**Baines Image Quizzer**

**Installation**

**Image Quizzer Project**

* The Image Quizzer project is available with special access permission through GitHub or in some cases, the study coordinator may set up a USB containing the Image Quizzer module and encrypted study data. (VeraCrypt is an application that can be used to encrypt data and mount the encrypted volume onto your PC; admin rights are required.)
  + ImageQuizzerProject folder which contains the following:
    - **Documentation** folder
      * **Image Quizzer Installation.docx** – this document
      * **XML Elements and Attributes**.xls (keywords to create the script)
      * **3D Slicer** – Keyboard Shortcuts.docx (popular shortcuts when in quiz)
      * Plus other support documents
    - **ImageQuizzerStartup**.bat – starts the Image Quizzer and does cleanup on close
    - **(ImageQuizzerShutdown**.bat – updated when running the quiz; may not exist on install)
    - **ImageQuizzer** folder – holds the module to run the quiz
* Update the startup batch file
  + If 3D Slicer was loaded into the default directory, the **ImageQuizzerStartup.bat** file may run as is. Default directory for 3D Slicer:
    - C:\Users\*username*\AppData\Local\NA-MIC\Slicer 4.11.20210226\Slicer.exe
  + If not, you can update the directory that points to the current installation of Slicer.exe
    - In Notepad edit the file **ImageQuizzerStartup.bat** located in ImageQuizzerProject folder
    - Replace the following lines:
      * cd /D %LOCALAPPDATA%
      * set SLICER\_LAUNCHER="NA-MIC\Slicer 4.11.20210226\Slicer.exe"
    - with the full path to Slicer:
      * set SLICER\_LAUNCHER=”...\Path\To\ NA-MIC\Slicer 4.11.20210226\Slicer.exe”

**3D Slicer**

* Install 3D Slicer
  + Download Slicer version 4.11.20210226
    - https://download.slicer.org/download?os=win&date=2021-02-26
  + Double click on the downloaded .exe file
    - Accept installation defaults
  + We are using version 4.11.20210226; revision 29738
    - Using any other version of Slicer may have unpredictable behavior for this application
* Install 3D Slicer extensions : SlicerRT, mpReview
  + Open 3D Slicer
  + Select View > Extension Manager
    - In the Search field (upper right-hand corner) input SlicerRT
    - Click Install
    - There will be a message to say the extension was installed
    - Click on Restart (bottom right-hand corner) and OK
  + Repeat for mpReview extension (optional)
    - Can be used as a preprocessor to convert dicom series to nrrd (or nifti) to speed up loading of images when running the quiz
* Set Slicer application settings to be compatible with Image Quizzer
  + Open 3D Slicer
  + Select Edit>Application Settings
  + Select DICOM in the left-hand panel
    - Set Preferred multi-volume import format = volume sequence
    - Set Load referenced series = Always
  + Restart 3D Slicer if prompted
* Connect the Image Quizzer module
  + Open 3D Slicer
  + Select Edit > Application Settings
  + Select Modules in the left-hand panel
  + Click Add in the panel to the right of “Additional module paths:” (may have to click the ‘>>’ button)
  + Search for folder **ImageQuizzer** in the downloaded ImageQuizzerProject
    - (eg. C:\Users\*username*\\Documents\ImageQuizzerProject\ImageQuizzer)
  + Restart 3D Slicer if prompted

**Data and Quiz Setup**

* Create a folder to hold the study data (referred to as the Database Directory)
  + In your quiz script, all <Path> elements must be defined relative to this folder. For example:

C:/Users/Documents/StudyData

|---->BrainStudy

|---->Patient1

|---->Image1.nii

* + <Path>BrainStudy\Patient1\Image1.nii</Path>
* Once you create your quiz script (and optional associated customized color file), you have the option to place it in the default location. (This is not necessary, but it saves the user from having to browse to find the quiz.)
  + Default location : …*/Path/To/ImageQuizzerProject*/ImageQuizzer/Resources/XML
  + Note: Also in this folder is an xml schema file (ImageQuizzer.xsd) that can help when scripting your quiz by ensuring the basic Image Quizzer scripting rules are followed. Notepad++ with the XML Plugin can be set up to use this schema file.
  + See Administrator Guide in the documentation folder for help to set up the XML script

**Run Image Quizzer**

* In File Explorer, browse to the directory where the Image Quizzer Project was downloaded.
* Run the batch file **ImageQuizzerStartup**
  + This will start 3D Slicer and immediately display the Image Quizzer login screen
    - **1. Select Data Location:**
      * Here the user will browse to the parent directory where all the study data is stored
    - **2. Choose quiz to launch:** 
      * The user must browse to the location of the assigned quiz and select it
    - **3. Launch Quiz**
      * Press the **Begin** button to begin the quiz
  + Using the ImageQuizzerStartup.bat file to run the Quizzer will initiate the ImageQuizzerShutdown.bat when the quiz is complete. This removes the folder that gets created by 3D Slicer on startup (SlicerDICOMDatabase in your data location folder) which can help reduce startup time especially when working with DICOM data.
* Note: The Image Quizzer can also be launched directly through 3D Slicer
  + Start 3D Slicer
  + Select Module:
    - Baines Custom Modules > Image Quizzer

**Quiz Results**

* Once the quiz is launched, two folders are created:
  + SlicerDICOMDatabase
    - A folder the 3D Slicer uses to manage DICOM data
  + Users
    - This folder will have subfolders (one for each user that logged in to Windows with their own login name)
      * CAUTION: If you have users logging into the PC using the same User login, the quiz results folder will not be unique to that user. If you are using the same login for all users, once one user completes the quiz, you must move or rename the results subfolder so that the next user can begin with a clean slate.
    - In these user subfolders, there will be an xml file with the same quiz filename. It will have the same layout as the scripted quiz, but will also contain xml elements that hold the user responses.
    - If the user was required to annotate the images, there will also be folders here containing .nrrd files for the contours and .json files for any line measurements.

**Remote Access**

* There may be issues if you are setting up the Image Quizzer so that the users can log in remotely. This is related to OpenGL which 3D Slicer uses for the graphical display. Using the Image Quizzer through remote access may depend on the following:
  + Video card driver
  + Operating system edition and version
  + Device management settings
  + Remote desktop access software
* We have had success using:
  + Windows 10 Pro v 21H2
  + NVIDIA Quadro 2000
  + Windows Remote Desktop
* Other recommendations:
  + Windows 10 must be used at both ends
  + Google Remote Desktop, RealVNC, AnyDesk (free remote software options)
* Notes:
  + SlicerRT – required for loading contour (label map) files – (there may be other dependencies)
  + mpReview – required for pre and post-processing functions
    - can be used for preprocessing of dicom series to nrrd format (to speed up read of image volume data) , Quizzer also depends on the mixins functionality that mpReview provides (in DICOMVolumeSequencePlugin.py, UtilsIO)
* To be added – for pre/post processing tools
  + Install pandas? (>cmd (admin); >python -m pip install pandas ) – for convert RTStruct UIDs to original volume
    - Instructions to do this through Slicer interactor to make sure it is added to the right environment
    - Install numpy and pydicom as well? Or are these already in Slicer?
  + Rules about exporting label maps as RTStruct Dicom file
    - If remapping the exported RTStruct to the original image volume, the directory defined that holds the original series must contain only that series. There needs to be a one-to-one mapping of Slicer’s exported dicom series to the original dicom series
  + How to run preprocessor to convert DICOM to nrrd (using mpReview)
  + How to run from startup batch file