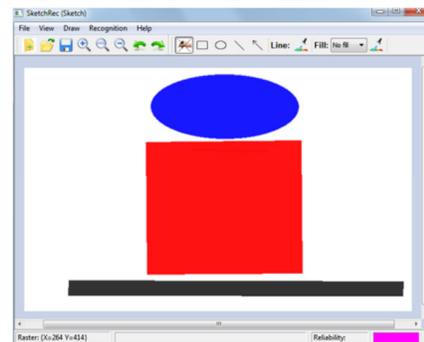
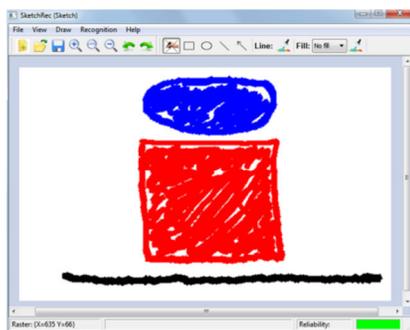
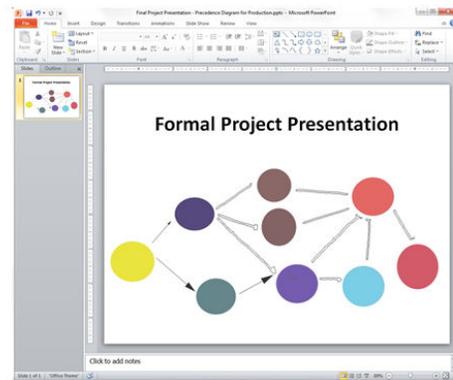
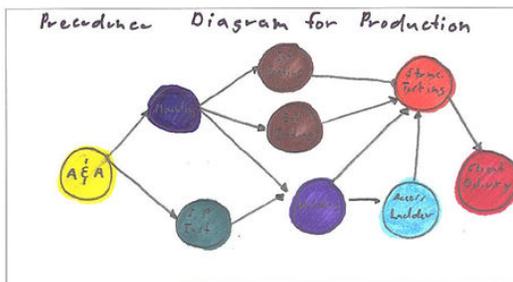


# SketchRec™ 2.2

## User Manual



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# Chapter 1: Introduction

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Imagars LLC offers the SketchRec™ 2.2 software to customers seeking to

- Rapidly transition from a handwritten design sketch to a presentable entity, e.g., a figure in a presentation slide or formal project report, without the need to redraw the sketch (hence providing enhanced productivity).
- Rapidly explore variations of a key design concept, for the purpose of enhanced creativity.

The primary new additions in the SketchRec™ 2.2 software pertain to a greatly enhanced graphical user interface) and improved stylus support.

The SketchRec™ 2.2 software comes in two flavors:

- SketchRec Pro offers sketch recognition with touch-screen support.
- SketchRec Standard offers sketch recognition without touch-screen support.

The common denominator is image recognition of high accuracy.

The installation package is offered through Imagars' website

<http://www.imagars.com/>

for 30-day free evaluation, and for purchase.

For further information on the benefits of the SketchRec™ 2.2 software, refer to the product data sheet:

<http://www.imagars.com/ProductDataSheet-SketchRec2.1.pdf>

---

## Operating Systems Supported

The SketchRec 2.1 SW supports Windows 8 (64-bit) and Windows 7 (32 or 64-bit).

---

## License Purchase

Upon expiration of the 30-day evaluation period, the SketchRec™ 2.2 SW prompts the user for a license key. Licenses can be purchased through Imagars' website

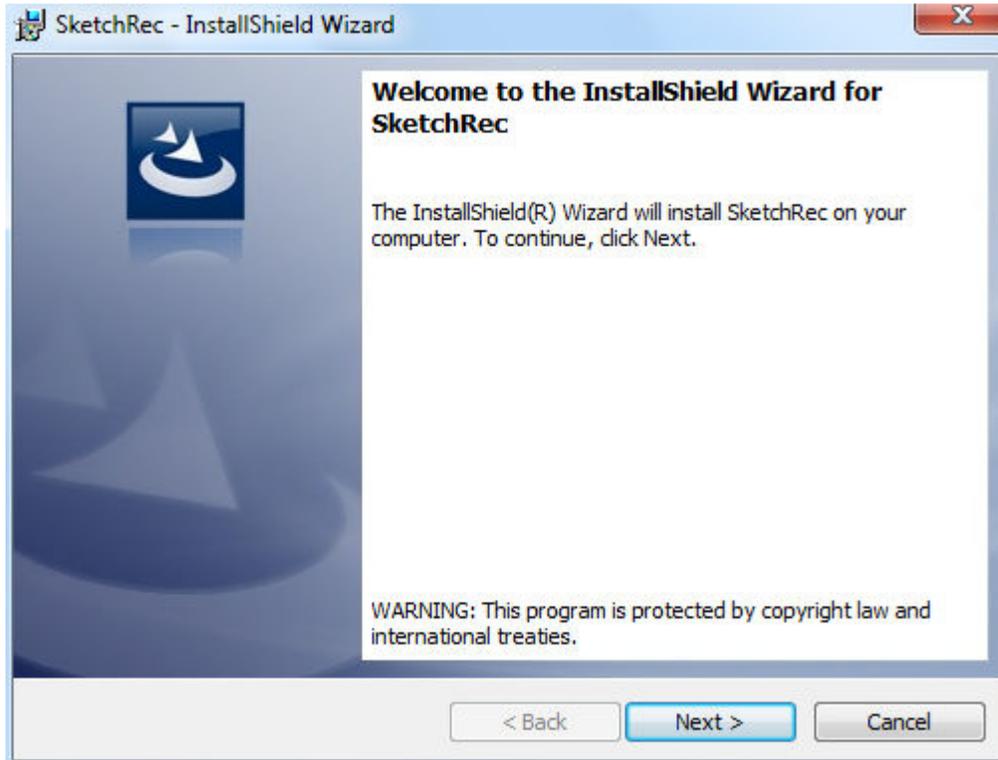
<http://www.imagars.com/>.

## Chapter 2: Installation and Overview

---

### The Installation Process

With SketchRec being a Windows application, the installation process is fairly typical. Figure 1 presents the welcome dialog.



**Figure 1:** The welcome dialog.

---

### The Tutorial Samples

The tutorial samples are contained in the folder

[\[base\]\SketchRec\Tutorial Samples\](#)

Here [base] could stand for

[C:\Program Files \(x86\)](#)

The tutorial samples provide the user with the ability to quickly experiment with the SketchRec software, and get up speed, without having to create any image sketches from scratch.

## Chapter 3: User Interface

The interface was designed with the intent of providing the user with the standard capabilities typically possessed by graphics applications. The SketchRec 2.1 release offers significant improvements in terms of touch-up capabilities.

### Main Menu

Figure 2 summarizes functionality of the main menu. The upper toolbar contains icons for file management, creation of graphical objects or connectors as well as object management. The lower toolbar contains icons for text insertion, formatting or color configuration. For initial explanation on the purpose given icons in the menu, simply hover over the icon with the cursor.

