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Technical Details of Signature Recognition

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Introduction

The Identi-Sig Signature Recognition API described here will allow a programmer to easily add Signature Recognition Capabilities to any Windows application including those written in VB.Net, C#.Net and Visual Studio ASP.Net.

In order to support JAVA applications, the Identi-Sig API must be re-written as a JAVA JAR (Java Archive Resource). This capability is available but at an extra cost.

The product described in the following pages is written as a 64 bit DLL. The DLL version can be delivered as a 32-bit DLL upon request for use in older operating systems such as Windows XP. The version described here is called Identi-Sig DLL.

The DLL allows the images of two signatures to be compared and returns a value indicating the likelihood of a match. The Identi-Sig API does not use

a database but the application containing the Identi-Sig API usually requires a database. The “Identi-Sig Demo Signature Recognition” application uses an Access database but can easily be modified to use MySQL or other larger external databases. When the API is installed, we will establish the correct connection string and database source for your application.

Signature Recognition is not an exact science. In this product, Signature Recognition is done by measuring features of a signature and recording these measurements in a string called an Electronic Signature. This product uses 57 measurements. When the signature is stored in the database the Electronic Signature is stored with it to improve the speed of comparison. When a comparison is made, many instances of the signature are considered before a final comparison value is returned by the algorithms.

The Signature Recognition DLL will make a comparison between two signatures by comparing the measurements in two different ES records, then applying various statistical analysis techniques to the comparison to determine the number of the features that match.

Determining a match involves some complex calculations, and some adjustments based on many years of experience dealing with this subject. As an example, a measurement might produce a value of 395 for the Master signature and then might produce a value of 733 for the sample signature measurement.

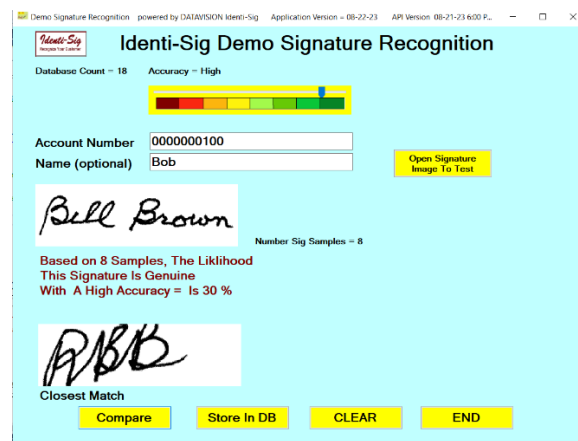
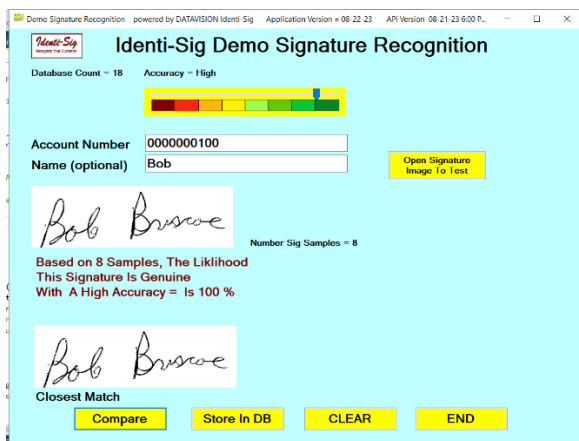
The answer to the question “Is a 395 value from one signature the same as a 733 value from a sample signature?” can be found by using Artificial Intelligence algorithms to process data from hundreds of thousands of comparisons. Based on the data patterns for feature values for this measurement the distribution can be derived for a particular algorithm. We can then infer the single sample value is distributed a certain way, and from that can predict the reasonable limits for a given measurement.

