NHS
Cancer Screening Programmes

Software to Extract Mammography Patient Dose Data from Digital Images: Software and Instruction Manual Version 1.2H

NHS BSP

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Authors

E H L Mungutroy[1], J M Oduko[2], K C Young[2]
[1]Jarvis Breast Centre, Guildford
[2]National Coordinating Centre for the Physics of Mammography, Guildford

Enquiries

Enquiries about this report should be addressed to:

E H L Mungutroy
Jarvis Breast Centre
Stoughton Road
Guildford
GU1 1LJ

Tel: 01483 783221
Email: lindsay.mungutroy@nhs.net
Website: www.nccpm.org

To be published by

NHS Cancer Screening Programmes
Fulwood House
Old Fulwood Road
Sheffield
S10 3TH

Tel: 0114 271 1060
Fax: 0114 271 1089
Email: info@cancerscreening.nhs.uk
Website: www.cancerscreening.nhs.uk

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1. INTRODUCTION

The collection of dose data for patient dose surveys by Physics departments has been one of the more tedious jobs done by radiographers in the past. It is necessary, however, as part of the quality control programme[1]. With the advent of digital mammography, the task can be automated to a large extent. This software now largely automates the collection of dose data.

The present version (1.2H) runs on Hologic images to give the required output. Slightly modified versions for images from other manufacturers will be supplied shortly. Fields that need modification for different equipment include target, filter, view codes, field size, AEC mode.

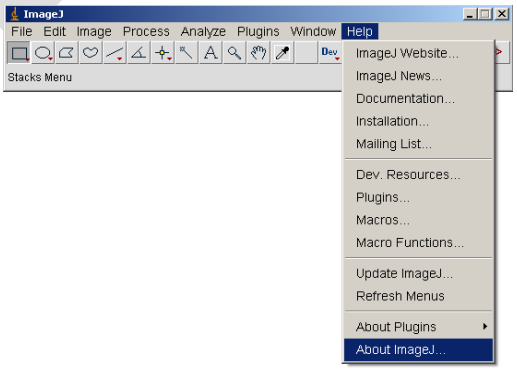
Disclaimer: This software is provided for use in the NHSBSP. Users should examine the DICOM headers of sample images to satisfy themselves that the output is as expected.

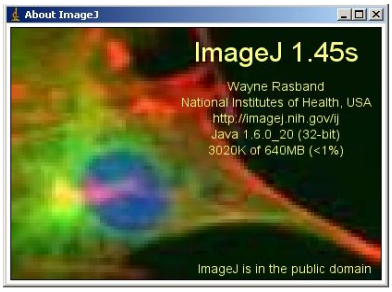
2. SOFTWARE REQUIREMENTS

The software itself is an ImageJ macro which reads the relevant DICOM headers from digital images and produces an output file. The file can then be loaded into the NHSBSP patient dose calculation software[2], which implements the patient dose calculations described by Dance et al[3]. The plugin is for use with an existing installation of ImageJ on a PC or laptop. It requires ImageJ version 1.43k as a minimum.

3. SOFTWARE INSTALLATION

Open ImageJ and check which version the computer is running by using Help/About ImageJ as shown below.





If the version of ImageJ is lower than 1.43k, it needs to be upgraded to the latest version either by clicking Help – Update ImageJ, or by downloading it from the ImageJ website at http://rsbweb.nih.gov/ij/

Download the software, an ImageJ plugin called “getDoseInfo”, from the NCCPM website, www.nccpm.org. Save it either in C:\Program files\ImageJ\macros, or any other chosen location.

Alternatively install the macro by using the macro editor's Macros>Install Macros command or the Plugins>Macros>Install command in ImageJ. There is further information about installing macros on the ImageJ website.

4. PREPARING THE IMAGES

Use the PACS to select the images for the chosen X-ray set, e.g. from one or two days on a mobile van, or several days for a room in a screening centre with a lower throughput of ladies. The Patient Dose Calculation software requires a minimum of 50 ladies, but since this ImageJ macro automates the data collection it is easy to deal with 100 or more. The statistics of the results are better with larger numbers.