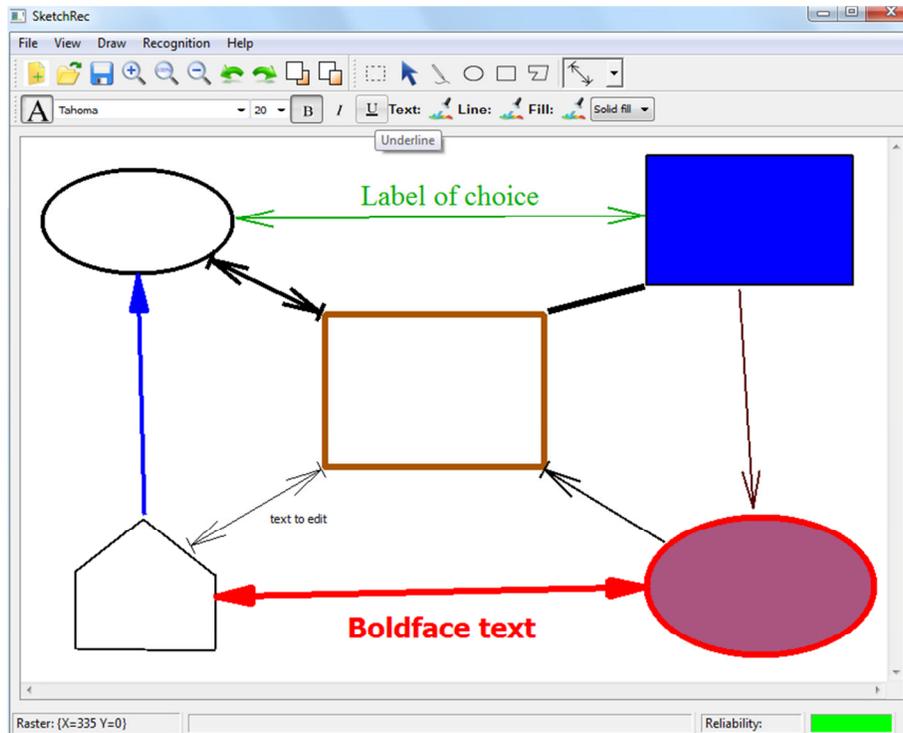


Figure 2: The main menu.

### File Operations

Table 1 summarizes the file operations supported by the SketchRec™ 2.2 software.

Submenu	Function
New	Clear the canvas
Open	Import an existing raster image or SVG document onto the canvas
Save As	Save the content of the canvas as scalable vector graphics (SVG), portable document (PDF), or as a raster-scan image (.jpg or .bmp)
Print	Print the vector graphics on the canvas onto a printer or into a file
Exit	Exit the SketchRec application

Table 1: File operations supported by the SketchRec™ 2.2 software.

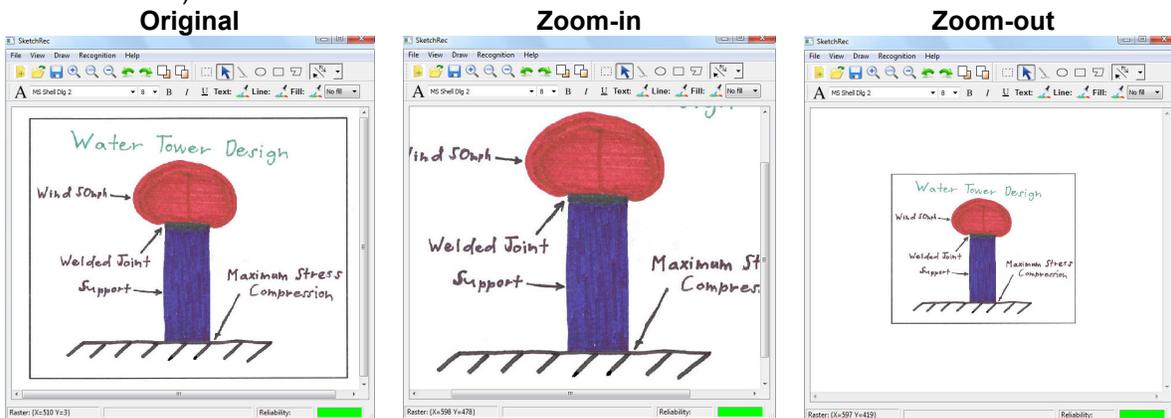
### View Operations

Table 2 outlines the view operations supported by the SketchRec™ 2.2 software.

Submenu	Function
Zoom In	Zoom in on the current canvas
Zoom 100%	Zoom current canvas to original scale
Zoom Out	Zoom out on the current canvas

**Table 2:** View operations supported by the SketchRec™ 2.2 software.

- When a new image is loaded onto the canvas, SketchRec™ 2.2 renders the image using the current (but not default) zoom settings. Once the user launches the SketchRec™ software, loads an image, zooms in or out, and then loads another image, the first image is loaded using the default zoom settings, but the second image is loaded using the zoom that had been configured at the end of the work with the first image.
- In addition to pressing ‘Ctrl+’ or ‘Ctrl-’ to activate the zooming, zooming can also be achieved – perhaps more conveniently - using the mouse wheel (refer to Figure 3 for an illustration).

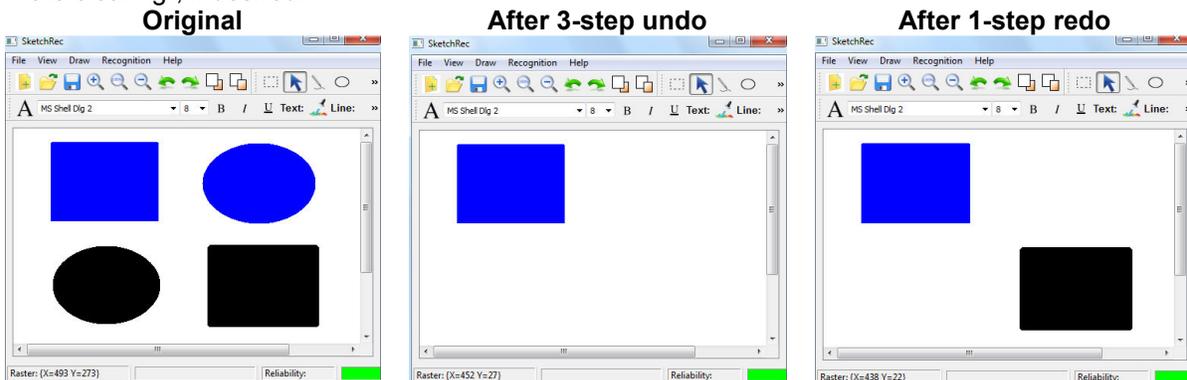


**Figure 3:** Convenient zooming using the mouse wheel.

### Draw Operations

#### Undo or Redo

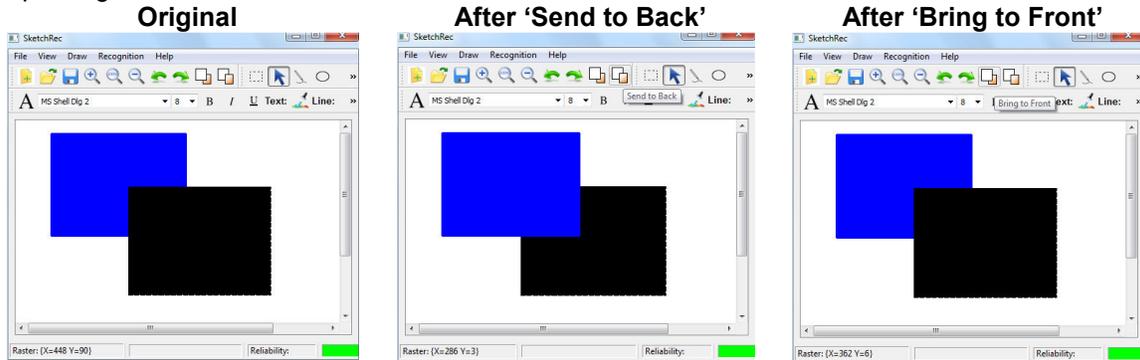
The SketchRec™ 2.2 release offers undo and redo operations with greatly enhanced functionality, compared to the earlier releases. The undo and redo operations can now be applied to multiple objects (i.e., a group of objects), up to infinite in number. They also can be applied to raster-scan images, pixel maps and SVG images. Even when the user clears the canvas, by executing a File → New operation, the user can retrieve the lost objects, by “undoing the clearing”, if desired.



