The Team with the Big Guns
Special Weapons, NSWC Crane

User Documentation

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Contents

1 General Information

1.1 System Overview

This system was designed for use assisting the Special Weapons Division, located at NSWC Crane, with analysis of targets used in scenarios where the acoustic system cannot be used, or as a supplement for the acoustic system. It is intended to replace the traditional method of measuring targets by hand with a fast and efficient means of collecting data on used targets.

1.2 Organization of the Manual

This manual describes installation of the SANTA (Small Arms Naval Target Analyzer) system, general usage, and some advanced settings. It is intended for consultation for any questions that may arise during general usage and installation of the system.

2 Installation Instructions

Follow these instructions to install SANTA on your computer.

2.1 Prerequisities

Make sure the following items are installed on your computer:

- Microsoft .NET framework version 2.0

  If .NET 2.0 is not installed, you can install it using the following instructions:

  1. Open your web browser, and navigate to `http://www.microsoft.com/downloads/details.aspx?familyid=0856eacb-4362-4b0d-8edd-aab15c5e04f5&displaylang=en`.
  2. Click Download, then Save.
  3. Run the file you just downloaded, agree to the terms and conditions, and accept the default install.

- Microsoft Visual C++ 2008 Redistributable Package

  You can install Microsoft Visual C++ 2008 Redistributable Package using the following instructions:

  1. Open your web browser, and navigate to `http://www.microsoft.com/downloads/details.aspx?familyid=9B2DA534-3E03-4391-8A4D-074B9F2BC1BF&displaylang=en`.
  2. Click Download, then Save.
  3. Run the file you just downloaded, agree to the terms and conditions, and accept the default install.

- Microsoft Office Professional 2007 (or Microsoft Office Professional 2003 with the Microsoft Office Compatibility Pack for Word, Excel, and PowerPoint 2007 File Formats)

  If you have Microsoft Office Professional 2003, you can download the Microsoft Office Compatibility Pack for Word, Excel, and PowerPoint 2007 File Formats:

1. Open your web browser, and navigate to `http://www.microsoft.com/downloads/details.aspx?FamilyID=941b3470-3ae9-4aee-8f43-c6bb74cd1466&displaylang=en`.
2. Click Download, then Save.
3. Run the file you just downloaded, agree to the terms and conditions, and accept the default install.

If you do not have Microsoft Office Professional 2003 or 2007, you can purchase 2007 from `http://office.microsoft.com/`.

2.2 Installation

1. Unzip `SANTA 2.0` into the directory of your choice, for example: `C:\Program Files`.
2. Open this folder and right-click on the file `SANTA.exe`.
3. Select Send To → Desktop (create shortcut).
4. You can now run SANTA from the shortcut on your desktop.

2.3 Initialization

The first time the program is run, you will need to select the default Report Template, Database, and Log files. To do this, for each item indicated, click browse, navigate to the file you unzipped `SANTA 2.0` to, and select the default file (the only one available for selection). When done, click save changes and then close. The installation is now complete.

3 Using the Application

3.1 Home Screen

When the program is opened, the home screen will be displayed. From this, most functionality can be accessed.

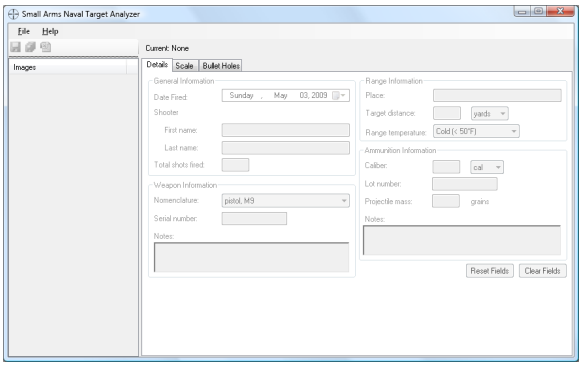

Figure 1: The home screen.

3.2 Opening Images

The most basic functionality is opening an image or set of images to manipulate. There are three options for opening images. Selecting them one at a time, selecting a folder, or opening a saved image from the database.