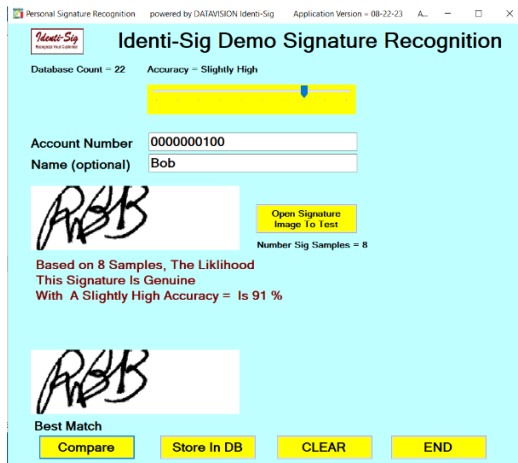
Based on over 20 years of experience DATAVISION is very familiar with the behavior patterns for different type measurements. That knowledge is incorporated in the Identi-Sig API and the results are quite accurate.

Identi-Sig calculates probability of a match using several kinds of kinds of logic/mathematical rule sets which have been proven using hundreds of thousands of comparisons. These calculations are not perfect, but an accuracy of over 97% has been achieved, and is reasonable to expect. In addition to the math, each dataset of signatures will produce a different result depending on quality and noise in the image. Those characteristics can be fined tuned by adjusting the quality of the image input settings (accuracy) available in the algorithm.

The Identi-Sig API is only used for STATIC (image based) signature comparisons. The Static Signature Recognition model uses 57 measurements. When the API is first installed it will return the probability of a match and will also show the best signature image match in the database. Depending on your requirements, it would be possible to add new samples of the signature to the database for a given account thus improving the overall accuracy of the prediction. This might prove useful in banking checking applications,

Here is what the screen looks like when the signatures match and when they do not match. The test “Bob Briscoe” account has 8 different signatures which vary from “Bob Briscoe” (written several different ways), to “RJB” which might be used for quick signing conditions. All these different variations are valid.





Notice the Bob Briscoe signature matches 100%, but the “Bill Brown signature is a poor match. When the valid RJB signature is examined the Identi-Sig returns a high score, because RJB is one variation of the Bob Briscoe signatures on record. Even though Bill Brown did not match, the IdentiSig API searched for the closest match among the available signatures and then showed “RJB”. This was probably because the slant in both the Sample and Master were the closest match and resulted in the best match for this fictitious signature.

There are many other factors involved in determining if a signature for a given account is valid, because not all signatures are written the same way. In banking applications where a signature is written over and over on a check, for example, the signature tends to resemble the signer’s name, and tends to be the same. In other industries such as checking signatures on prescriptions, the doctor’s signature may be only a “squiggle” and not represent the signer at all. In both cases we have found the percentage of match returned is consistent. In mortgage applications, the signatures are quite alike, so it is easy to detect where a fraud has been used on a document.

The Identi-Sig API considers that signatures will be different not just in the way the signature is drawn but also in the actual signature itself.

The Process

Signature images are introduced to the algorithms via a file which contains the image. The image can be in any popular file format such as BMP, JPEG, TIFF, PNG, PDF, etc.

The first step in the process is the internal algorithms change all file formats to a BMP image format. The image is then “normalized” so it occupies the same window size for height and width. Next the image is scrubbed to remove as much noise as possible.

All images in the Identi-Sig API are managed as memory streams. This means that the API can run in server environments where image pages are not permitted as well as in desktop applications.

All images are changed to one bit level BMP images, and then further scrubbed to eliminate the RGB characteristics associated with one bit images.

The image is then manipulated so each dot in the image is addressable. This process is called Binarization. After the image has been properly prepared, it is subjected to analysis by 57 different algorithms, and the results are recorded into an Electronic Signature.

Comparison are done by comparing one Electronic Signature to another. Scoring is a complex process that considers not only single Electronic Signature comparisons but also considers the results of several events occurring. It's complex.

Using the API

Using the API is not complicated, but we have an even better solution. DATAVISION will **install our Identi-Sig API in your application of choice at no extra cost** which will guarantee Signature Recognition in your application. Our software team is very experienced in installing the API in desktop or server applications, and it's all included as part of the purchase price.

The “Identi-Sig Demo Signature Recognition” application is a ready to use application written in VB.Net. We will include the source code for this demo when you purchase the API so you can add the API to other applications in the future by using the demo as a guide.

To test the accuracy of the Identi-Sig API, we offer **a free on line Google Meeting demo for the product**. During this demo we will show you how the product works and invite you to use your own signature images if you want. We also have a library of hundreds of images we can use to show you the power of this product.

