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IJCAT - International Journal of Computing and Technology, Volume 2, Issue 8, August 2015 ISSN : 2348 - 6090 www . I J CA T . o r g 301 Lie Detection System with Voice Using Bidirectional Associative Memory Algorithm 1 Bustami, 2 Fadlisyah, 3 Nurdania Delemunte 1,2,3 Department of Informatics, Faculty of Engineering, University of Malikussaleh Aceh, Indonesia, 24354 Abstract - Associative two-way memory algorithms can be used to detect lies through sound.

This system is a branch of sound processing that can be used to identify types of voice lies using several verbs such as moving, walking, going. The test is carried out by means of simulating training data and test data to produce voice recognition values and the classification of these lies. Experiments were carried out with several changes in parameter values to get the best recognition and classification percentages.

The highest level of recognition contained in the verb "go" is up to 90%. The results of this study are the sounds that are indicated to be no indication of lies and deception in the form of values classified according to the type of sound known from the results of energy calculations using bidirectional associative memory. Keywords - Bidirectional Associative Memory, Lie, Voice. 1.

Introduction Voice is a physical phenomenon created by the vibration of an object in the form of an analog signal with a change in continuous amplitude which is directly proportional to time. Voice is a wave that has a content about a number of parameters (amplitude, deviation, frequency, spectrum) that cause sounds to differ from one another.

In the development of today's media man voice very much used both in the field of

technology or not, and the current sound development in the field of technology is very important. Many things in the form of convenience are offered to meet the interests of human and computer interaction, one of which is in speech recognition. For humans, how to recognize human speech is easy to do. This is because humans have the ability to recognize patterns of introduction very well.

But it is certainly difficult for computers to do. Because the computer must analyze in detail every sound signal that enters it. A lie is a fake story that ultimately makes people distrust the story. The scope of this research focuses on identifying lies carried out through non-verbal cues or physiological activities carried out by objects.

This research investigates the style so as to produce conclusions between true or false stories. In the scenario, there are five independent samples. The computer-based text analysis program correctly classifies liars and the truth of stories at a rate of 67% when the topic is constant and the overall rate is 61%. Because many people lie to let us know how to commit fraud like that. So that fraud can be seen from several elements: a. Facial expressions b. Behavior c.

Style language (verb). Because a person tends to pay attention to facial expressions and behavior in normal interaction, then the fraudster aware of this fact and be careful to control the expression and their behavior, making the face and body are relatively poor impostor scams.

And conversely changing the tone of the voice receives less attention in normal interactions, fraudsters pay less attention and control this type which makes the interrogators tend to create new ways of researching fraud. Bidirectional Associative Memory (BAM) methods have been widely used in various fields, especially in neural networks.

BAM is able to extract perfect forms from imperfect forms, it is one of the abilities possessed by humans. 2. Literature Review 2.1. Voice Signal a. Signal Signals are physical quantities that change according to time, space, or other independent variables. Examples of signals: speech, ECG, and EEG signals. Mathematically, a signal is a function of one or more independent variables. This process is done through modeling signals.

Signals are environmental phenomena that can be measured or quantified, while the system is part of the environment that connects the signal to other signals or in other words, responds to the incoming signal by producing an output signal. Voice conversation is an example of a signal while the telephone communication system itself is an example of a system that connects signal conversation.

IJCAT - International Journal of Computing and Technology, Volume 2, Issue 8, August 2015 ISSN : 2348 - 6090 www . I J CA T . o r g 302 b. Voice Voice is a physical phenomenon produced by the vibration of an object in the form of an analog signal with amplitude changes continuously over time. Voice is a wave that contains a number of parameters (amplitude, deviation, frequency, spectrum) that can cause sounds to differ from one another. c.

Voice Processing Speech resulting from a collaboration between the lungs (pulmonary), glottis (the vocal cords) and articulation tract (mouth and nose cavity or nasal cavity). To generate a voiced sounds (speech sounds), lungs compressing air through the epiglottis, vocal cords vibrate, menginterupt air through air flow and menghassilkan a quasi-periodic pressure wave. frequency of information on the signal. This Nquist Criteria.