**Figure 4:** Undo and redo operations applied to a single object.

## Bring to Front or Send to Back

The SketchRec™ 2.2 software provides the user with the ability to bring objects to the front or send them to the back (see Figure 5). In this sense, SketchRec™ 2.2 supports a layered paradigm.



**Figure 5:** Simple illustration of the layered object paradigm of the SketchRec™ 2.2 software. In the image to the left, the black rectangle has been selected.

## Object or Area Selection

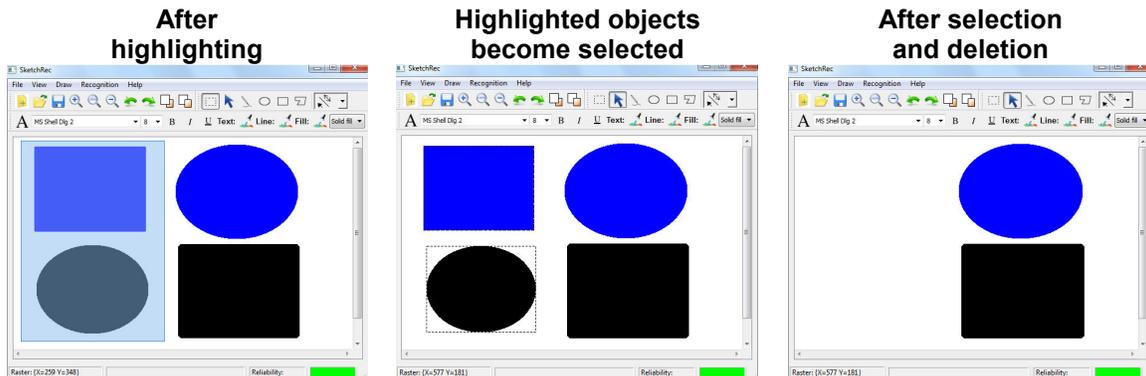
Object selection is achieved by simply clicking once on the object of interest. This will result in SketchRec™ rendering contours of the object, as well as its bounding box, as a thin, black, dashed line (see Figure 6 or Figure 14 for an example).

To deploy the area selection, the user simply clicks on the icon with the dashed rectangle and specifies the corner points of the rectangle whose content is to be deleted, either with the mouse or the stylus. As a result, the objects inside the selection area, and their bounding boxes, are visualized with a dashed line, indicating they have been selected (see Figure 6). The user then simply presses on the delete key on the keyboard. This tool can be very effective.

Regarding the area selection, there are two additional points worth mentioning:

1. The rectangle specified identifies the objects located inside it with high degree of accuracy (see the image to the left in Figure 6).
2. The area selection is automatically turned off after each highlighting.

This is done to avoid cases of false area definition, once the user moves on to other assignments, such as to selecting other objects in the scene.



**Figure 6:** Simple example of area selection.

## Inserting a Shape

### Ellipses and Rectangles

The logic for inserting ellipses and rectangles is essentially the same as before. The user simply selects the icon for the object, clicks on the canvas to define the first corner point of the ellipse or rectangle, with the mouse or the stylus, drags over to the second corner point and releases.

### Polygons

To insert a polygon, the user selects the polygon icon in the menu, click on the canvas with the left mouse button, to define the first corner point of the polygon, moves the mouse to the next corner point (without holding it down) and left-clicks again. The user proceeds to define the other corner points in the same way. The user, finally, moves the mouse to the position of the first corner point and double-clicks with the left mouse button. This closes the polygon.

### General

Once done inserting the object, the SketchRec™ 2.2 software switches automatically back to the 'Selector' mode. Without this functionality, the user is prone to inadvertently introducing unintentional (false) ellipses, rectangles or polygons.



Figure 7: Connectors supported.

## Inserting a Connector

To insert a connector, the user simply selects a connector from the drop-down list (see Figure 7), clicks on the canvas to define the starting point of the connector, with the mouse or the stylus, drags over to the end point and releases. Once done inserting the connector, the SketchRec™ 2.2 software switches automatically back to the 'Selector' mode. Without this functionality, the user is prone to inadvertently introducing unintentional (false) connectors.

## Text Insertion

To insert a text object, simply click on the text icon, triple-click with the cursor on the canvas, and start typing. The font type, font size, font color and other formatting attributes will reflect the formatting specified just prior to the text insertion. To insert subsequent text objects, you need to triple-click on the canvas and then start typing. The triple-clicking was introduced to avoid insertion of false text objects. For further illustration, refer to Figure 8.

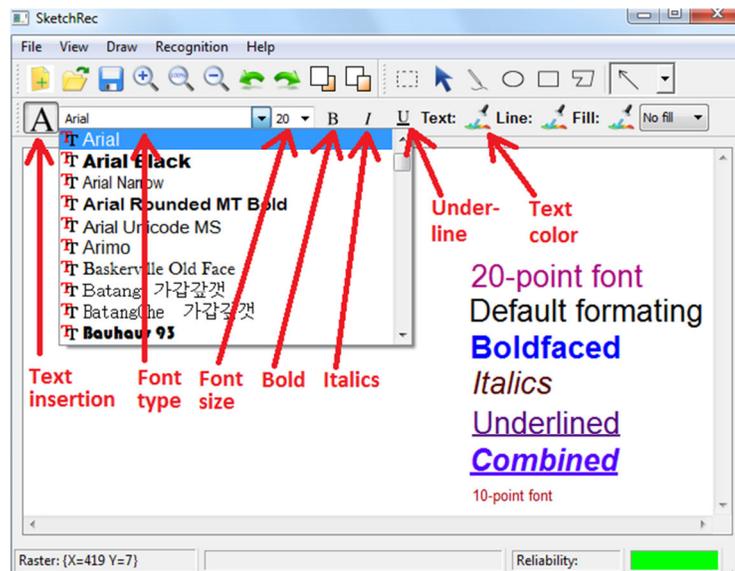
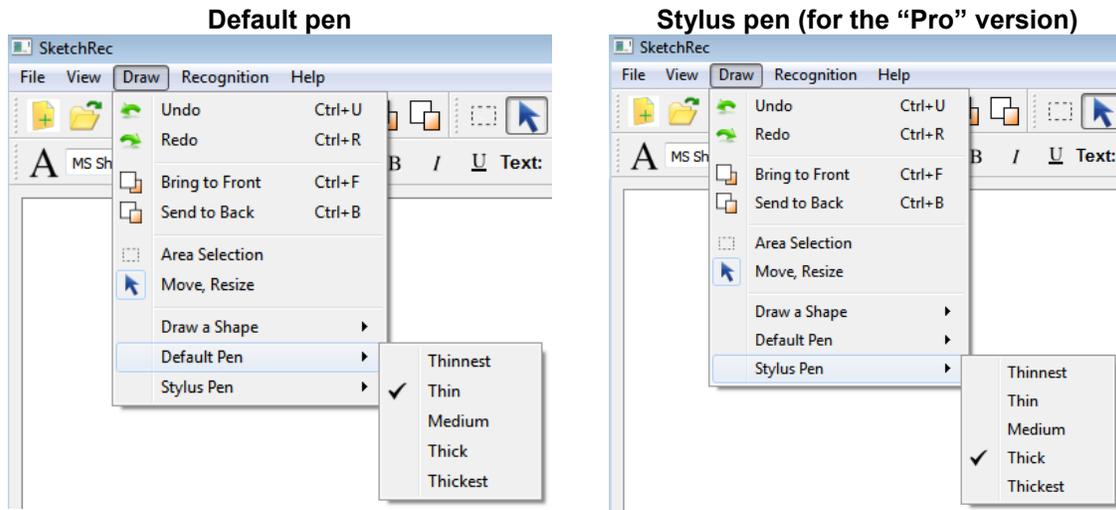


Figure 8: SketchRec™ 2.1 features related to text insertion.

