

BODY AREA NETWORK TECHNOLOGY AND TO SEND SECURE DATA OF PATIENT THROUGH CRYPTOGRAPHIC KEY ALGORITHM USING IMAGE MATRIX DATA, SOUND MATRIX DATA AND VIDEO URL AS KEY

Pradeep Kumar

Ph.D. Student, Enrollment Number: 120481

Mody University of Science and Technology, Lakshmangarh, Sikar-332311, Rajasthan, India

Abstract: Wireless body area network can be secured by particle swarm optimization algorithm. Although, IoT-based patient health status monitoring has become very popular, monitoring patients remotely outside of hospital settings requires augmenting the capabilities of IoT with other resources for health data storage and processing. In this paper, we propose artificial intelligence algorithm for security coding for cryptographic key generation taken as recent advances in wireless communications technologies for medical/fitness applications. Security algorithm requires key generation and key can be possible through images matrix through pixel reading and sounds matrix and sound signal coding. If we have many images than body area network is also sensor-based hardware that may require low intensity images for possible software and we can classify required images with the help of particle swarm optimization algorithms to get required key.

Keywords: Body area network, particle swarm optimization, security keys

II. Image Processing: [1] An image can be considered as a function of two coordinates like x, y , where x and y are spatial coordinates and the value of the function at given pair of coordinates (x, y) is called the *intensity value*. The programming counterpart of such a function could be a one or two-dimensional array. Code Snippet 1 and 2, show how to traverse and use 1-D and 2-D arrays programmatically. Arrays can be used as key generation through programming actually bits are required for keys generations and we can achieve these bits through image processing programming by creating an array and if it is two-dimensional direct table of bits can be used as key by applying particle swarm optimization for classification and key generation and for safer patient data in using body area network as technology for remote patient treatment. Both of them essentially can represent an image as shown in Figure 1:

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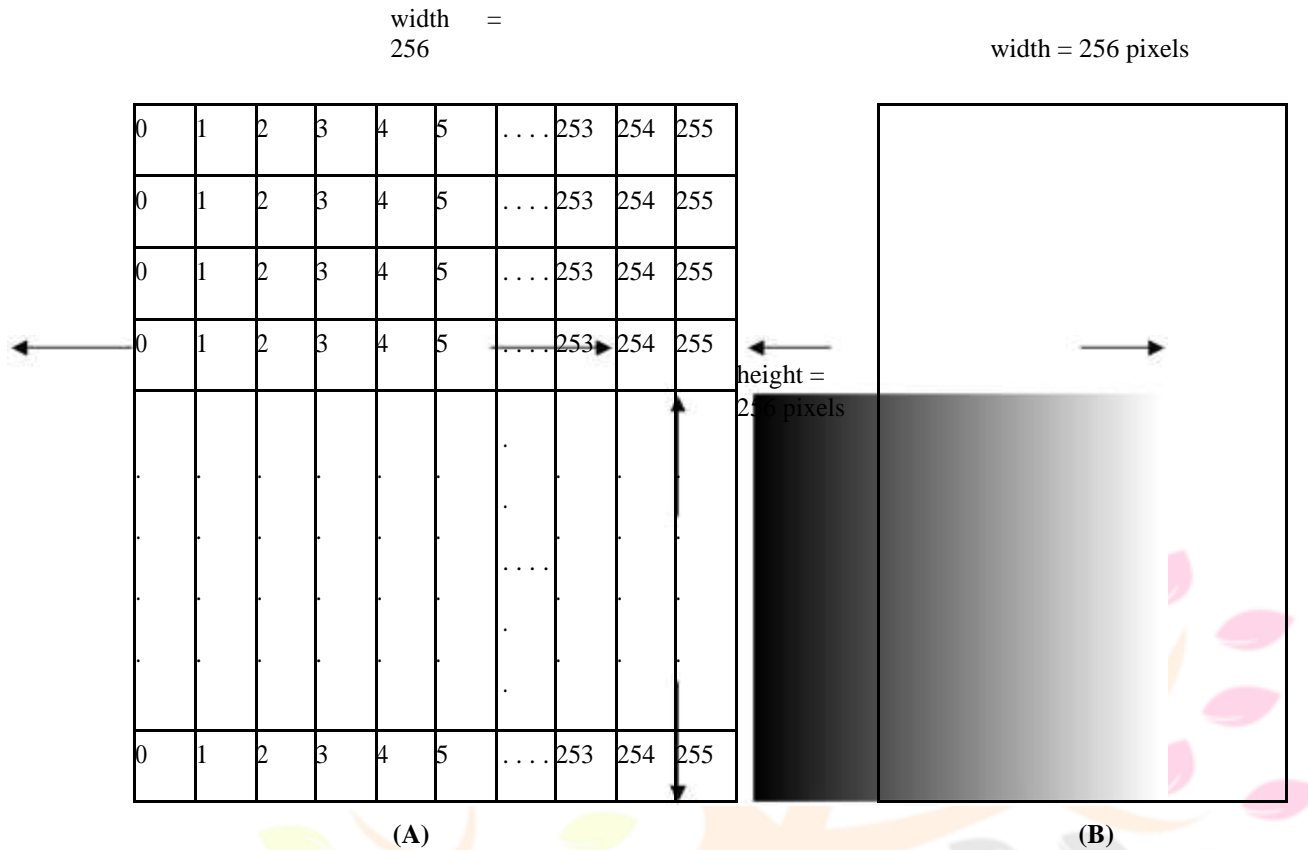


