Operator’s Manual
Memory Software Game

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Important Safety Instructions:

Follow any safety instructions from the manufacturer associated with your laptop or computer and microphone.

Parts and Accessories:

The game is divided into several components, which you will encounter as you progress through the game. They include the following:

1) Create/Select/Edit/Remove Profile form
2) Add Person form
3) Photo Library form
4) Create Scenario form
5) Run Scenario form
6) View Statistics form—time & score

Details on each of these components, as well as corresponding figures, may be found in the “Software Description and Troubleshooting” section. The game also includes a USB Desktop Microphone from Logitech.
Features:

One of the stand-out features of this software is the application of the Microsoft Window’s Voice Recognition Library for .NET 3.5. The software uses this library to record and recognize the names spoken into the microphone by the user. This application also allows you to adjust the confidence interval for voice recognition, depending on the user, which allows for greater personal flexibility while running the game.

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1 Introduction:

This Memory Game application was written in C# using the .NET framework libraries. The Microsoft Windows Visual Studio 5.0 environment was used to code the game. The intent of this game is to improve memory recall in patients with Alzheimers’, dementia, or short-term memory loss, through the use of images and repetition. The game allows the user to upload personal pictures, create lists of persons (names and photos), called scenarios, and then run these lists within the game space. As each picture in the selected scenario appears, the user says the name of that person into the microphone and the game discerns if this is the correct response or not and gives feedback. The game times the length of the scenario and the score for each run, and then these statistics may be viewed in both table and graph form. All data is saved by the game.

Requirements:

1) Operating System: Vista, Windows 7, XP

2) .NET 3.5 (included with installer)

3) Microsoft Charts Data Visualization Libraries for .NET 3.5 (included with game installer)

4) Microphone and drivers (included with microphone):


1.1 User Profiles

1.1a Creating/Selecting/Removing a User Profile

Upon entering the game, you will see the form pictured in Figure 1 below. Before being able to proceed with the game, you will have to create a new user profile or select a previously created user profile.

If selecting a profile, either type the name of the profile in the text field next to “Select Profile:” or highlight the desired profile in the box below the text field. Then click the button which says “Select Profile.” Removing a profile involves the same procedure except the button “Remove Profile” is clicked at the end.
Figure 1: Create/Select/Remove user profile Form

Figure 2: Adding a new user profile to the game
If you want to create a new profile, click “Add Profile.” Another text box will appear where you can enter the name of the new profile which you wish to add (See Figure 2). In this case, the name of the profile is “Joe Bob.” After you’ve entered a name, press “Update Profile.” You have now created a new user profile!

**Note:** Whenever you click “Add Profile” or “Edit Profile”, you will also have the option of changing the voice recognition confidence level by moving the slider, as shown in Figure 2. By default, it runs at 93%. The higher the percentage, the “more certain” the game will have to be about the answer given in order to consider it correct. You can try the game out and adjust the level. Sometimes different voices need different confidence levels. If the game is considering wrong answers correct, you may need to increase the confidence level for that profile. If it is considering correct answers to be incorrect, you may need to lower the confidence interval. Voice recognition is not a precise science, so you may have to make some adjustments as you go, depending on who is playing the game. However, 93% is usually very sufficient, so don’t change the level unless you must.

**1.1b Editing and Switching a Profile**

If you are in the middle of the game and decide to switch the user profile, you may do so by clicking on File >> Switch Profile (Figure 3). The initial profile form will appear on your screen again and you can select the profile to which you want to switch.

If you wish to edit a profile, as in change the name, highlight the profile you wish to edit in the box below the text field, and then click “Edit Profile.” A new text box, like that which appears for adding a new profile, will contain the name of the profile you selected. You may delete this and type a new name. Then, click “Update Profile.” The profile has now been edited.

Every time you exit the game by clicking File >> Save and Exit or the “X” at the top right hand corner of the screen, the game will automatically save all your data. However, if your computer crashes, you may lose data. Therefore, if you wish to save as you go, simply click File >> Save, and you’ll be certain to protect your data.
1.2 Adding People to the Game