## Configuring the Thickness of the Default or Stylus Pen

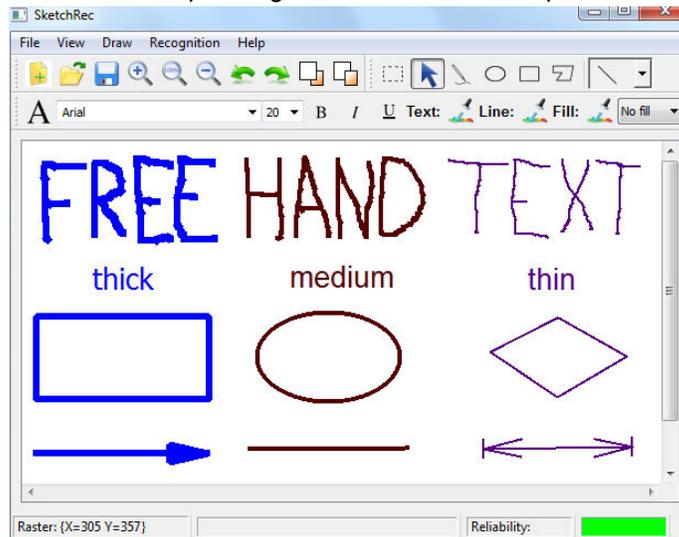
The default pen controls the thickness of the shapes, connectors and of the free-hand mouse. The thickness of the default and stylus pens can be specified as 'Thinnest', 'Thin', 'Medium', 'Thick' or 'Thickest', with 'Medium' being the default value (see Figure 9). Figure 10 illustrates what strokes from a 'Thin', 'Medium' and 'Thick' pen look like, both for the free-hand mouse, the shapes and connectors.



**Figure 9:** The user interface for the configuration of the default and stylus pens.

### Free-hand Drawing with the Mouse

The free-hand drawing with the mouse is enabled simply by selecting the icon for 'Free-hand drawing, eraser, stylus'. The free-hand mouse strokes are generated by pressing the left-mouse button. The color of the strokes is defined using the color selector for 'lines', and the thickness corresponds to that of the default pen. Figure 10 contains a sample illustration.



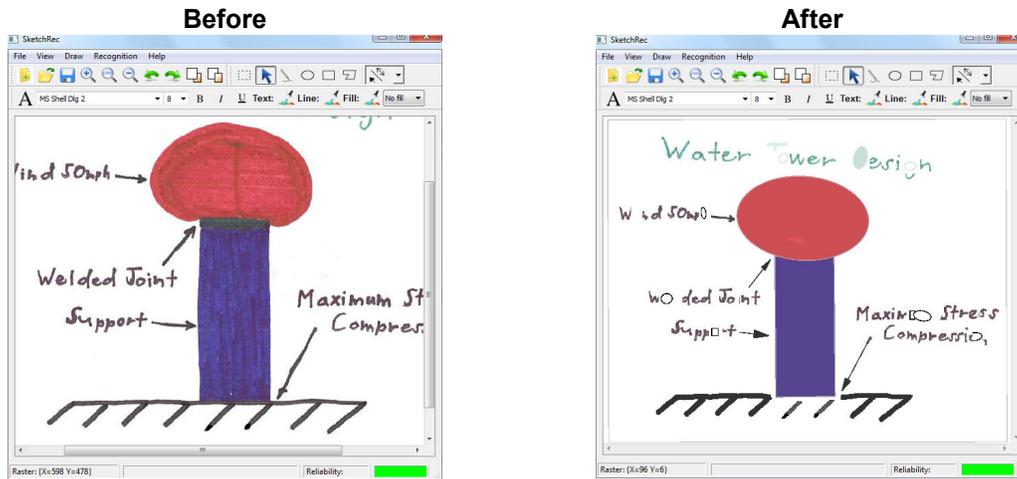
**Figure 10:** Strokes from the free-hand mouse, of different thickness and color, along with shapes and connectors of corresponding thickness and color.

### Recognition Operations

The recognition capabilities of the SketchRec software are covered, for most parts, in Chapter 4. With regards to the user interface, it suffices to make the following, two points (for now):

1. The user is provided with the opportunity to specify the desired thickness of the pen used to draw the contours recognized onto the canvas.

- The recognized objects are automatically scaled such that they are all viewable inside the current canvas area, regardless of the zoom settings prior to launching the recognition (see Figure 11).



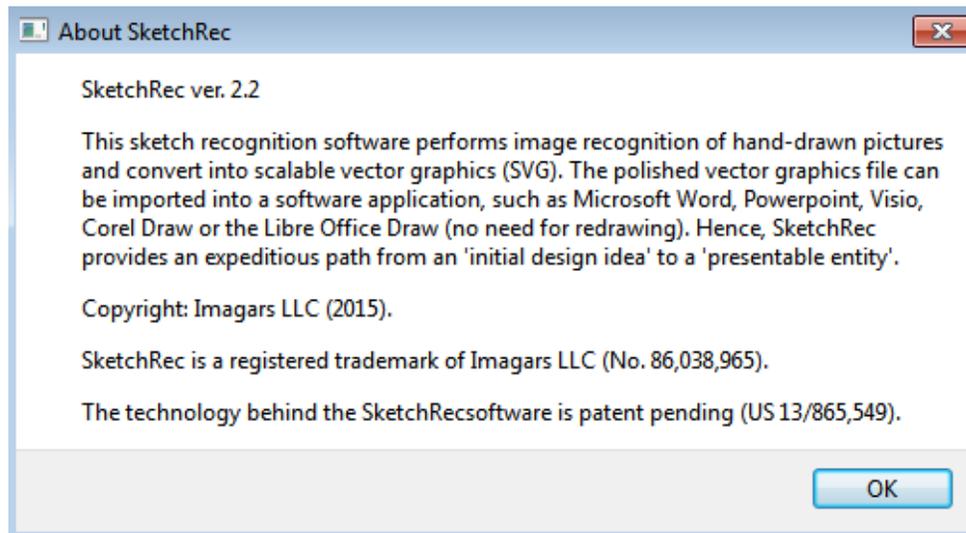
**Figure 11:** After launching the recognition and generating the vector objects, the field of view is automatically scaled, such that all the objects recognized fit within the viewable area.

## Help Operations

The help menu contains submenus titled 'About', presenting background information about the SketchRec 2.2 software, and 'License Key', for entering the license key.