Correlations that occur can be seen in the formula below: Fs> 2 Fmax (information signal) A sinusoidal signal can be expressed by x(t) = A sin ? 0 t Analog sine signal can be expressed mathematically as follows: x(t) = A sin (t+) = A sin (2 f+) with = 2 f Discrete sine signal can be expressed mathematically as follows: x(n) = A sin (wn+) , wherewn=2 f/fs = 2 fn = A sin (2 fn+) Where n is an integer, the value of n states nth sampling.

A discrete signal with period N can be expressed by: N N = or , (mouth and nose cavity or nasal cavity). To generate a n n where/k = integer. 2 Angular Frequency 0 = 2 f0 = rad/sec To 2.2. Frequency Concept 1 Period To= F0 = 2 o 1 sec o Most of these natural signals in analog form. To obtain a Frequency F0 = = Hz T0 2 p F0 discrete signal from an analog signal to do a process called sampling.

In mathematics, the sampling process is expressed by equation. Analog signal has various types, described here only for periodic signals or uniform are generally widely used in practice. Digital Frequency w0= 2p Nquist = Fs> 2Finformation 2.3.

Lie rad = ? 0Ts Fs x(n) = xa (nT) = x(t)|t = Ts, for - 8 < n < 8 (n=integer) where: x(t) = analog signal x(n) = discrete-time signal xa(nT) = analog signals are sampled every period Ts Where: Ts = sampling time Fs = 1/Ts, sampling rates F In General : = Fs Where: = normalized frequency F = information frequency Fs = sampling frequency To avoid frequency aliasing, the smallest sampling frequency size must be twice the maximum Lying often involves telling a good story false or do not believe that individual. Most research has focused on identifying such lies through nonverbal cues or physiological activity.

This project investigates the style of language that distinguishes between true and false stories. In the analysis of five independent samples, the computer-based text analysis program correctly classifies liars and truth-tellers at the level of 67% when the topic is constant and the overall rate is 61%.

When compared with truth-tellers, liars use fewer self-references, other references, and exclusive words and more words "negative emotions" and "motion". because basically no human can keep a secret. If the lips are silent, he chats with the tips of his fingers; betrayal comes out of him in every pore. Deception is not an easy task.

Fraudsters may be careful to try to compose what they are about to say, only to give everything the way they say it - with their tone of voice, body language or facial expressions. A large body of research has examined these nonverbal channels to determine which are most predictive of fraud. Despite the fact that the message IJCAT - International Journal of Computing and Technology, Volume 2, Issue 8, August 2015 ISSN : 2348 - 6090 www . I J CA T .

o r g 303 deceive require manipulation of linguistic content, relatively little attention has been devoted to the pattern of deceptive use of language in communication. Lying is a complex cognitive effort. Based on previous studies of emotional writing, one would assume that a liar will have more difficulty making a difference in their stories.

From a cognitive perspective, the truth-teller is more likely to tell about what they do and what they did not do. That is, they make a distinction between what is in the category of their stories and what not. Many strategies to detect fraud operates under the assumption that the individual proof of increased anxiety when lying, and that the signs of this passion will leak out through one or more communication channels.

This assumption is consistent with research on self-control, which shows that people have a limited ability to control their behavior. When people try to deceive others, some clues as possible to their concerns and their deception must be controlled at the same time. However, people do not have the necessary resources to monitor all possible channels of communication.

As a result, fraudsters must strive to control a small number of channels. The result is, fraudsters must try to control a small number of channels. Liars use motion verbs, such as "run," move, "and" go "at a higher level than the truth-teller. This is a specific deceptive marker that has no precedent in the literature, and although it is a significant predictor, we are hesitant to interpret it.

Liars might use this verb at a higher level because they speak in general. However, future research must investigate the predictive power of motion words before strong conclusions can be drawn. 2.4. Bidirectional Accosiative Memory Bidirectional Associative Memory (BAM) neural network model has two layers and connected completely from every other layer.

That is, there is a feedback connection from the output layer to the input layer. However, the weight of the connection between two neurons is given of the various layers of the same. You might even consider to be a single two-way relationship with a single weight.