3.2.1 Selecting Image Files

To open a single image or a set of individually chosen images, go to File, Open, Single image. From here, you will be prompted for the file(s) you wish to load. To open a folder of images, to to File, Open, Folder of Images. From there, you will be prompted for a folder to import all of the images from. From this folder, all valid images (JPG and PNG) will be loaded into the program.

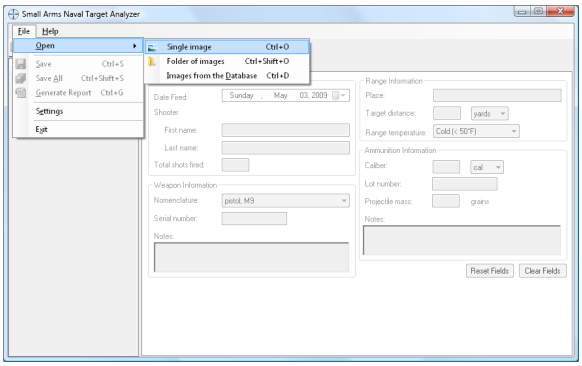

Figure 2: The home screen.

3.2.2 Opening Saved Image From Database

In the event that you have a saved image you wish to retrieve, you can use File, Open, Images from the Database. In the dialog box you are presented with, enter the ID #'s of the image (see Figure 3), making sure to separate each id with a space (see Figure 4).

3.3 Entering Individual Details

After selecting which images to process, the names of the images will appear in the pane on the left side of the window. On the right, the input fields will be visible and editable when an image is selected (seen in Figure 5). Initially, exclamation marks will be seen, indicating fields that are required for the report or image recognition to function properly, and items in the left pane in red indicate images that have at least one exclamation mark.

3.4 Entering Details for Multiple Images

Many times, many of the images will have the same details. In order to enter these details once, in the left pane, hold CTRL and select each image that will have the same details. When all images have been

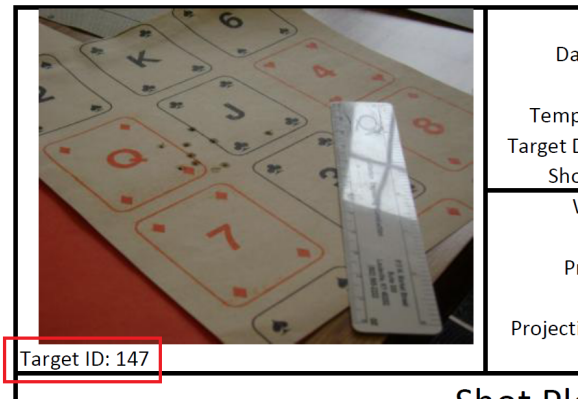

Figure 3: Location of the target ID.

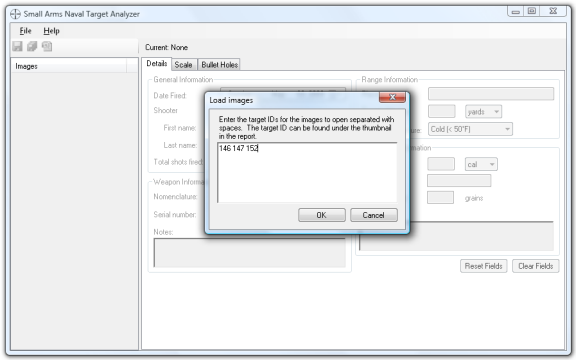

Figure 4: Entering multiple database files.

selected, the display will represent the commonalities among the files (ie any detail shown will be common to all files). Editing this screen will change only the modified elements for the files selected. When finished, select a single image and resume editing as normal.

3.5 Determining Image Scale

After entering the image details, a scale must be positioned to convert from pixels to inches. Select the Scale tab to be able to adjust this. The indicator (visible in figure 6) should be positioned such that the red line is vertical and the blue line is horizontal relative to the image contents. The length that each line represents can be adjusted at the top of the window. If you desire that these lines are perpendicular to each other, then button located immediately adjacent to these will lock the axes perpendicular (all seen in Figure 7).