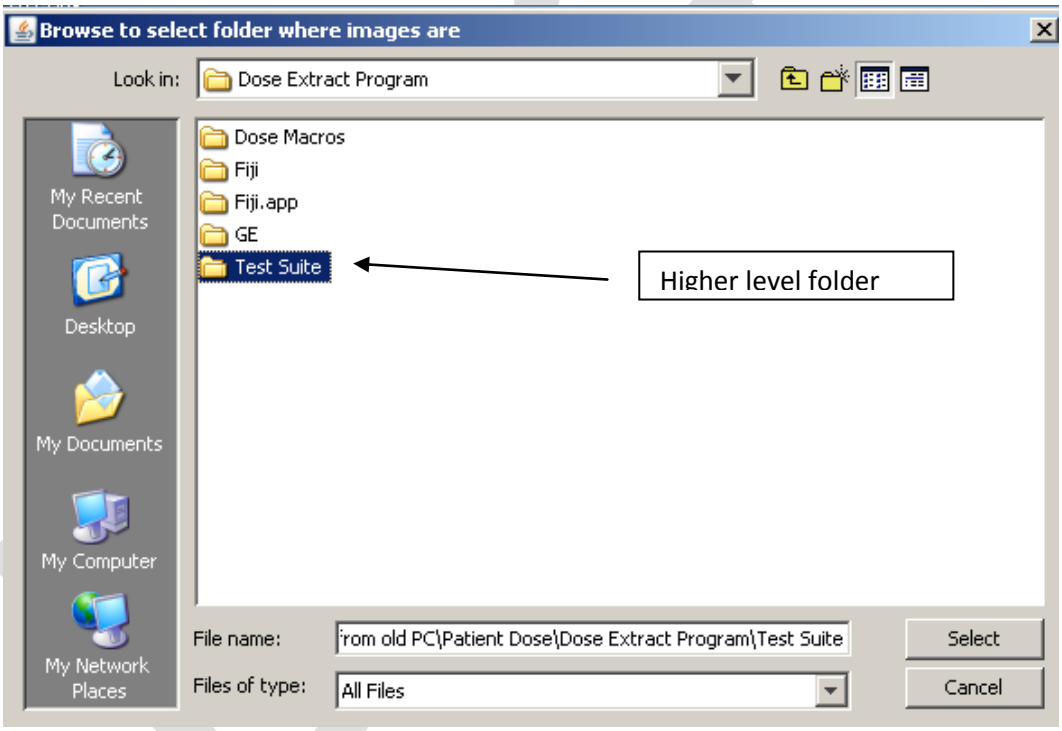
Information Governance: The images must be anonymised (by the PACS) as the images and/or the output data are sent to a medical physics service, i.e. outside the screening centre.

Save the anonymised images into a single folder, ready for the software to run. They must be DICOM images (.dcm). Either “For Processing” (Raw) or “For Presentation” (Processed) is acceptable. The folder could be on a portable drive, a laptop, or on a PC in the screening centre if the software is to be run on-site. The images can either be in separate folders for each lady or all in the same folder. The single folder or separate folders holding the images should be contained in one higher-level folder which is selected when running the macro as described in Section 5.