Weighting matrix for connection of the output layer to the input layer simply transpose of the matrix weights to the relationship between the input and the output layer. If we show the matrix for connection to front weights by W, the WT is the weighting matrix for the output layer to the input layer connection. As you will recall, the transpose of the matrix obtained simply by interchanging the rows and columns of the matrix. There are two layers of neurons found in waves.

These layers are the input layer and the output layer. There is no lateral connection between the two. The point is that no two neurons in the same layer are connected. A recurring connection, which is a feedback connection to the neuron itself, may or may not exist. This architecture is quite simple. Analog common case. Inputs to BAM networks are real number vectors, usually in the set {-1, 1}.

Output also vectors of real numbers, usually in the set {-1, 1}, with the same dimensions or different from that of the input. The vector can be considered a pattern, and the network makes heteroassociation pattern. If the output is required to be the same as the input, then you ask the network to make autoassociation, which is not, and it becomes a special case of the general activity of the type of neural network.

Step 1: The relationship between the pair pattern stored in memory in the form of bipolar binary vector with entries - 1 and 1. {(a(1) , b(1)), (a(2) , b(2)).. (a(p) , b(q))} Step 2: The weight is calculated by W = ( ) ( ) Step 3: Test vector pair a and b are given as input. Step 4: In the forward pass, b is given as input and is calculated as Step 5: Vector a now given as input to the second layer for backward pass.

Step 6: If there is no longer updating the process stops. If no steps 4 and 5 are repeated. 2.5. Wav WAV is a standard audio format Microsoft and IBM's personal computer (PC), typically using a coding PCM (Pulse Code Modulation). WAV is the data is not

compressed so that the entire sample audiodisimpan everything on my hard drive.

Software that can create WAV from analog sound example is Windows Voice or Sound Recorder. This audio file is rarely used on the internet due to the relatively large size with a maximum limit for the WAV file is 2 GB. 2.6. Neural Network Artificial Neural Network (ANN) is a computational engine that is designed to simulate how a biological brain or behavior in performing various tasks or specific functions.

As a computing technology, ANN is an information processing technique which uses quantitative models of biological neural computing inspired the IJCAT - International Journal of Computing and Technology, Volume 2, Issue 8, August 2015 ISSN : 2348 - 6090 www . I J CA T . o r g 304 creation of a process that is identical to the working of neurons in the human nervous system.

JST consists of processing elements called neurons, which is associated with other processing elements by a rule and weight. Generally. JST is a collection of analog signal processing are connected through a link called interconnections or connections simple. Schematically, JST digambar¬kan in the form of a graph that has a direction toward a knot of processing elements.

Arrows indicate the direction of the normal direction of a flow signal. Signal processing in the network is done through a process of computing. Therefore. JST is a computational technique in software or hardware that emulates biological neurons in conducting information retrieval operation. A neuron consists of three main parts, namely the soma (the parent bodies of neurons), axon (output path from the soma) and dendrites (input path for soma).

Relationship one neuron to the next neurons called synapses. Because synapses are where one neuron relationship with the next neuron then the place was very profitable as a regulator of signal conduction. Some synapses deliver signals from one neuron to another neuron with ease, while other synapses difficult to deliver the signal.

Besides some post-synaptic neurons react with a large number of impulses while others only react to some impulse alone. So synapses perform a selective action, for example by blocking the signal is weak but continuing strong signal, selects and amplifies weak signals specific and often distribute signals to various directions, not just to one direction only. JST study of samples called training set.

Because the study of the samples, JST has the potential to build computing systems as a result of input and output mapping relationships that exist in the system. Training set is

known as a training pattern in the form of a vector and is obtained from sources such as images, voice signals, and various other information. 2.7. Learning Neural Network JST learning process is classified into two: 1. Learning with supervision 2.

Learning without supervision Supervised learning, the network responded by getting a specific target. Before changing the network's own weight to achieve the target download, interconnection weights initialized. JST learning process is supervised learning process by providing training to achieve a defined output targets. JST get training to recognize certain patterns.

By providing a target output, input changes will be adapted by the output by changing the weight of the interconnection follow the prescribed learning algorithm. Set the training are selected from each state maximum output function parameters changed. By initializing the weight of each cell, JST will seek smallest error, so the shape of the output function approaching the desired target. 3.

