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LIE DETECTOR FOR LOYALTY TEST USING ARTIFICIAL NEURAL NETWORK

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Abstract: Human being has lot of virtual mask in their behaviour (mind or brain) and actions. It is able to find a person's loyalty through their emotions, stress of speech, way of expressions and so on. It is not a novel technique to this world. The judgement and the hearings are finalizing in accordance to questions and the corresponding amswers. One of the best methods meant for speech stress analysing based cheap lie detection for the loyalty test is Artificial Neural Network. In order to show the results, polygraph is a comprehensible demonstration oriented approach. This method is already used by the insurance fraud investigations and police. Through an individual's stress in voice as well as their emotions are able to detect the loyalty. This techniques require being extremely confidential and dynamic.. Here in this paper, we predict the liars through voice stress analysis and body reactions..

Key words: Voice Stress Analysis (VSA), Artificial Neural Network (ANN)

1. INTRODUCTION

Arduino lie detector is a simple and dynamic method, since on continuous practice be able to find the internal structure of the lie detector system. It is extremely simple to the frauds. Hence the methodologies have to be dynamic changeable by using ANN. With the blood pressure, ECG (pulse), EEG, count of eyes blinking per minutes, lip movements, hand and leg movements are necessitate to collect without their knowledge, these entire parameters are required to predict the results. All the above mentioned requirements will be discussed in this research paper. Through software application require to take more concentration through neural network of human being and the computer network system. This research concept totally depends upon physiological approach with artificial neural network and Embedded System.

2. RELATED WORKS

It is very effectual and reliable in determining the credibility of the witness by the United States judicial system places huge weights in the belief to juries are. However, the behavioral and social research explains that humans are good at lying and quite poor at lie detection. For exemplar, an average individual's capability to detect deception in a face-to-face interaction through another individual is very easy (Ekman & O'Sullivan, 1991). Therefore, the significant of truthful testimony in addition to the inadequacy of human lie detectors encompass prompted the perennial search intended for a technology-based objective method of lie detection or else truth verification; this search continues nowadays (Grubin, 2010) polygraph, measures activity of the peripheral nervous system towards gauging truthfulness and it has been the primary technical method intended for lie detection through the last century.

The scenario of a deception task refers in the direction of the hypothetical setting in experimental deception occurs. For illustration, a few experiments engage participants in a mock crime situation in addition question them about it (Kozel, 2005). Others probe participants concerning autobiographical information of dissimilar levels of intimacy (Abe, 2009). Ultimately, experiments to treated emotion, embarrassment in addition to autobiographical memory since confounds rather than variables of interest, used comparatively "neutral" scenarios to necessitated concealing possession of a playing card intended for a monetary reward. The task scenario as well determines the risk or benefit ratio of the deception experiment.

The investigational deception model refers towards the method used to generate deceptive responses in addition to the appropriate controls. The two fundamental deception-generating models are the CQT (Comparison Question Test) and the GKT (Guilty Knowledge Task), as well referred to since the CIT (Concealed Information Test). These models are not unique to MRI research along with have been developed intended for forensic investigative use (Stern, 2003) through the polygraph along with later through EEG (Rosenfeld, 1988).

3. PROPOSED SYSTEM

Here we proposed a new method of lie detector for loyality test. The Lie Detector using Artificial Neural Network Approach is a mechanism that is proposed in order to ensure accurate result. The lie detector system

helps to find whether a person is lying or not. The lie detector device captures the signals from a person. The signal of a person in different situation can be captured.

The proposed system is based on artificial neural network. The ANN helps to predict whether the person is lying or not based on the signal collected from a person and from the camera output (variations in eye). The ANN requires huge amount dataset to train our system. The system predict based on the dataset collected. The training can be performed by the available dataset. Model (model saved at the time of training). The inputs from the subject which are ECG data, pulse rate and sound rate is transmitted to the computer. The dataset collected can be undergoing the steps namely preprocessing, architecture creation, feature extraction, training and testing. The dataset collection, training and testing are the main steps involved in our system. The dataset collection includes the signals of person at different situation (eg: lying, not lying).The preprocessing steps helps to convert the data into system understandable format. We need to create a architecture to train our system. The architecture helps to learn data from the dataset. The training procedure helps extract features from the dataset. A model file can be created after training process. The testing helps to predict whether the person is lying or not based on the eye movement and the loaded

3.1 BLOCK DIAGRAM

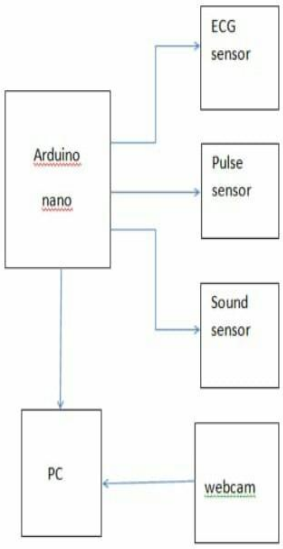

FIG 3.1.PROPOSED SYSTEM

BLOCK DIAGRAM DESCRIPTION: The system has three sensors attached to the controller which are ECG sensor which is connected to the adc port of the Arduino Microcontroller, Pulse sensor is connected to a digital pin and Sound sensor also connected to the adc port of Arduino. The signals from the sensors are processed and corresponding digital values are recorded and are transmitted serially to the PC. The values thus obtained will processed with the python application running in the PC along with the camera output.