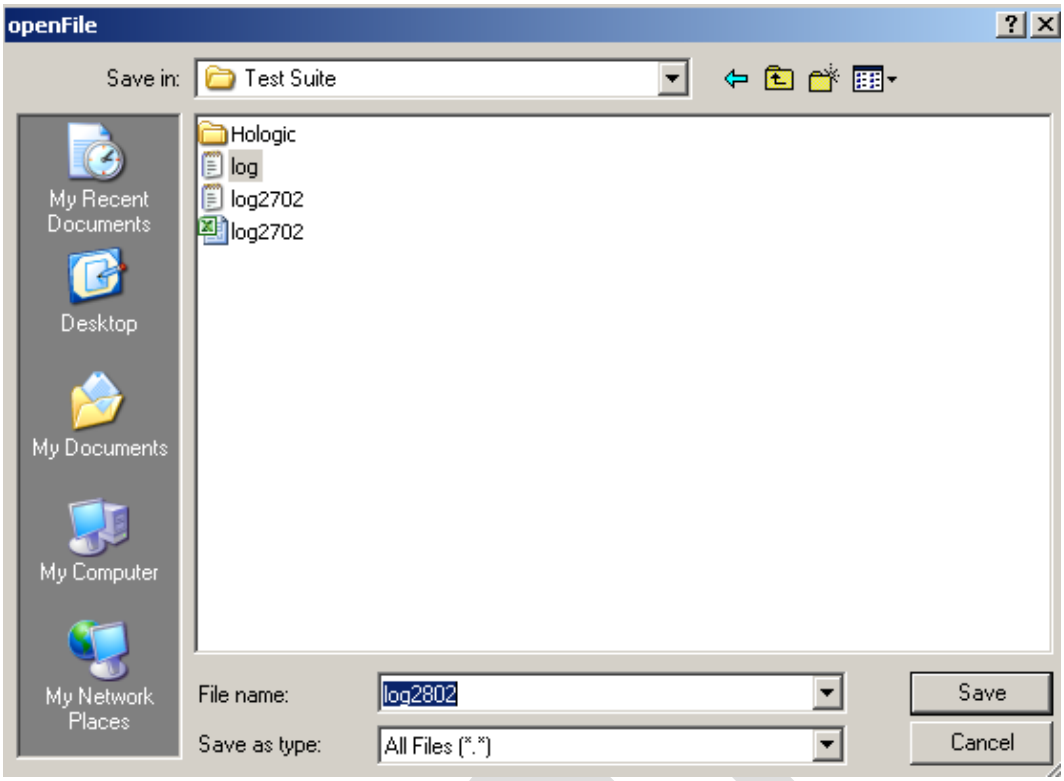
5. RUNNING THE SOFTWARE

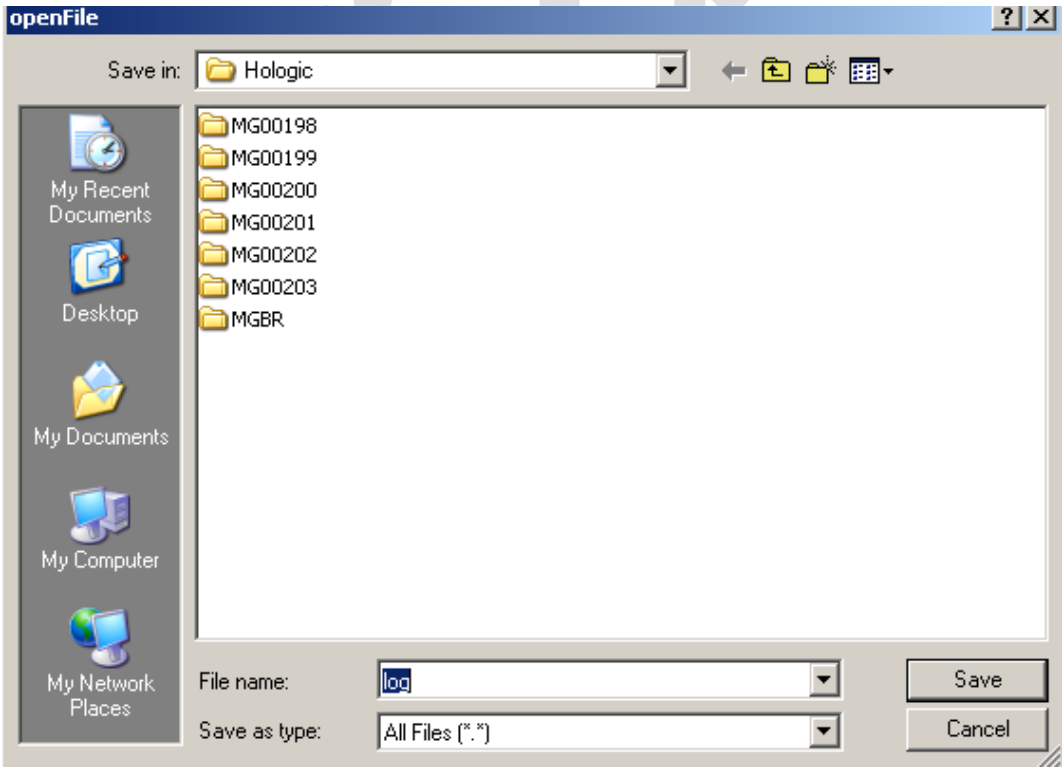
Follow this procedure:

- Open ImageJ. To use the macro, use the Plugins>Macros>Run commands.
- The macro asks where the folder containing the images is. Select the higher-level folder (see Section 4) in the normal way. The folder Test Suite (shown below) contains several folders, each of which contains images. You may need to avoid running the macro on files located somewhere else on the network, as this makes it more likely to crash. Running with images on the same PC or laptop or on a portable drive is safer.