Figure 1: Values in the grid represent the grayscale intensities of the image on the right.

(A) Intensity values are shown in a grid of the same dimension as image (B) Image as seen on a monitor

A. Following code declares a 1-D array of type 'unsigned byte' having

B. size 256*256. It then puts values from 0 through 255 in each row.

```
int width, height;           // width and height of image
int offset;                 // num of elements traversed in array
int value;                  // image intensity value
width = height = 256;
value = offset = 0;

unsigned byte array_1D[height * width];

for(int j=0; j<height; j++) // traverse height (or rows)
{
    offset = width * j;     // modify offset traveled
    for(int i=0; i<width; i++) // traverse width (or columns)
    {
        array_1D[offset + i] = value++; // update value at
                                         // current index i.e.
                                         // (offset+i)
    }
    value = 0;
}
```


III. PROPOSED METHODOLOGY

In the proposed method Swarm particle optimization algorithm can be used as classification and used in the key generation process. For encryption, we have proposed AES. The symmetric key algorithm is proposed due to its computation speed and less overhead in key management. The process of generating the key from the Particle swarm optimization has the following steps:

STEP 1: From various images of various intensities and from various sound signal we can classify images and sound signals which are suitable for key size in body area network which require low powered arrangements. Images with low intensities can be separated through classification and be given for next step for cryptographic purpose.

STEP 2: A binary sequence is generated with the help of a small image like part of the image of ECG sensor image through the image processing computer programming. Means any image can be used as a cryptographic security key through reading functions for matrix. Similarly, image generated from metal touch made up of mixture of various material can be used for cryptographic security key just like biometric way. Any number of such mixture of metal can be created and its touch to sensor can create different images means any number of keys through image processing computer programming and similar mixture of metal can be kept at both ends.

STEP 3. In computer program, an image can be considered as a function of 2 variables, $f(x, y)$, where x and y are spatial coordinates and the value of the function at given pair of coordinates (x, y) is called the intensity value. The programming counterpart of such a function could be a one or two-dimensional array. The first row of this two-dimensional array can be used as key generated from the same image used for the cryptographic purpose. More critically, a random number can be generated to choose the row from the array because the first-row idea can be hacked.

STEP 4. Through computer coding in particle swarm optimization, limits of allowed number of digits for key can be decided for better speedy results with the fitness function from generated rows of the array in computer program from the concept image processing. Fitness function like converting first row of two-dimensional array carrying bits into a decimal number and the new decimal number generated by this process can be divided by hundred or more as per optimality factor after experimentation to reduce the bit size to convert this number back into binary and can be used as the population of cryptographic reduced key in lesser number of digits as per hardware availability and requirement.

STEP 5. For highly insecure environment coding can be changed to use of two images by intermixing of arrays to increase the population to create double lock environment

STEP 6. Matrix from sound programming computation can be used as key if the image is not available.

STEP 7. For internet environment video URL can be used for generating key that can be generated similarly as reference [4]. For distributed environment in this way we can generate many number of keys and can send different keys to different users in networks to access the secure data. Means as many number of clients we can generate that many keys for more authentications.