Moving the points can be done by holding `Ctrl`, clicking on one, and dragging it. All of them can be moved together, keeping their present arrangement, by right-clicking and dragging while holding `Ctrl`. For general image navigation, see section 3.8.

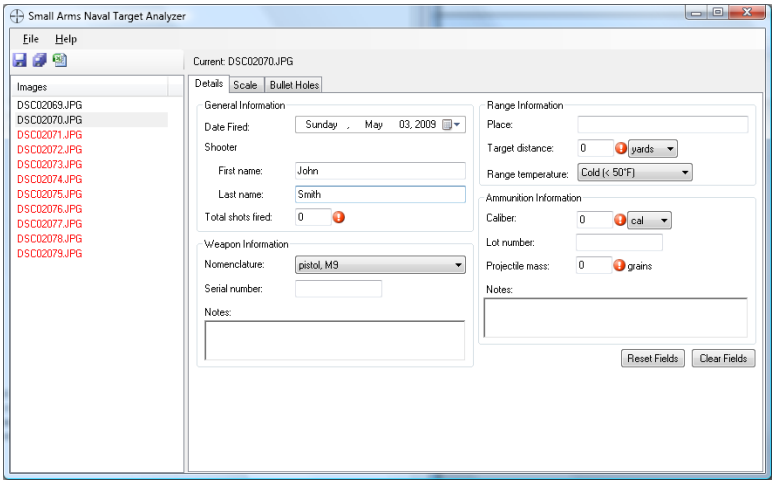

Figure 5: The detail input and scale setting window.

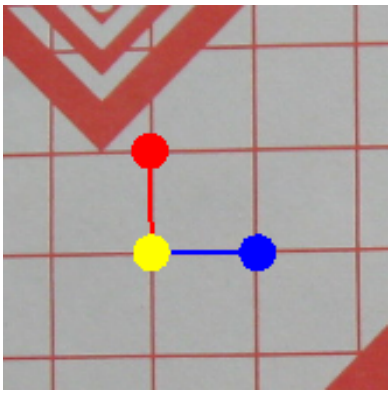

Figure 6: The scale indicator.

3.6 Selecting a region of interest

In order to obtain a more specific region of interest, as well as to define the region plotted in the report, move the outside green rectangle immediately around the holes. This can be done in a similar manner as moving the scaling points. Simply hold `Ctrl`, click on one of the corners, and drag it.

3.7 Image Recognition

After entering a caliber, determining the image scale, and selecting a region of interest, SANTA can automatically guess at where the bullet holes are on the image. While you can clear the guesses if they are incorrect, having correct results will save you time. Here are some things you can do to increase the accuracy of the image recognition phase:

- Use at least a 4 Megapixel (roughly 2300 x 1750 resolution) camera.

Figure 7: Adjusting the scale values and forcing scaling axes to be perpendicular.

- Take the picture with the camera pointed straight at the target with minimal slanting.
- Use high contrast in the background and the bullet holes. For example, if the target is white, take the picture with a black background so that the image has the white target with the bullet holes appearing black.

If you remember these items, you can save a great deal of time while processing large batches of images.

3.8 Navigating the Scale and Bullet Holes Windows

General image navigation primarily involves the left mouse button and the scroll wheel. Clicking anywhere in the image panel and dragging will move the image in the direction of the mouse. Scrolling up will zoom in on the portion of the image under the cursor, while scrolling down will have the opposite effect. The image can be reset to the center of the panel and its original zoom level by clicking the scroll wheel.

Beyond moving around the image, placing, moving, and removing bullet holes can be done with the left mouse button while holding `Ctrl`. See the following subsections for specific details.

3.8.1 Adding Bullet Holes

Clicking on the "Add Hole" button or pressing `Ctrl+A` will put the editor in "add hole" mode. Clicking on the image while holding `Ctrl` will place an indicator on the image. Additionally, while holding `Ctrl`, the holes can be moved by clicking and dragging.