## About Menu

Figure 12 presents the 'About' menu for the sketch recognition application.



**Figure 12:** The 'About' menu for the sketch recognition application.

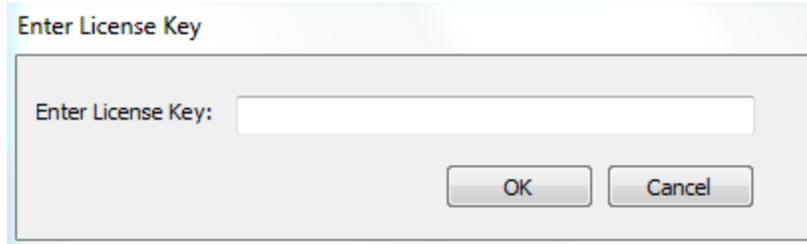
## User Manual

This User Manual is also available online:

[www.imagars.com/UserManual-SketchRec-2.2.pdf](http://www.imagars.com/UserManual-SketchRec-2.2.pdf)

## Accessing the License Dialog

The license dialog is accessed by selecting 'Help' in the main menu, and then 'License Key'.



**Figure 13:** The license dialog for the sketch recognition application.

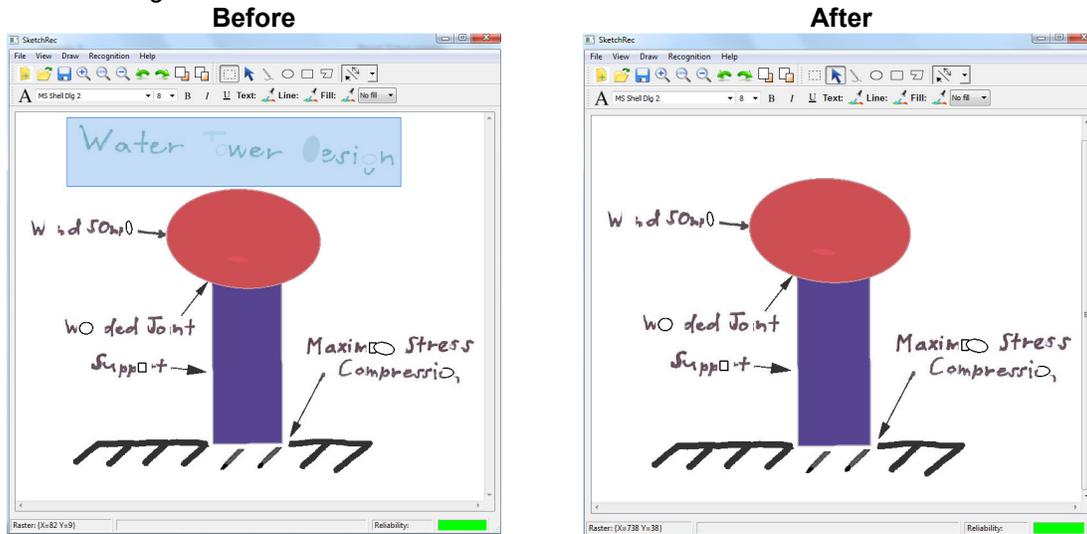
## Touch-Up Capabilities

The SketchRec™ 2.2 software offers capabilities for fixing up the vector graphics recognized. In particular, SketchRec™ provides capabilities for

- Removing undesired objects
- Adjusting the object position
- Adjusting object height or width

## Removing Undesired Items

The SketchRec 2.2 software enables the user to remove undesired objects. Individual objects can be removed, by selecting the object (clicking on) and pressing the 'delete' button. Alternatively, objects can be highlighted, by selecting an area, and the highlighted objects removed using the 'delete' button.



**Figure 14:** Removal of undesired vector items.

## Adjusting Object Position

Adjustment of object position are straight forward. You simply can click on the object of interest and move it around using the mouse or stylus. Refer to Figure 15 for an example.

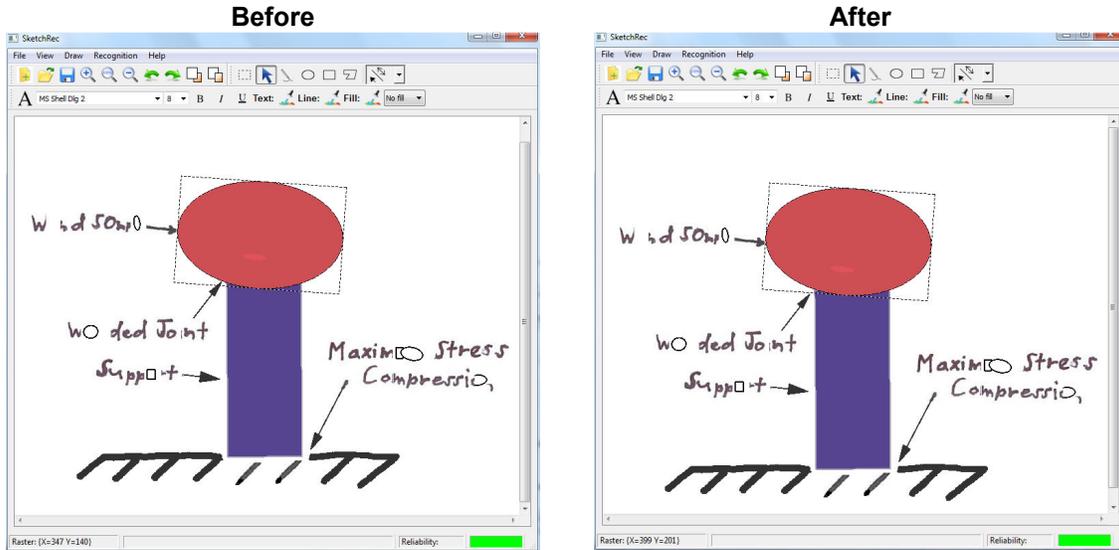


Figure 15: Example of a minor adjustment in the position of an ellipse object.

### Adjusting Object Height or Width

To adjust the height or width of a given vector object, simply double-click on the object and adjust the position of the anchor in the lower right-hand corner. The size of the object will be adjusted accordingly. To exit the resizing mode, simply double-click on the canvas area outside the vector object. For an illustrative example, refer to Figure 16.

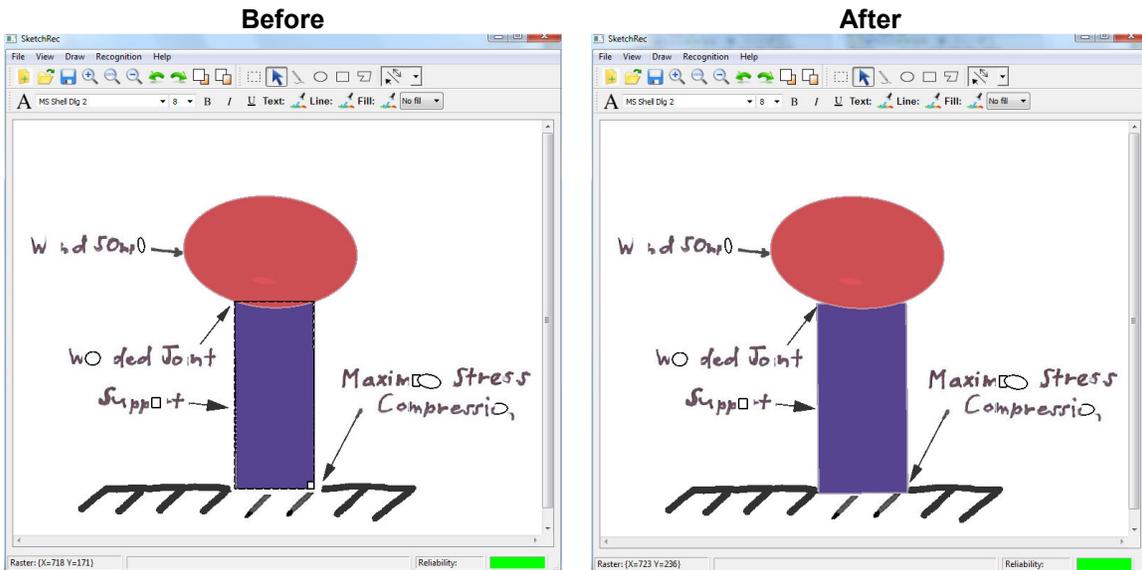


Figure 16: Example of minor increase in the height and width of a rectangle object.