All of the people, with corresponding names and pictures, which you wish the game to include, may be added by first selecting Scenario >> Add People, as pictured in Figure 4 below. The form pictured in Figure 5 will appear on your screen.
Once the add person form in Figure 5 appears on the screen, you may type in the names of the person you want to add: first name, last name, an alternative name (i.e., nickname), and full name. When playing the game and speaking the name into the microphone of the person who appears on the screen, the game will recognize each of these 4 name alternatives. So, for instance, if John Wayne’s picture appears during the game, if you say “John” or “Wayne” or “Duke” or “John Wayne” into the microphone, the game will accept any of those options as correct.
You may also add a photo for each person you create. Click the “Add Photo” button shown in Figure 5. Then the dialogue boxes, pictured in Figure 6, will appear on your screen. First, the photo library form will appear and you can select a photo directly from the library (Figure 7). (Note: You need to click directly on the picture NOT the whitespace in order to add the photo to the person). Simply select the photo of your choice and click “Save.” You may also add a new photo to the library from another file by clicking the “Add Photo” button in the photo library. A dialogue box will appear from which you may navigate to any folder where your photos are stored. Select the photo(s) you wish to add and click “Open.” This adds the selected photo(s) to the game’s photo library. Then, from the photo library, select the photo you wish to correspond to the person you are creating. Once you have selected a photo for the person, and clicked “Save”, the picture will appear in the box, as shown in Figure 8. Click “OK” in the message box which says “Person created,” as shown in Figure 9. You have now added a new person to the game!

Note: You may also dump photos into the photo library without attaching them to a person by going to Photos >> Photo Library. Then you will have photos available in the library for future use. There is a celebrity photo folder from which to take names and pictures that comes with the installer. It is in C:\Program Files\Memory Game\Celebrity Photos.
Figure 6: Adding a photo for a person

Figure 7: Photo library
Figure 8: Selected photo appears in picture box

Figure 9: New person created
1.3 Creating a Scenario

A scenario is a list of persons, which you can create, to run in the game. In order to create a scenario click Scenario >> New Scenario. The form pictured in Figure 10 will appear on your screen. A list of available persons will appear in the left box. You may select any combination of people to add to a scenario by highlighting the name and then clicking “Add Person to Scenario.” The person’s name will then appear in the right box entitled, “Persons in Scenario,” as shown in Figure 11. Once you have added all desired persons to the scenario, enter a name for the scenario in the text field below the selection boxes. The name MUST be unique to all other scenario names. Then click “Submit.” You have now created a scenario!

You may remove a person from a scenario by highlighting the name in the right box and clicking “Remove Person from Scenario.”

![Figure 10: Creating a scenario](image)
1.4 Selecting a Scenario

In order to select a scenario to run in the game, go to Scenario >> Run Scenario. The form pictured in Figure 12 below will appear on your screen. You can choose the scenario you want to run by highlighting its name in the box and then clicking “Select.” You may also create new scenarios from this page by clicking “Add.” This will take you back to the form described in section 3 for creating new scenarios.

After you have selected a scenario to run, a message box will appear to remind you to make sure your sound is setup on the computer, as shown in Figure 13. See the requirements above for tutorials on setting up the microphone.
Figure 12: Selecting a scenario

Figure 13: Make sure the sound is set up on your computer
1.5 Running a Scenario

Once you have selected a scenario, you are ready to play the game. After pressing “Ok” in the message box reminding you to set up the sound on your computer, the form pictured in Figure 14 will appear on your screen. The first picture in the selected scenario will appear in the picture box. For each person in the scenario, you will have 3 attempts to recall the name. Before each attempt, you must press the button with the microphone below the score box. If you do not do this, the game will not record your answer. Once you have clicked the button (which turns blue and starts the timer), say the name of the person into the microphone. If the answer is correct, a big “CORRECT” will appear in the empty space below the picture, and the screen will automatically switch to the next person. The “Right” score will be updated and the process will repeat. If the answer is wrong, a big “WRONG” will appear in the empty space and the attempts indicator will decrement by one. If you do not get the answer correct in three attempts, the “Wrong” score will be incremented and the screen will switch to the next person. Audible feedback is also included, so make sure your volume is turned up, if you wish to have this feature. When you have completed the scenario, a message box with the score and time will appear.

![Figure 14: Run scenario form](image-url)
1.6 Viewing Statistics

At any time, you may view the statistics for your particular profile. Go to Statistics >> View Statistics. You may view statistics by scenario or by person. Select as many scenarios or persons as you want and then click “Load Charts.” Click the different tabs—Table, Time Chart, Score Chart—to view the data in different forms. Figures 15, 16, and 17 demonstrate this.
2 Maintenance:

Changes may be made to the game by someone who is familiar with the C# language, as the code will be supplied to you. Keep the microphone in room temperature and away from water and wet surfaces.