3.8.2 Removing Bullet Holes

Clicking on the "Remove Hole" button or pressing `Ctrl+R` will put the editor in "remove hole" mode. Clicking on any indicator in the image while holding `Ctrl` will remove the indicator.

3.9 Saving Data

Clicking on the "Save to Database" button or pressing `Ctrl+S` will save the image data (details, image name, indicators, etc.) to the database.

3.10 Generating a report

Clicking on the "Generate Report" button or pressing `Ctrl+G` will first save the image data to the database then prompt for a filename with which to save an Excel report.

4 Reports

As reports are the eventual output of this system, the functionality of the report is essential for the success of the system. The following is a set of information to allow for reports to be an effective part of this system.

4.1 Template

At the heart of the report is a template. The template is a bare bones skeleton of the report's layout and is used by the system to generate the report. The most critical component of this template is the plot; this plot must be configured to use the cells the program will output to as the basis for plotting points, lines, and circles on the graph.

4.2 Modifying Original

Modifying the report that is generated can be done through modifications to the settings panel and report template file.

5 Settings

In order to anticipate the needs that may arise in the future, there are various settings that may be modified in the program. To modify them, go to File, Settings.

5.1 General Settings

These settings are the most basic settings, and the most likely to be changed. The first three are the locations of critical files to the system. They should be the complete path names to these files. Typically, they will point to Report Template.xlsx, SANTADB.mdb, and Log.txt, however, future needs may require these to point elsewhere.

The other setting that may be changed is what happens after a report is generated. By default, you will be prompted whether you want to open the file. Other options available are doing nothing or always opening the file.

The save changes button will save any changes made; reset will reload the data in the database, and close will exit this window.

5.2 Report

The report template specified in the General Settings is purely a template report. In order to provide further customization, you can change the cell location and date formats of the report based on the settings in this tab. Changing a cell name here will change the output location in the report.

5.3 Weapons

This is a complete listing of the weapons available to choose in the image details. Additional weapons can be added here.

6 Revision History

Version #	Date	Revision Description
0	2 February 2009	Created outlined document.
1.0	18 February 2009	Completed documentation for version 1.
2.0	4 May 2009	Updated documentation to SANTA 2.0 beta.
2.1	22 May 2009	Finalized SANTA 2.0 documentation.

7 Future Maintenance

In order to update SANTA in the future, only the following files may need to be updated:

1. SantaCPP.dll
2. SANTA.exe
3. SANTA.exe.config
4. Report Template.xlsx
5. SANTADB.mdb

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[6] "Portable Network Graphics." Chris Lilley, World Wide Web Consortium, 17 Mar 2006, http://www.w3.org/Graphics/PNG/.

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Glossary

The **Joint Photographics Experts Group (JPEG)** [5] is a committee for image standards. JPEG is more commonly associated with an image file format. It is used for compression, but the compression causes some loss of data.

Mach number is the velocity of an object divided by the velocity of sound.

Microsoft Excel [3] is a spreadsheet program created by Microsoft Corporation.

Microsoft Windows [1] is a family of operating systems created by Microsoft Corporation. The operating systems provide a layer of abstraction between computer users and the underlying hardware.

NAVSEA [9] stands for Naval Sea Systems Command. This branch of the Department of Defense's mission is to develop, deliver, and maintain ships and systems on time, on cost for the United States Navy. It exists to serve the seaman.

Naval Surface Warfare Center Crane (NSWC Crane) [2] is the third largest naval base in the world. NSWC Crane's mission is to "provide engineering and technical services with a product focus in sensors, electronics, electronic warfare and special mission weapons..." [2].

NMCI, also known as Navy Marine Corps Intranet, supports all of the software and network solutions for the United States Navy. This is the department that will have to be consulted for final product distribution, as well as for database development.

NSWC stands for Naval Surface Warfare Centers. The NSWC centers are divisions of NAVSEA that perform specific duties within the NAVSEA organization. NSWC is the primary weapons depot for the United States Navy.

Portable Network Graphics (PNG) [6] is an image file format. It has no loss of image data.

super-sonic is defined to be any object traveling at or above 1.15 Mach.