- The macro asks for a filename for the results (the default is log.txt, but change it if you wish) and for its location. Do not save the results file in the sub-folder where the images are, as the macro would then try (and fail) to read it. It can be saved in the higher level folder that contains the images' sub-folders.


openFile
Save in:
Test Suite
Hologic
log
log2702
log2702
My Recent Documents
Desktop
My Documents
My Computer
My Network Places
File name:
log2802
Save as type:
All Files (*.*)
Save
Cancel


openFile
Save in:
Hologic
MG00198
MG00199
MG00200
MG00201
MG00202
MG00203
MGBR
My Recent Documents
Desktop
My Documents
My Computer
My Network Places
File name:
log
Save as type:
All Files (*.*)
Save
Cancel

- Leave the macro to run. This will take some time as it depends on the number of images to be read, the PC running it and the network.

6. VIEWING AND SAVING THE RESULTS

The results file (log.txt or the name you gave it) is a CSV (comma-separated value) file, which can be viewed with Notepad or WordPad.

Open the results file with the Excel text import wizard (comma delimited option), and save the results as an Excel spreadsheet. The results contain all the dose information needed for input into the Patient Dose Calculation software with additional information described in Section 7.

7. EDITING THE OUTPUT

Some minor editing may be required, e.g. if there is more than one LCC view for one lady, the main one should be left as LCC and the others renamed LCC2, LCC3, etc in the Excel output.

A number of additional fields are provided at the end of each row (after Force), that may be of help for any further information required for the Patient Dose Calculation software.

The Image acquisition times provided at the end of the rows can be used to facilitate the renaming of the views mentioned above (assuming that the first image is the main one). This process is expected to be automated in subsequent software versions.

If there are any mag views present in the image set, these are indicated by “0.1 mm” in the focal spot column. The mag views need to be deleted from the output before loading into the dose calculation software.

The column headed View indicates any different types of images (e.g. tomosynthesis reconstructions or projections) that may be present. The Image Type column indicates whether the images are raw (ORIGINAL\PRIMARY) or processed (DERIVED\PRIMARY). The examination dates allow the first and last date (required by the Patient Dose Calculation software) to be determined. The Model and Serial No information allows the identification of any data that may have been erroneously included (e.g. specimen cabinet images) so that they can be removed prior to the data import.

These additional columns (after Force) need to be removed completely from the file before the file is loaded into the Patient Dose Calculation software. Use of the External Data - Import Excel Spreadsheet function is recommended. In versions of Access prior to 2007, this function is under File/Get External Data/Import Files of Type Excel.

The Appendix lists the Patient Dose Calculation software fields with their corresponding DICOM headers.

8. REFERENCES

1. Cush S et al, Quality assurance guidelines for mammography: Including radiographic quality control. NHS Cancer Screening Programmes, 2006 (NHSBSP Report 63)
2. Breast dose surveys: software and instruction manual. NHS Cancer Screening Programmes, 2001 (NHSBSP Occasional Report 01/10)
3. Dance et al 2011 Dance DR, Young KC, Van Engen RE. Further factors for the estimation of mean glandular dose using the United Kingdom, European and IAEA breast dosimetry protocols, Phys. Med. Biol. 54:4361-4372 (2009)

APPENDIX

Fields used by NHSBSP Patient Dose Calculation software with corresponding DICOM headers

Field Name	**DICOM Header**	**Original Values in Header**	**Format required by Patient Dose Calculation**
Survey Number			N/A
Patient Number	0010,0020	“40200120”	40200120
View code	0018,1030	“ L CC”	LCC
kV	0018,0060	“28”	28
Anode	0018,1191	“ TUNGSTEN”	W
Filter	0018,7050	“ ALUMINUM”	Al
Thickness (mm)	0018,11A0	“42”	42
mAs	0018,1153	“173500”	173.5
large cassette used	0019,1026	“18X24”	No
auto/man	0018,7060	“AUTOMATIC”	AUTOMATIC
Automatic Mode	0018,7062	“ AutoFilter”	AutoFilter
AEC density set	0019,1029	“AEC Density setting 0”	0
Age	0010,1010	“ 050Y”	50
Comment			N/A
Error			N/A
AEC Density Mode	0019,1025	“NORMAL”	NORMAL
Force	0018,11A2	“83.1”	83.1
Focal Spot(mm)	0018,1190	“0.3”	NR
View	0008,103E	“ L CC Raw Tomosynthesis Projection”	NR
Image Time	0008,0033	“110544”	NR

Image Type	0008,0008	“ORIGINAL\PRIMARY”	NR
Model	0008,1090	“Selenia Dimensions”	NR
Device Serial No	0018,1000	“81003110743”	NR
Study Date	0008,0020	“20110823”	NR

Notes:

NR - Not required by Patient Dose Calculation software
N/A - Not available in DICOM headers, requires manual input