Working of the proposed system

Our skin is amazing! It provides a medium for us to experience the sense of touch, it keeps infections out and keeps innards in but I bet you didn't know that our skin changes conductivity depending on many different things one being our mood! It called Electrodermal activity (EDA). The basics are that our skin changes its conductivity depending on how we feel. We start by connect our Arduino to the subject and then connect the Arduino to a computer with the graphing software (I'll go over this in detail later) We have to start by asking the subject some easy questions we know they will answer truthfully like "what is your name" and "where do you live" to get a baseline and from there we can start asking questions that they may lie about, if they do they would probably feel nervous and then we can read the change in the base line that be established earlier if they lie

3.2 Architecture Of Proposed System

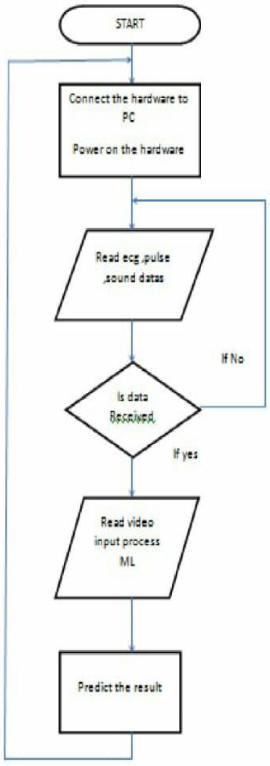

Fig 3.2 Architecture

3.3 Components Specification

1. Arduino nano:

● Arduino Nano is a small, compatible, flexible and breadboard friendly Microcontroller board, developed by Arduino.cc in Italy, based on ATmega328p / Atmega168

● It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V.

● Arduino Nano Pinout contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins.

● Each of these Digital & Analog Pins are assigned with multiple functions but their main function is to be configured as input or output.

● They are acted as input pins when they are interfaced with sensors, but if you are driving some load then use them as output. ● The analog pins come with a total resolution of 10bits which measure the value from zero to 5V.

● Arduino Nano comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage.

● There is one limitation using Arduino Nano i.e. it doesn't come with DC power jack, means you can not supply external power source through a battery.

● This board doesn't use standard USB for connection with a computer, instead, it comes with Mini USB support.

● Tiny size and breadboard friendly nature make this device an ideal choice for most of the applications where a size of the electronic components are of great concern.

● Flash memory is 16KB or 32KB that all depends on the Atmega board i.e Atmega168 comes with 16KB of flash memory while Atmega328 comes with a flash memory of 32KB. Flash memory is used for storing code. The 2KB of memory out of total flash memory is used for a bootloader.

2. AD8232(ECG sensor)

● This sensor is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily.

● The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement.

● The AD8232 module breaks out nine connections from the IC that you can solder pins, wires, or other connectors to. SDN, LO+, LO-, OUTPUT, 3.3V, GND provide essential pins for operating this monitor with an Arduino or other development board. Also provided on this board are RA (Right Arm), LA (Left Arm), and RL (Right Leg) pins to attach and use your own custom sensors. Additionally, there is an LED indicator light that will pulsate to the rhythm of a heart beat.

Features are:

● Operating Voltage - 3.3V
● Analog Output
● Leads-Off Detection ● Shutdown Pin
● LED Indicator
● 3.5mm Jack for Biomedical Pad Connection or Use 3 pin header.

3. Pulse sensor

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

4. Sound sensor

Analog Sound Sensors are typically used in detecting the ambient loudness in your environment. The Arduino can collect its output signal by imitating the input interface..

● Wide voltage range from 3.3V to 5V
● Standard assembly structures (two 3mm holes with multiple of 5cm as interval)

● Easily recognised interfaces

● Icons to simply illustrate sensor function

3.4 Modules

Preprocessing: The preprocessing technique helps to remove unwanted data from the dataset. The dataset may contain some noises or irrelevant data. These in noises and irrelevant data can be removed in the preprocessing stage. The data cleaning can be done in the preprocessing steps.

Architecture Creation: The CNN architecture can be used to learn the information from the given dataset. The learning of CNN architecture can be used based on the collected dataset. The CNN architecture constitute different layers and they combine to carry out the training process.

Training: The training procedure helps to extract features from the dataset and the features can be saved as a file called model file. The generated model file stores features of available data. The model file helps to predict the result.

Testing: The testing procedures can be performed based on the created model file. The features extracted from the model file can be used to predict whether a person is lying or not.

4. RESULT

The data sent over the serial communication has a data frame like S72,200,500A where 'S' is the start of frame with following readings from the sensors in the order sound level, ECG and pulse rate. And the terminating character 'A'. The sensor data along with the blink rate is taken as input in the python application. Based on the data set the corresponding result is predicted whether it is a lie or not.

5. CONCLUSION

Lie detector is a kind of instrument that help detect whether or not a person is lying. The underlying assumptions behind lie detector is that the act of telling lies is reflected in the physiological or neurological responses as the human body tends to react differently when deliberately trying to hide the truth or facts.

The system monitors a persons ecg signals, heart rate audio levels along with continuously monitoring these datas by video streaming the datas processed on a computer that is running a machine learning algorithm to predict the results.

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