STEP 8: Other option is to take two sound signals for two keys generation as double lock for security in transfer of data in body area network

STEP 9: Particle Swarm Optimization Classification Algorithm can take result as:

```

Input: raw data as image matrix or/and sound matrix
repetition number (generate initial particles (=threshold rule) randomly)
for repetition number do {for each particle do {
Calculate the fitness value as low intensity image using raw data for
finding the pbest; end for;
find the gbest;
for each particle do {compute velocity and update particle; end for}
end for}
output: rule same as gbest, we can choose gbest as key.
```

IV. CONCLUSION

Privacy and data security in body area networks is a significant area, and still, there is a number of challenges which need to be overcome. Image processing can create an image as a data for cryptographic purposes. So, there is no limit to a number of images and so as to the number of keys. Mathematical function on keys can help us to more growth in this field. Particle swarm optimization can be used for classification among images, which can be used for security key in body area networks. Distributed environments can be used as body area network as different security keys for different clients. As internet speed is entering 5G than multimedia use for security key will be speed justified. App culture and allowed sensor possible attachments with smart phones can easily allow transfer of sensor data and app coding can use this security key arrangement. Government may adopt this every hand arrangement of remote patient data monitoring system development. A company like hospital can register both patient and doctor with images and sound security data and create software for sensors through like following coding security. Both doctor and patient can be register for single image and/or sound key issued from administrator and they can send and receive data from single key after treatment these key can be deregistered and can be reuse for another patient for body area network :

Android provides SensorManager and Sensor classes to use the sensors in our application. In order to use sensors, first thing you need to do is to instantiate the object of SensorManager class. It can be achieved as follows.

```

SensorManager sMgr;
sMgr = (SensorManager)this.getSystemService(SENSOR_SERVICE);
```

The next thing you need to do is to instantiate the object of Sensor class by calling the getDefaultSensor() method of the SensorManager class. Its syntax is given below –

```
Sensor light;
light = sMgr.getDefaultSensor(Sensor.TYPE_LIGHT);
```

Once that sensor is declared, you need to register its listener and override two methods which are onAccuracyChanged and onSensorChanged. Its syntax is as follows –

```
sMgr.registerListener(this, light, SensorManager.SENSOR_DELAY_NORMAL);
public void onAccuracyChanged(Sensor sensor, int accuracy) {
}

public void onSensorChanged(SensorEvent event) {
}
```

Getting list of sensors supported

You can get a list of sensors supported by your device by calling the getSensorList method, which will return a list of sensors containing their name and version number and much more information. You can then iterate the list to get the information. Its syntax is given below –

```
sMgr = (SensorManager)this.getSystemService(SENSOR_SERVICE);
List<Sensor> list = sMgr.getSensorList(Sensor.TYPE_ALL);
for(Sensor sensor: list){
}
```

Example

Here is an example demonstrating the use of SensorManager class. It creates a basic application that allows you to view the list of sensors on your device.

Following is the content of the modified **MainActivity.java**.

```
package com.example.sairamkrishna.myapplication;
import android.app.Activity;
import android.hardware.SensorManager;
import android.os.Bundle;
import android.util.Log;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.widget.TextView;
import java.util.List;
import android.hardware.Sensor;
import android.hardware.SensorManager;
public class MainActivity extends Activity {
    TextView tv1=null;
    private SensorManager mSensorManager;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        tv1 = (TextView) findViewById(R.id.textView2);
        tv1.setVisibility(View.GONE);
        mSensorManager = (SensorManager) getSystemService(SENSOR_SERVICE);
        List<Sensor> mList= mSensorManager.getSensorList(Sensor.TYPE_ALL);
        for (int i = 1; i < mList.size(); i++) {
            tv1.setVisibility(View.VISIBLE);
            tv1.append("\n" + mList.get(i).getName() + "\n" + mList.get(i).getVendor() + "\n" + mList.get(i).getVersion());
        }
    }
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        // Inflate the menu; this adds items to the action bar if it is present.
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return true;
    }
    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
```

```

// Handle action bar item clicks here. The action bar will
// automatically handle clicks on the Home/Up button, so long
// as you specify a parent activity in AndroidManifest.xml.
int id = item.getItemId();
//noinspection SimplifiableIfStatement
if (id == R.id.action_settings) {
    return true;
}
return super.onOptionsItemSelected(item);
}
}

```

V. References:

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