Research Method Methodology lie detector system constructed in this study is illustrated in Figure 1. Figure 1. General overview of the methodology. The stages were carried out after the actor or the voice source is a signal feature extraction stage vector or vector computing, then testing voice recognition through BAM neural networks and will ultimately result in the identification of lies. 4.

Result and Discussion In the design process of computer-based systems, problem analysis plays an important role in making the details of the application to be developed, the analysis of the problem is a step in understanding the issue before taking any action or decision final settlement. System analysis aims to identify the problems that exist in the system, in which applications built include the operating environment, the user and associated elements.

This analysis as a basis for the system design stage. The system designed in this study of a lie-detector system in which the system can detect lies someone memalui verb pronounced. Sample the lie is taken from several interviews in which every sentence containing verbs such as go, move around and there is a tendency can be detected someone is lying or not. 4.1.

Voice System Training Voice training samples used in this study amounted to 5 samples each voice representing verbs such as moving, road and go. IJCAT - International Journal of Computing and Technology, Volume 2, Issue 8, August 2015 ISSN : 2348 - 6090 www . I J CA T . o r g 305 Figure 2. image illustrates the sound signal on the word go Figure 3. Image illustrates the sound signal on said moving Figure 4.

Image illustrates the sound signal on said road 4.2. Performance Measurement System Lie Detector Performance measurement system is done by gradual exercise. At the sound of the voice signal contains a few who are able to be detected using the verb to be moving like move, go and roads. Lie detector system has a level of accuracy of the word go 90%. Table 13.1, 13.2, 13.3 illustrates some results pegukuran lie detection system performance.

The results of the evaluation carried out show that the system of increasing the level of lie detection is closely related to the increase in the amount of training conducted. This system uses the verb road detector to get an accuracy rate of 82%. And moving verbs get 70% accuracy when using moving verbs when doing research. Tables 13.1, 13.2 and 13.3 illustrate some of the results of measuring the performance of a lie detection system. Table 1.

The results of the lie detector system performance "go". Total Voice Training Total Voice Testing Total Detection is True Detection Rate 5 10 6 0,6 10 10 7 0,7 15 10 8 0,8 20 10 9 0,9 Table 2. The results of the lie detector system performance "street .

Total Voice Training Total Voice Testing Total Detection is True Detection Rate 5 10 5 0,5 10 10 6 0,6 15 10 7 0,7 20 10 8 0,8 Table 3. The results of the lie detector system performance "street . Total Voice Training Total Voice Testing Total Detection is True Detection Rate 5 10 3 0,5 10 10 6 0,59 15 10 5 0,69 20 10 7 0,7 At the voice of the sentence containing the containing the verb go, road and move having different accuracy of complex background, testing is done each for voice without voice orientation and orientations.

5. Conclusion The conclusions of this study are as follows: a. Bidirectional associative memory can be used to detect lies through voice. b. Tests were carried out on samples outside of training resulting in a 90% recognition rate. c. The highest level of recognition contained in the verb "go" with up to 90%. References [1] Fadlisyah, Bustami, M.Ikwanus. Voice processing. First Edition. Yogyakarta.

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Newman, James W, Diane S. Berry, Pennebaker, Jane M. Richards. Predicting Deception from Linguistic Styles, The University of Texas at Austin, Southern Methodist University, The University of Washington. Author Details: B u s t am i, Completed Bachelor ' s Degree in MIPA Mathematic at University of Syiahkuala (UNSYIAH) and He Completed a Postgraduate in Department of Informatics at STMIK Eresha Jakarta. He has written many books that have been published throughout Indonesia.

F a d li s y a h, Completed Bachelor s Degree in Computer Science at University of Padjadjaran Bandung and He Completed a Postgraduate in Computer Systems Engineering at University North Sumatera (USU). He has written many books that have been published throughout Indonesia. W ho occupied positions ranging Informatics Laboratories, Head of Community Service, Head of Robot Intelligence Study Center, and also as a coach MTQ branch DAK Qur'an. Cultivated fields of research interest is the Image Processing and Speech Processing.

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