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A LIE DETECTION TECHNIQUE FOR PHYSICAL DECEPTION

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ABSTRACT
A Polygraph that measures and records physiological symptoms such as pulse, blood pressure, respiration, sweating and skin conductivity, when a person is asked series of questions. This method is popularly referred as detection tests. Polygraphs are used as interrogation tool with over crime suspects in several countries. The physiological symptoms are examined using ECG graphs for lie detection. Our skin changes conductivity depending on many different things is termed as Electro dermal activity (EDA). In this system, the lie is detected by a small portable "ARDUINO LIE DETECTOR".

KEYWORDS: Arduino UNO, Lie detection, Pulse sensors.

1. INTRODUCTION
The introduction of lie detector machines used by several intelligence agencies or any another investigation by detectives, works with the help of polygraph technique and lie detector machine. The important fact about lie detection tests are, the test cannot tell us the person is lying or telling the truth, by itself. The major plot to develop the lie detection test is by changing the reaction of the human body between when a person is telling the truth or answering to a normal and routine question and his body reaction when he or she is lying. For example when a criminal is going to have a lie detection test the investigator attach sensors on his finger, head or maybe on his chest. These sensors measure the breathing rate, pulse, blood pressure and perspiration etc. At some point the machine has the possibility to record things like arm, leg, face, and pupil movement data sets. When the test begins the investigator asks some critical or shocking questions to the criminal. When the criminal started answering it, the investigator initiates the norm graphs of his reaction. After that, the main questions will be asked. During the test or after that, the investigators check the results. If he finds a significant change indicates that the criminal is lying. These changes could be due to several parameters like faster heart rate, higher blood pressure, increased perspiration, moving and looking around etc. When an experienced examiner uses a lie detector machine he can able to detect the lie with higher accuracy. If you use the polygraph for the first time it could be a little bit hard for you to recognize the lying. Here, SHT20 is used to measure temperature and perspiration, Electro Cardiogram electrodes to measure respiration rate, pulse rate sensor to measure heart rate and an Arduino UNO microcontroller to get datasets and analyze the parameters.

2. MATERIALS AND METHODS

Microcontroller
Arduino UNO
Arduino is a single-board microcontroller which makes the application more accessible with interactive objects and its surrounding environment. The hardware features, an open-source hardware board, 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Existing models consists of USB interface, six analog input pins and fourteen digital I/O pins that allows the user to attach various extension boards. The ATmega328 based Arduino Uno board is used which has fourteen digital I/O pins in which 6pins for PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, six analog inputs with power jack and a reset button. This contains all the required support needed for microcontroller. In order to get started, they are simply connected to a computer with a USB cable or with AC-to-DC adapter or

battery. The Uno Board differs from all the other boards and it doesn't use the FTDI USB-to-serial driver chip in them. It is featured by the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

FIGURE:
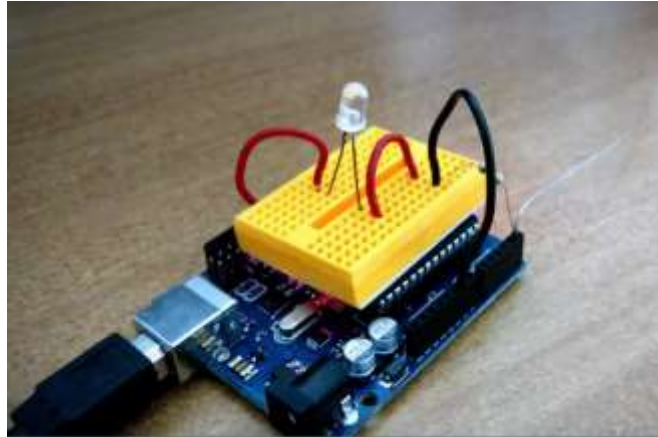
Heart rate pulse sensor
The heart rate can be measured with the help of SHT20 Pulse Sensor in a well-designed plug-and-play heart-rate sensor for Arduino microcontroller. It was widely used by in all fields which possess students, artists, athletes, gamers and mobile developers who want to incorporate the live heart- rate data easily into their projects. This includes an open-source monitoring application that graphs your pulse in real time systems.