# Chapter 4: Sketch Recognition

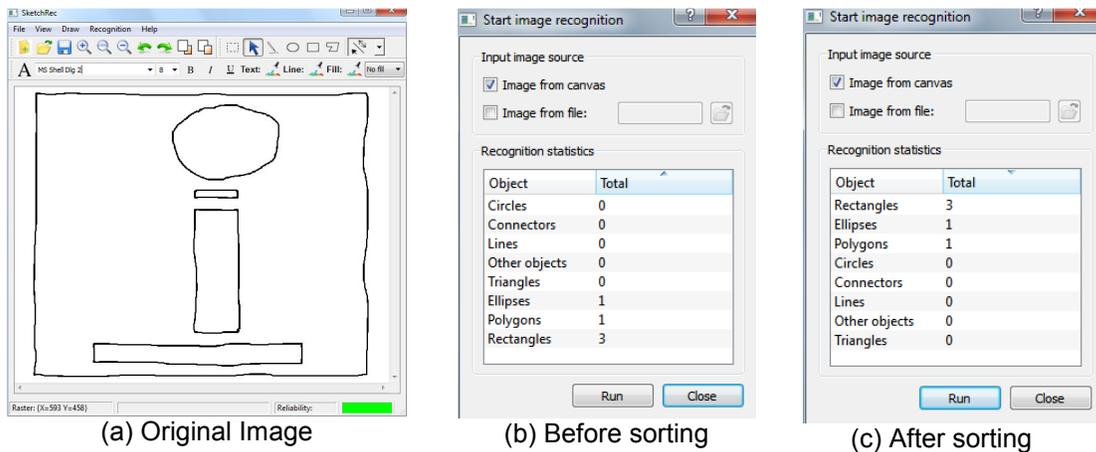
## On the Submenus

### Thickness of Recognized Contours

By selecting the 'Contour' option under the 'Recognition' menu, the user has the ability to specify the thickness of the recognized contours. For canvas with row and column number not exceeding 500 pixels, the current default ('Auto') may result in reasonable rendering of the recognized image. For canvas with 2000 rows or columns, contour thickness of 4 points may be more appropriate.

### Recognition Statistics

The SketchRec software is capable of counting the recognized objects and presenting an itemized count by object category. Upon selecting 'Run' in the 'Start ...' menu under 'Recognition', the graphics recognition gets activated. The objects recognized are automatically rendered on the canvas and the recognition statistics populated. Note that the recognition statistics can be sorted in ascending or descending order by clicking on the icon for 'Total'. Note also that some rectangles may be classified as polygons.



**Figure 17:** Count capabilities of the SketchRec™ 2.2 software (simple illustration).

### Reliability Metric

The SketchRec™ software provides an estimate for its confidence in the accuracy of recognition results. This confidence metric is presented, through color coding, in the lower right corner of the user interface. The color coding is explained in Table 3.

Color	Meaning
Green	Recognition results are considered of high accuracy
Yellow	Recognition results are considered of medium-to-high accuracy
Magenta	Recognition results are considered of no more than medium accuracy

**Table 3:** Meaning of the color coding for the reliability metric.

## Intended Usage

Typical usage of the SketchRec™ software is summarized in Figure 18. The user first loads the input image into SketchRec, through 'File' → 'Open' in the menu (see Step A). The user then kicks off the recognition, through selection of the menu options for 'Recognition' → 'Start' → 'Run' (see Step B). The user next saves the recognized image as SVG and imports into the 3<sup>rd</sup> party tool of choice, for example Microsoft Word, Visio or PowerPoint (Step C). Importing into Visio can be an intermediate step, if minor clean-up is considered necessary. As noted in Chapters 1 and 2, the overall goal is to expedite the process of converting an initial design sketch into a 'presentable entity'.

Keep in mind the recognition only needs to be run once. Repeated runs are not likely to improve the accuracy.