3 Technical Specifications:

The memory game application is designed for practicing facial recognition through memory stimulating exercises. The goal of the application is to improve the user’s ability to recall common names based on visual prompts, typically a photograph. The main consideration of design is to make the program as accessible as possible to users of the User role type. This is due to the anticipated variability in users’ prerequisite knowledge of computers and ability to interact with user interfaces. The design that was chosen to be implemented utilizes Microsoft Window’s Software Development Kit (SDK) with the .net framework. This is a freeware kit that allows developers to use the Window’s environment to create customized applications. Microsoft’s Visual Studio Integrated Development Environment, which may be downloaded for free, will be used to develop the game. This design was chosen as it is the most cost-effective option, while also providing all the necessary means for creating both a simple graphical interface and a voice recognition component. In general, two roles will exist in this program. These roles are discussed below, and Figure 5, above, describes the tasks available to each role, as they comprise the whole program.
3.1 Administrator Role

The default mode of memory application will give access to Administrator and User roles. Administrators will have open, create and update access to the user profile database. Administrators will be able to export and import scenario data and initialize a User role session.

3.2 User Role

Once an Administrator has initialized a scenario, the user interface is simplified to show only the items necessary to run the scenario. Users will use their voice or keyboard to input the name associated with the displayed picture at each round. (They will automatically be advanced to the next round upon completion). A score indicator will be provided after all rounds of the scenario have been run and the user interface will revert to reflect the administrator role.

3.3 Subunits

**System Overview**

The application will consist of several subsystems. An intuitive user interface will allow the User to access the full functionality of the application through a menu system. Additionally a profile database will keep track of the Users of the program, their associated persons, scenarios, and photos. A handler class will be used to create files containing information on a scenario or load a scenario file. A speech handler class will be used to enable speech input for names during a User’s scenario session. Figure 9 below is a detailed break-down of all the classes, variables, and methods that will be necessary in the code.

![Figure 9: UML class diagram](image-url)
**User Interface (Administrator Role)**

Upon entering the application, the User will be prompted to create or select a profile. The list of current profiles will be loaded from the profile database. Creating, editing or switching profiles can be accessed at anytime from the top menu bar of the program window. The default interface upon admittance will show a list of recent scenarios, a button to run those scenarios, and an option to create new scenarios. Creating or editing a scenario will bring the user to a list of persons attached to that user’s profile. Persons may be added to the scenario list in a one to many relationship so a person can be used more than once in a single scenario. Randomized scenarios can be created and run on the fly from this screen. Additional persons may be added from within the Administrator role user interface. A panel containing various fields pertaining to a person are available from the edit/create person menu option. A person and photo library are maintained within each user profile database.

**User Interface (User Role)**

The User session is automatically initialized when a scenario is run. The application window then switches to full screen mode and the first round commences. A round consists of a photo being displayed to the User and the User speaking the correct phonemic pattern into the microphone or typing the correct text into the provided text box. The round is then scored for correctness and a new round is shown until all rounds in the scenario are exhausted. The user interface will then revert to the Administrator role and display statistics. Figure 10 below describes the sequence of events that would occur upon running the game for both the User and the Administrator roles.

![Sequence diagram](image-url)

**Figure 10: Sequence diagram**
Profile Database

The back end of the memory game application consists of a profile database. The profile database will be stored and encrypted in save files and handled through a Data Access Object. Figure 11 below describes this database in more detail.

![Database diagram](image)

Figure 11: Database diagram

Scenario Save Handler

A specially designed class will be used to create encrypted scenario files. These files will consist of the person list associated with the scenario and any other settings needed to run the scenario. This will enable exporting and importing files between workstations or directories.

Speech Recognition

Speech recognition is an essential characteristic of the memory game application. The program will achieve this by using the system.speech reference of the .NET libraries. This reference will import Speechlib SDK 5.3 for Windows Vista operating systems and SDK 5.1 for Windows XP operating systems. A speech handler class will handle all speech interaction containing methods to start and stop listening, identify and compare phonemes, and store phonemes for comparison.

Required Hardware

A properly installed microphone is necessary for the speech components of the memory game application to work. Using the Windows speech training wizard increases the accuracy with which the speech libraries can recognize the User’s voice. The team anticipates the
program will have minimal memory cost. Recommended system requirements will likely be 512MB of memory on XP machines and 1GB of memory on Vista machines.

**System Dependencies**

The memory game application requires Windows XP or Windows Vista. A CD-Rom drive is required for installation. .Net 3.5 libraries must be installed on the system for the application to run voice components properly.

**4 Troubleshooting:**

The code will be supplied to the client for revision and changes to the game.

![Troubleshooting Diagram](image-url)

Figure 12: Troubleshooting Diagram