,6 ➔ E_2
G1 = 0,8 ➔ E_3

Using genetic probability that the diagnosis is described as follows with the possible value of each premise shown below:

$$K(G1) = \frac{H(1)*E(1)}{\sum_{i=1}^{3} H(i)*E(i)}$$
$$= \frac{H(1)*E(1)}{H(1)*E(1)+H(2)*E(2)+H(2)*E(2)}$$

$$= \frac{0,6*0,4}{0,6*0,4 + 0,4*0,6 + 0,6*0,8}$$

$$= \frac{0,24}{0,24 + 0,24 + 0,48}$$

$$= \frac{0,24}{0,96}$$

$$= 0,25$$

$$K(G2) = \frac{H(i)*E(i)}{\sum_{i=1}^{3} H(i)*E(i)}$$

$$= \frac{H(2)*E(2)}{H(1)*E(1) + H(2)*E(2) + H(2)*E(2)}$$

$$= \frac{0,4*0,6}{0,6*0,4 + 0,4*0,6 + 0,6*0,8}$$

$$= \frac{0,24}{0,24 + 0,24 + 0,48}$$

$$= \frac{0,24}{0,96}$$

$$= 0,25$$

$$K(G3) = \frac{H(i)*E(i)}{\sum_{i=1}^{3} H(i)*E(i)}$$

$$= \frac{H(3)*E(3)}{H(1)*E(1) + H(2)*E(2) + H(2)*E(2)}$$

$$= \frac{0,6*0,8}{0,6*0,4 + 0,4*0,6 + 0,6*0,8}$$

$$= \frac{0,48}{0,24 + 0,24 + 0,48}$$

$$= \frac{0,48}{0,96}$$

$$= 0,5$$

The calculation of the possible value premise intertwined with each premise will be multiplied by the value of the hypothesis.

$$K_{(G1\ or\ G2\ or\ G3)} = K_{(G1)} + K_{(G2)} + K_{(G3)}$$
$$= (0,25 * 0,6) + (0,25 * 0,4) + (0,5 * 0,6)$$
$$= 0,15 + 0,1 + 0,3$$
$$= 0,55$$
$$= 0,55* 100\%$$
$$= 55\%$$

Results diagnosis Then the value of certainty or likelihood of the rice plant diseases Tungro is 55%.

4. CONCLUSION

From the analysis above it can be concluded that the probability of genetics can be applied in expert systems and simpler when compared to the other by using probability theory. The level of truth diagnosis can not be proven because depend on the truth value of hypotheses and evidence, and if the research object is an animal, plant or another nonhuman then an assumption that can be done only taken appropriate physical symptoms or symptoms that can be viewed directly on the object Further studies should be made if there is more than one disease that has similar symptoms

REFERENCES

[1] Susan L. Elrod and William D. Standfield, “Schaum’s Outlines, Teori dan soal-soal Genetika”, edisi 4, Erlangga, Surabaya, 2007

[2] Fariz Setiawan, “Sejarah Teori Peluang dan Genetika Peluang”, Balai Pustaka, Jakarta, 2012

[3] B. Herawan Hayadi, "Sistem Pakar, Penyelesaian Kasus Menentukan Minat Baca, Kecenderungan, Dan Karakter Siswa Dengan Metode Forward Chaining," Deepublish, Sleman Yogyakarta, 2016

[4] Meysam Rahmani Katigari, Haleh Ayatollahi, Mojtaba Malek, Mehran Kamkar Haghighi, “Fuzzy expert system for diagnosing diabetic neuropathy", Word Journal Of Diabetes,8 (2), pp 80-88

[5] Abraham Kandel, “Fuzzy Expert System”, Department Of Computer ScienceOf Engineering, University Of South Florida Tampa, Florida