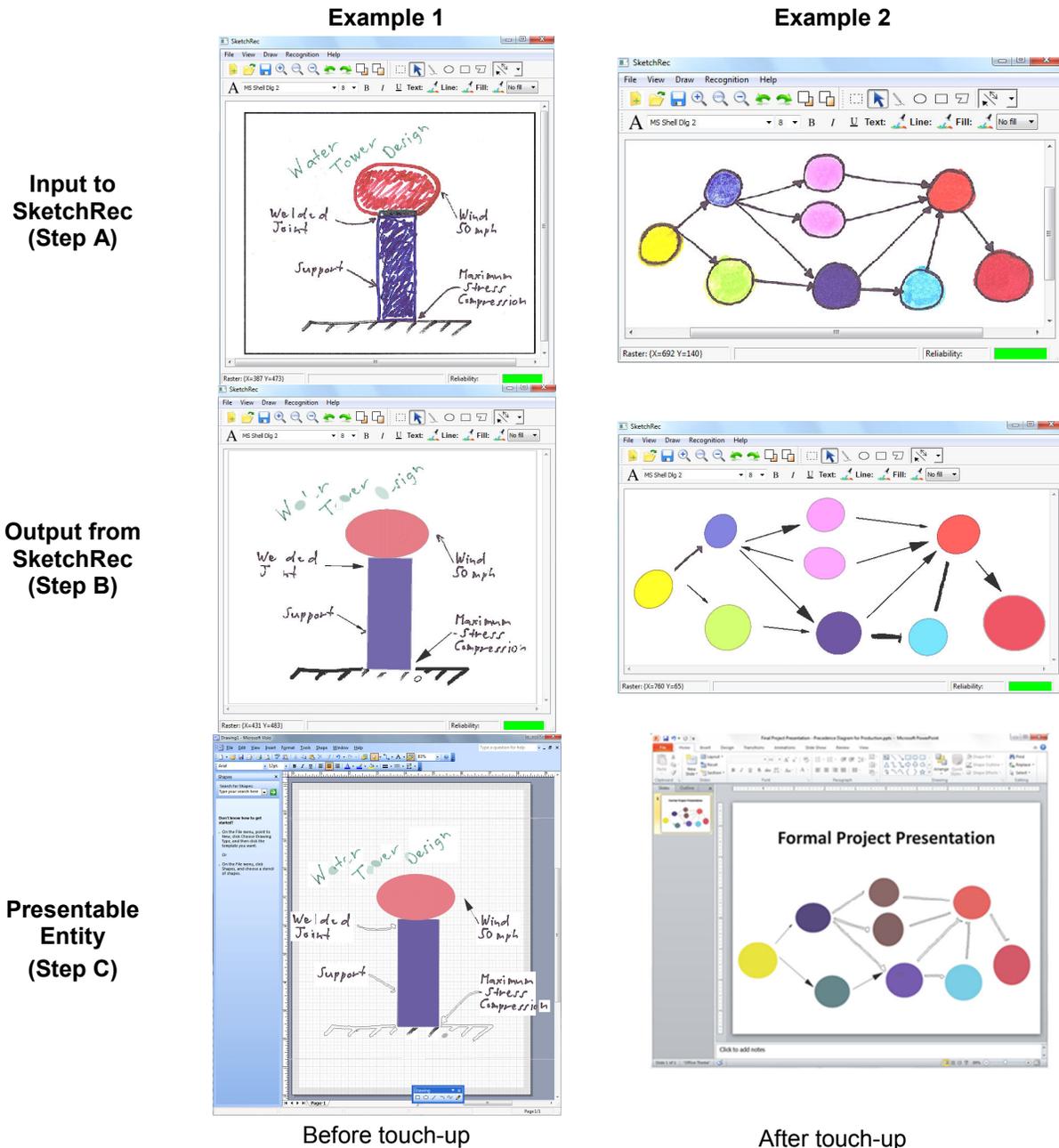


Figure 18: Sample output from the SketchRec 2.2 SW (from the Tutorial Samples).

---

## Input Formats

SketchRec™ 2.2 can import raster image in the BMP, JPG and PNG formats. The recommended scanning format is PNG. To help professionals add to or modify previous designs, SketchRec™ can also input vector images in the SVG format.

---

## Input Resolution

Input resolution of 200 – 250 dpi suffices for most practical purposes. It does not make sense to run recognition on images with resolution in excess of 500 dpi.

---

## Minimum Contour Thickness

For accurate recognition, SketchRec expects contours with minimum thickness of 2 points.

---

## Output Formats Supported

The SketchRec 2.2 SW allows the user to save the recognized image as Scalable Vector Graphics (SVG), Portable Document Format (PDF) or as a raster image (JPG or BMP). To realize the time savings offered by SketchRec, SVG is the recommended output format. For background information on SVG, refer to

[http://en.wikipedia.org/wiki/Scalable\\_Vector\\_Graphics](http://en.wikipedia.org/wiki/Scalable_Vector_Graphics).

---

## Types of Graphical Objects Recognized

The SketchRec™ 2.2 software supports recognition of the following object types:

- Polygons
- Rectangles
- Triangles
- Ellipses
- Circles
- Other objects
- Lines
- Connectors

Rectangles may be detected as polygons, as noted above, but should not be double-detected. 'Other objects' may unrecognized objects not conforming to any of the other object types.

---

## More on the Connectors

Generic connectors are classified as 'Connectors' unless they exhibit high degree of conformity with a line. The SketchRec™ software contains logic for assessing whether connectors contain an arrowhead or not. 'Lines' with an arrowhead are rendered as arrows. Otherwise, they are simply rendered as straight lines.

---

## Ability to Recognize Text Areas

The SketchRec software is capable of recognizing the areas in the image containing text. Upon running the recognition, the content of these areas is presented alongside the recognized graphics. Upon saving the vector graphics and importing into one of the supported tools, it only takes a few clicks to highlight and delete the text, if the user wishes not to include it in the final product (the presentable entity).

---

## 3<sup>rd</sup> Party Tools Supporting the SVG Format

The 3<sup>rd</sup> party tools supporting scalable vector graphics include, to name **some**,

- Microsoft Word

- Microsoft Visio
- Microsoft PowerPoint
- Libre Office (available both for Linux and Windows).
- OpenOffice (available both for Linux and Windows).
- Google Drawing
- Google Docs
- Google Chrome
- Mozilla Firefox
- Internet Explorer 9 and 10
- Corel Draw
- Adobe Illustrator
- Inkscape
- ImageMagick
- Scribus (for desktop publishing)

### Convenient Importing Procedure for the Common Usage Scenarios

For each of the common usage scenarios, Table 4 summarizes the procedure for efficiently importing the SVG graphics from SketchRec into the application used to create the final deliverable.

Scenario	Application for Final Deliverable	Importing Mechanism
Presentable entity consists of formal project report or presentation created in MS Office (MS Visio installed)	MS Word or MS Powerpoint	Import the SVG into Visio (→ File → Open) and copy into Word or Powerpoint
Presentable entity created in MS Office (no Visio installed)		If direct importing does not work, try importing SVG into a free 3 <sup>rd</sup> party application, such as InkScape or LibreOffice, generate EMF and import the EMF into Word or Powerpoint
Presentable entity created through Google Docs or Google Drawing	Google Docs	Simply select 'File' and then 'Open'
	Google Drawing	
Presentable entity created in LibreOffice or OpenOffice	Libre Office	
	OpenOffice	
Presentable entity consists of brainstorming notes exchanged through e-mail	MS Outlook	Simply attach the SVG, presentation or document as a regular attachment
	Gmail	Simply select 'Insert files using Drive'

**Table 4:** SketchRec offers convenient importing procedure for each of the common usage scenarios.

---

# Chapter 5: Touch-Screen Applications

---

## Primary Benefits

Compared to the raster-scan images, the touchscreen (Pro) version of SketchRec™ provides means for more direct input. For the latter, the user can run the recognition directly on the stylus image (no scanning needed).

## Assumptions

SketchRec™ 2.2 Pro was developed and tested on platforms supporting high-precision Wacom styluses, as opposed to the less expensive digitizers, supporting finger touch input, but no stylus.

## Platforms Supported

SketchRec™ 2.2 Pro is aimed at mobile users with convertible laptops running Windows 7 or Windows 8, with Surface Pro 2 or Surface Pro 3 tablets.

## Recommended Usage

The recommended usage of the SketchRec™ 2.2 Pro assumes the mouse is connected separately. Using the mouse, vector objects can be drawn directly onto the canvas, while the free-hand strokes can be provided using the stylus.

In the absence of mouse input, the user can draw on the canvas using the stylus, but also draw most objects (in particular rectangles, ellipses and the connectors). Polygon objects cannot be drawn using a stylus, since most styluses are missing the equivalent of a right-click button. Note that for free-hand drawings with the stylus, the user needs to enable the icon labeled 'free-hand drawing, eraser, stylus'.

## Further Recommendations on the Stylus Usage

1. Apply the Stylus at an Angle, and Don't Press Hard onto the Glass
  - For detailed instructions, refer to the user instructions for the stylus.
2. No Undo Needed for the Stylus Input, Since Most Styluses Support Erasing Functionality
  - Similar to regular pens, the eraser is oftentimes located at the end opposite to the tip of the pen.
  - Simply rotate the pen and apply the eraser.
3. The Eraser Thickness Matches the Stylus Thickness
  - When you adjust the thickness of the stylus pen, you are indirectly adjusting the eraser thickness as well.

## Sample Results

Figure 19 and Figure 20 contain sample results showing the recognized image, the corresponding count results as well as the PowerPoint presentation comprising the final presentable entity.

