

## 3.0 Activity 3. Identify, Procure, and Test Advanced Technology Data Collection and Verification Systems for FAA Safety Data

The contractor shall continue to investigate emerging technologies not covered in other research efforts for field data collection and verification that hold promise of increasing inspector efficiency and effectiveness.

### 3.1 Remote Access Software

For an Aviation Safety Inspector (ASI) who is at a remote location away from the office, the ability to connect to the office computer to upload and/or download files via a modem has the potential to be a valuable asset. We performed a literature review on remote control software and selected a product highly recommended for purchase and conducted an evaluation. These products also will connect to a Local Area Network (LAN).

Unauthorized access to a Host system is restricted by the use of a user ID and password. The user ID also contains the default settings of that user's local machine. These default settings include modem and Network configurations, printer output destination, keyboard handling, cache file size, file transfer protocol, etc.

#### *Application Capabilities*

This application allows the user to either operate as a host computer or contact a host from a remote location. When at a remote location calling a Host computer, the user can maintain a list of hosts that may be called. Each host has its own setting like computer name, phone number, recording, logging etc. If connecting over the network, it will then show a list of available hosts to choose from. When assuming the role of a Host, the user can specify the privileges for the caller. Each caller can have their own privilege or every caller can be provided with the same default privileges. Privileges include permission to reboot host, blank host screen and keyboard handling method, etc.

When operating as the remote computer, the user can bring up the on-line menu from the control menu of the current session. The on-line menu contains a number of functions: (1) End session; (2) File Transfer function that will bring up a file manager in which the user can transfer from or to the host machine, (3) Reboot host, (4) Save screen function that will save the current screen to be viewed later or stop the recording of the current session, (5) On-line setting function will display a dialog box to change the remote operation setting and also provide a Chat function to let the user interactively query someone at the host machine, (6) Scripts function allows the user to define and edit new script and the script to be run on the current session, and (7) Turning the recording off.

The script language provided by the software is quite complete from the point of view of terminal emulation program or using DOS application. However, the script language was designed for text-based application. It would have been nice if the script would have provided more control over the Windows environment like choosing a menu or accessing a window.

This application allows the user to record the session and save it into a file. This allows the user to play the session back at any future time. It can also capture a particular screen and display it later. Moreover, it provides a logging function that can keep track of activities and statistics within a session. It keeps track of when the session starts and ends, information concerning files transferred, and names of computers connected that were connected.

One drawback of this application is that after it is installed, if the user wants to change the resolution of the computer display or install a new video driver, the application must be either reinstalled or the user must modify the SYSTEM.INI file to reflect the change.

### *Performance Evaluation*

The application response speed operating within the Windows environment has to be discussed in two aspects: displaying speed and processing speed. The sharing of menus and dialog boxes from the Host computer to the remote computer was a slow process. The cache file size was increased but there was no noticeable improvement. When the DOS window was open the response time was decreased. This indicates that the delay is due to the transfer of the graphical images. On the other hand the actual file copy time is dependent on network traffic. During times of light network traffic we were able to transfer a one Megabyte file in two minutes. During moderate network traffic, two minutes is required to send a 250 KB file. We found that we were able to improve the file transfer situation by first copying a file from either the Host or remote computer to a network drive first then have the other computer copy it to its own hard drive

## **3.2 Handwriting Recognition Software**

The contractor has evaluated several handwriting recognition software engines that recognize printed characters. We became aware of a product that was released recently that advertised to be able to recognize both cursive and printed handwriting. We purchased this product and performed the following evaluation.

This application is a word-based recognizer which recognizes handwriting word-by-word instead of character-by-character. It finds the closest match between the user's handwritten word and the words in the dictionaries that are currently in use. This application will not recognize words that have any of the following; (1) all uppercase letters, (2) a capital letter in the middle of the word, or (3) punctuation in the middle of a word.

To use this application, the user can write directly to the application that is being used if it is designed to recognize pen inputs. The other option is to use the sub-editor that comes with this application. To use this sub-editor, the user first activates the window that contains the sub-editor. The user then writes the desired text onto the sub-editor which then translates it to text. At this point the user has the option to rewrite the words or modify the translated text using a single character editor. This application will also provide a list of alternatives optional words which the recognition engine identified as similar to what was written so that the user can choose from the list instead of rewriting the whole word again. When the word or text is correct, it is then sent to the application.

## Evaluation

Since the recognition is restricted by the dictionaries used, the testing material was structured so as not to contain too many special names or acronyms. We decided that the form for reporting aircraft accidents satisfied this requirement. A Visual Basic form was created to allow user to input these data. Two people were invited to participate in the tests. Here is the outline of the testing procedures.

### *Introduction to Pens computing (10-15 min)*

- Let the participant go through the "Learning Pens Basic" program (10 - 15 min). This program will teach the participant how to use the pen.

### *Introduction to the application (5-10 min)*

- Explain rules with examples
- 2 ways of input
  - a) Write directly onto the application
  - b) Use the Editor
    - Explain different options available
    - Show the functions available

### *Practice (10 min max.)*

- Let the participant to write using the pen until he feels comfortable with the environment

### *Fill out the form (15 min max.)*

## Results

In general, more negative comments are collected than positive comments. The comments are summarized as follow.

This application does recognize cursive writing well if the user's hand writing is good and does not contain any numbers or special names. Also, the speed of recognition is very good. For example, a ten word string will take approximately one second to translate.

One the other hand, this application does not recognize punctuation and all capital letter acronyms. Numbers are also easily mis-recognized. The reason is that the recognition engine tries to find a closest match from the dictionary for every entry. It tries to recognize the numbers and surrounding letters together as a word. The numbers are then recognized as letters instead. Moreover, it seems that the chance is higher to recognize a character as a letter than as a digit. The numbers 0, 1 and 5 are often recognized as the letters O, l(lower case L) and S respectively. In general, many of the typical data entry text that is used by ASIs, such as acronyms, all capital abbreviations, and numbers are not accommodated by this software.

The other issue is that this application does not recognize editing gesture well. This problem is important because there are always mistakes. A large amount of time is spent in correcting the mis-recognized words. In addition, when a written word is recognized as different word, the whole word has to be corrected. Compared to other character-based recognizers, it takes more time to correct a whole word than correcting characters within a word.

This recognition engine does not require training due to the fact that it claims that the manufacturer claims its product is handwriting independent. This means that it can recognize all styles of handwriting. Unfortunately, a character in one person's style may be very similar to another character in a different person's style. The more styles it can recognize, the higher possibility this situation happens and the easier it mis-recognizes words. Other recognizers which provide training a function can usually recognize less number of styles but more accurately.

In summary, while this application is able to do a good job at recognizing typical written words, it does not recognize the typical type of handwritten entry that ASIs use on a daily basis. The following is a summary of the brief evaluation that was conducted.