LCD Display
The liquid crystal display works based on the property of light monitoring the liquid crystal and they do not emit the light directly. This display is a flat panel display or the electronic visual display with low information content in the LCD' s obtained by the fixed image or the arbitrary image which are either displayed or hidden like present words, digits or seven segment display. These arbitrary images are made up of large number of small pixels and larger elements

Working
The lie detector works based on the polygraph principle, which detects the galvanic response or conductance of the skin, which translates the skin variations when a person is interrogated and tries to tell a lie. In this sense the rate of person saying a lie decreases with the help of their skin resistance. The working principle of the polygraph used here is shown in the fig.1. In this proposed method the Arduino Uno card is used, which we will proceed to program taking into account respective of considerations:

A reference point based on a tension point will be initiated, which will serve as a point of comparison with the value obtained from the metal plate, whose perturbations will depend on the response of the person to be interrogated. This will help us structure the programming.

By decreasing the cutaneous resistance, it implies that the person is lying and, therefore, the analog input of the Arduino (AO) will tend to 5V and this will activate an output of the system.

The greater the cutaneous resistance, implies that the person is telling the truth and, therefore, the analog input of the Arduino (AO) will tend to 0 V and this will activate an output of the system.

The Beats per minute can also be measured with the use of heart rate pulse sensor. This can be viewed in Liquid

Crystal Display.
In the serial plotter, we can get the output of the skin response through the graph.
In the serial monitor, the beats per minute can be measured.

Serial plotter
The Arduino Serial Plotter is a Tool that comes pre-installed with your Arduino IDE (version 1.6.6 and above) that takes incoming serial data and displays them in a plot. The value of serial data increases or decreases based on the vertical Y axis. The X axis has 500 points and each tick of the axis is equal to executed Serial.println() command. This means that the plot is updated every time you use the Serial.println() command with a new value .

Serial monitor
The Arduino IDE has a characteristic feature that can help in debugging sketches and also controlling the Arduino from the computer's keyboard. This Serial Monitor in Arduino is a separate pop-up window that acts as a separate terminal that communicates by receiving and sending Serial Data to the microcontroller.

COM ports
Arduino boards such as the Uno and Due all have a serial port that connects to the USB device port on the board. The USB port enables the sketches to be loaded to the board using a USB cable. The Code used in the sketch can access the same USB serial port to communicate with the PC by using the Arduino IDE Serial Monitor window or a Processing application for example. The USB port used are appeared to be the virtual COM port of the connected PC.

The Initial configuration for the proposed technique includes the code for Arduino lie detector is compiled first and for the uploading process; the Arduino board is connected to the PC via USB cable. Then on the Arduino ide screen port is selected from the tools option. The graph is plotted between the time in x axis and heart rate in y axis.

BAUD rate
The baud rate is defined as the rate of change of information transferred in a communication channel. The term "9600 baud" means, the serial port is capable of transferring a maximum of 9600 bits per second. If the baud rate exceeds 76,800, the cable length has to be reduced. So the baud rate should be maintained at 9600 for every channel.
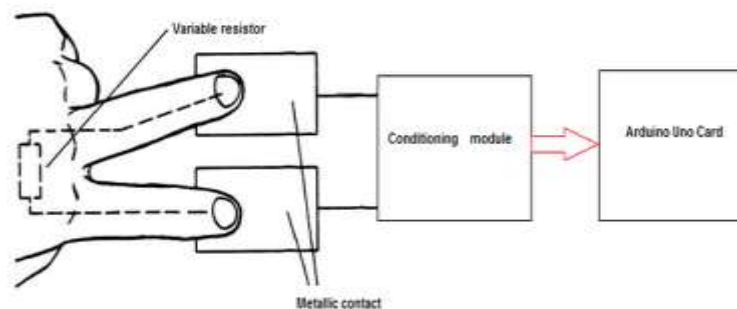
3. RESULTS AND DISCUSSION
The source code has several aspects which correspond to the data sets from various sensor used like temperature and perspiration from SHT20 sensor and I2C port Heart rate from pulse sensor and breath rate from impedance pneumography circuit were both by analog input pin.

```
{
Serial.begin(9600);
sht20.initSHT20(); // Init SHT20 Sensor
delay(100);
sht20.checkSHT20(); // Check SHT20 Sensor
}
```

```
void loop()
{
floathumd = sht20.readHumidity(); // Read Humidity
float temp = sht20.readTemperature(); // Read Temperature
Serial.print(temp, 2);
Serial.print(",");
Serial.print(analogRead(A3)); // Read Pulse sensor value
Serial.print(",");
Serial.print(humd, 1);
Serial.print(",");
Serial.println(analogRead(A2)); // Read Breath rate
}
```