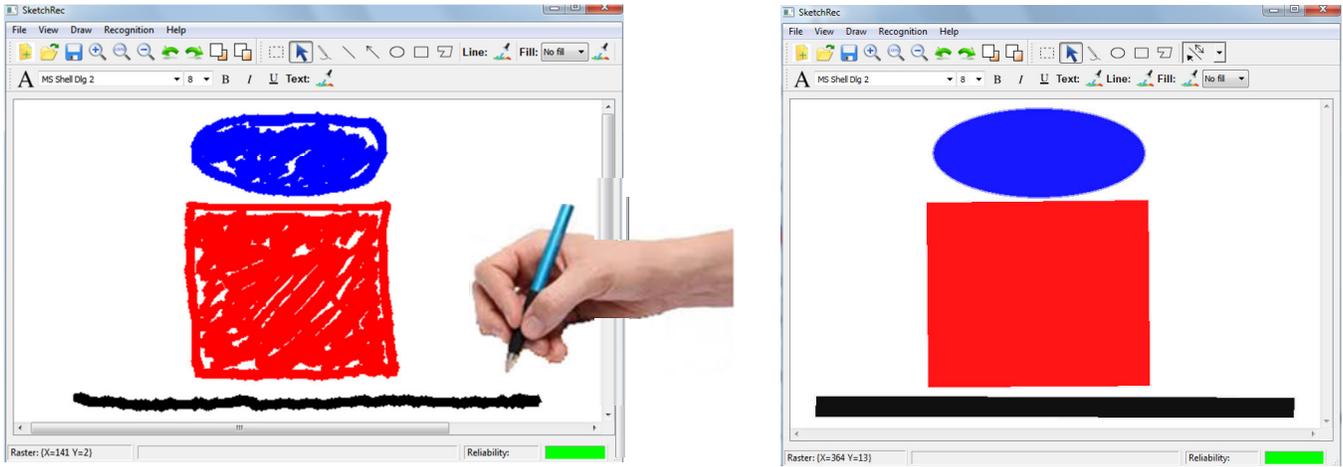


Figure 19: Input image from stylus (left) and the corresponding recognized image (right).

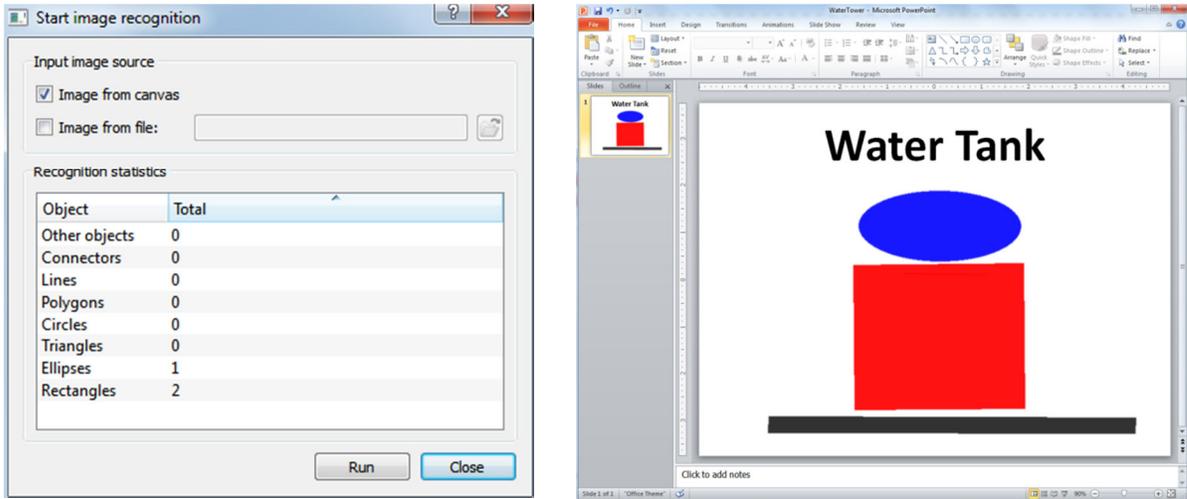


Figure 20: Mining (count) results and presentable entity for the input image in Figure 19.

## Appendix A: Frequently Asked Questions

Table 5 lists recommended resolutions for problem scenarios that could conceivably arise.

Problem Scenario	Resolution to Consider
Shape shows up in the recognized image, but is not included among the count statistics	<ul style="list-style-type: none"> <li>• Is the contour 'open'?</li> <li>• Consider fully 'closing' the contour.</li> </ul>
The colors don't come through correctly upon importing the SVG file	<ul style="list-style-type: none"> <li>• Check for a missing extension</li> </ul>
The SVG vector graphics are presented as a single figure, not as a collection of individual objects	<ul style="list-style-type: none"> <li>• LibreOffice or OpenOffice: Check for a missing extension</li> <li>• Google Drawing or Google Docs: Try converting the SVG into WMF (or EMF), using Inkscape, and then import the WMF (EMF) file</li> </ul>
"The application was unable to start correctly (0xc000007b)"	<p>This type of problem definitely should not arise with the SketchRec™ 2.2 SW. In the very unlikely scenario that you do come across this message, consider installing the following package:</p> <p><a href="http://www.microsoft.com/en-us/download/details.aspx?id=30679">http://www.microsoft.com/en-us/download/details.aspx?id=30679</a></p>

**Table 5:** Recommended resolutions for problem scenarios that could arise.

## Appendix B: Recent Enhancements

Release	Key Enhancements
1.0	<ul style="list-style-type: none"> <li>• Essential sketch recognition and search facility</li> </ul>
1.1	<ul style="list-style-type: none"> <li>• Visualization of thumbnail images from CATIA v.5 and Pro/Engineer part files</li> </ul>
1.2	<ul style="list-style-type: none"> <li>• Visualization of AutoCAD drawing (.dwg) files.</li> <li>• Additional tutorial samples (CATIA v.5, Pro/Engineer and AutoCAD).</li> </ul>
1.3	<ul style="list-style-type: none"> <li>• Enhanced visualization of thumbnail images from CATIA v.5 and Pro/Engineer part files.</li> </ul>
2.0	<ul style="list-style-type: none"> <li>• Sketch and search utility presented as separate applications.</li> <li>• Support for .PDF output.</li> <li>• Undo &amp; redo.</li> <li>• Significantly improved graphics recognition.               <ul style="list-style-type: none"> <li>○ For example detection of lines and triangles.</li> </ul> </li> </ul>
2.1	<ul style="list-style-type: none"> <li>• Introduction of a user-friendly interface, supporting               <ul style="list-style-type: none"> <li>○ Object selection and deletion</li> <li>○ Area selection</li> <li>○ Deletion of the content of an area selected</li> <li>○ Ability to adjust the position of objects selected</li> <li>○ Ability to adjust the height or width of objects selected</li> <li>○ Ability to insert polygon objects</li> <li>○ Ability to insert a variety of different connector types (lines and arrows)</li> <li>○ Ability to move an object to the foreground or send to the background</li> <li>○ Ability to identify obscured parts of the input image and scale recognized graphics to automatically fit inside the viewable area</li> <li>○ Ability to import SVG (say, a previous design, to be modified or enhanced)</li> <li>○ Ability to type in text</li> <li>○ Customizable thickness of the free-hand pen</li> <li>○ Customizable thickness of the stylus pen</li> <li>○ Seamless zooming of the scene with the mouse wheel</li> </ul> </li> </ul>
2.2	<ul style="list-style-type: none"> <li>• Resolution of problems associated with earlier versions of SketchRec™ appearing to hang up, when processing very large and dense input images.</li> <li>• Enhanced capabilities for moving and resizing objects with a stylus.</li> </ul>

**Table 6:** The key enhancements included in software versions released.