If you like the accuracy of the “Identi-Sig Demo Signature Recognition” application and want to buy the Identi-Sig API, we offer an unlimited license allowing you to make multiple copies of the Identi-Sig API for use in all your applications. We will provide free installation of the product in the application of your choice, and we offer paid installation for multiple applications.

If you want to start building your own application with the Identi-Sig API, here are the steps we use.. The API has several functions that are called to accomplish Signature Recognition. Here are the functions available in the API.

1. [Instantiate the DLL.](#)

Public MySignatureRecognition As New IdentiSig.IdentiSig

2. [Public Function](#) GetDLLVersion (returns the API in use)
3. [Public Function](#) GetESString (used to specify the signature image file to use)
4. [Public Function](#) SetPrecisionLevel (sets between 0 – 9, with 9 the most precise)
5. [Public Function](#) GetMasterES22(returns a Master ES calculated from the File chosen)
6. [Public Function](#) CompareSignatures22 (the function that compares the signature to the data stored in the database. It basically does all the work)

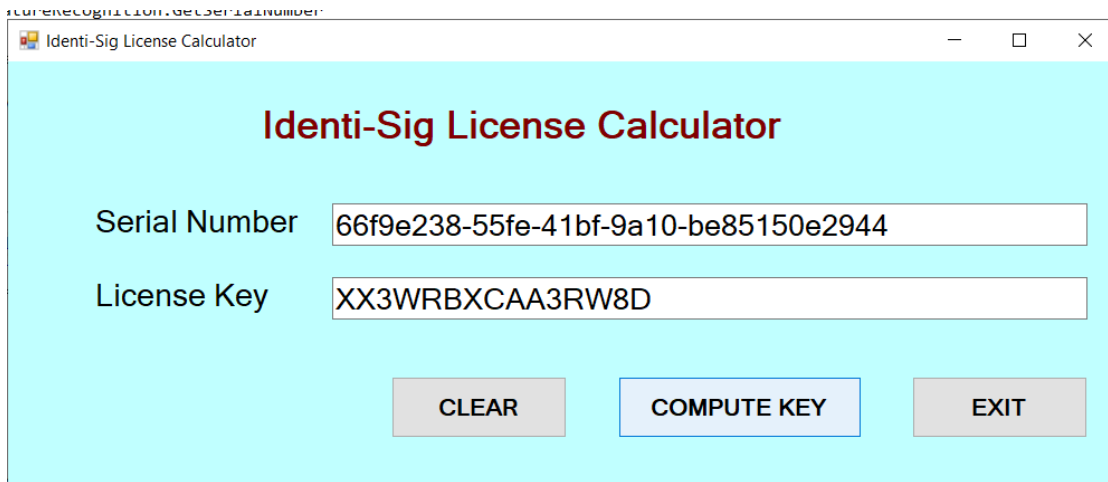
Here are the functions used in licensing applications:

7. [Public Function](#) GetSerialNumber() [As String](#) (returns machine GUID)
8. [Public Function](#) CompareValidLicenseKeys([ByVal](#) EnteredLicenseKey [As String](#)) [As String](#) (compares machine GUID hash with entered valid license key, Sets MyLicense setting as AUTHORIZED upon success.

9. **Public Function** CheckLicense(**ByVal** EnteredLicenseKey **As String**) **As String** (checks if EnteredLicenseKey matches hashed Machine GUID, returns AUTHORIZED upon success. If MyLicense is set to AUTHORIZED, the function returns AUTHORIZED. Upon failure returns NOT AUTHORIZED.)

The API can be safeguarded for use in SAAS applications by using the built in “Check License” functions within the API. These functions read the user’s unique machine GUID and then hash the results to derive a License Key. We will provide you with a License Key program to calculate the License Key at no additional charge when you purchase the product, upon request.

The License Key program looks like this:



Cost

Please contact DATAVISION IMAGE LLC for pricing details. We request a small deposit upon order and then bill you for the balance after the product is running in your application. The Identi-Sig API includes a one year renewable support plan, which is billed separately.

DATAVISION charges an hourly rate for custom software and will offer a fixed price for various projects involving Signature Recognition. Please call or email us to discuss details. Installation of the Identi-Sig API in your application is included in the initial license fee. Call or write for a free no obligation demo using Google Meeting.



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