The main piece of software is used in the newest version on the Arduino IDE, brings a new way to see the data being received from the Arduino, instead of being in text form from the serial monitor, now it can be displayed in a real time graph which will help us identify when the data changes its pattern (when someone lies).

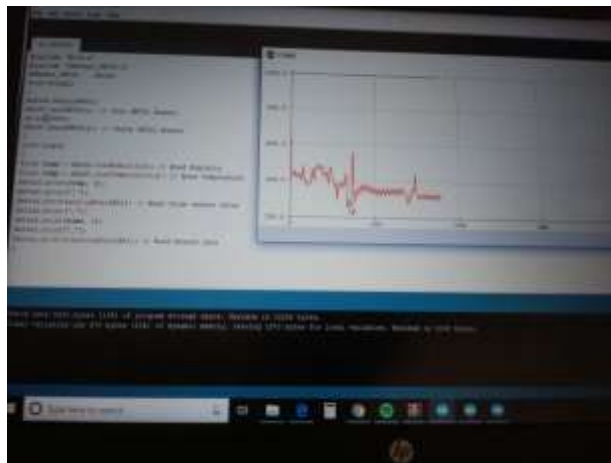*Fig 2.Graph obtained from the normal person*

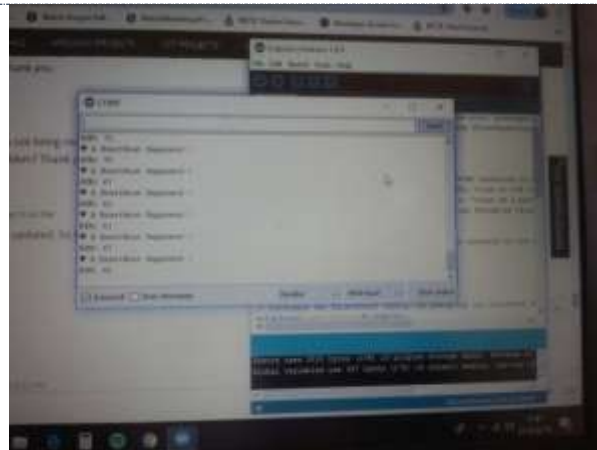*Fig 3.Graph obtained when the person lies or pretends to be a normal person*

Fig 4 .Beats per minute in serial monitor

4. CONCLUSION

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 the unknown facts about our skin is it changes conductivity depending on many different things based on the mood of the individuals. This property of the skin is known as Electro dermal activity (EDA). The research progression in developing "lie detection" technique is based on the ideas about physiological functioning for the most part, but has been independent of systematic psychological research. Early researches believed that deception required effort could be assessed by monitoring physiological changes. But the proven results remains unsatisfied due to the limited on the nature of deceptiveness. Efforts to develop actual tests have always outpaced theory-based research. Without a better theoretical understanding and knowledge about the mechanisms and nuances of deception functions, the development of a lie detection technology seems highly difficult.

5. ACKNOWLEDGEMENTS

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