

Development of An Automated Pre-Treatment Data-Transfer Evaluation

J Rembish*, N Bice, C Kabat, S Stathakis, N Papanikolaou, P Myers

UT Health San Antonio, San Antonio, TX

INTRODUCTION

To assure safe and high-quality treatments for radiotherapy patients, radiation oncology teams conduct pre-treatment plan evaluations which assess the machine treatment parameters, patient set-up instructions, prescriptions, and radiation dose distributions. The current process is performed manually, which consumes a great deal of time and introduces the risk of human errors (e.g., oversight of parameter discrepancies, failure to achieve optimal target coverage, unnecessary dose to surrounding healthy tissue). Automation of the pre-treatment evaluation process has the potential to reduce these errors and improve clinical efficiency.

AIM

To increase clinical efficiency while increasing error detection sensitivity of pre-treatment data-transfer checks.

METHOD

Using Python, a script was created to automatically compare the data from the DICOM export, and the plan information stored in the Mosaik SQL database. Various machine parameters, prescription details, and patient information are taken into consideration when cross-comparing between the two systems. The results are saved as a spreadsheet with a color-coded scheme to allow easy observation of any discrepancies. These scripts are publicly available through PyMedPhys.

RESULTS

A data-transfer check can be performed between a plan’s DICOM files and Mosaik’s SQL database to confirm consistency between general patient information and beam specific information. The comparison can be performed in a matter of seconds, making it significantly less time demanding than a manual comparison. The image below is an example of some of the current results when using the application. In addition to the beam information that is shown, comparison of the prescription and general patient information is also performed. The benefits of implementation in the clinic will soon be evaluated.

	RMT_DICOM	RMT_MOSAIQ	RMT_W_DICOM	RMT_W_MOSAIQ	RLT_DICOM	RLT_MOSAIQ	RLT_W_DICOM	RLT_W_MOSAIQ
mrn	MRN	MRN	MRN	MRN	MRN	MRN	MRN	MRN
first_name	FIRST	FIRST	FIRST	FIRST	FIRST	FIRST	FIRST	FIRST
last_name	LAST	LAST	LAST	LAST	LAST	LAST	LAST	LAST
site	RT BREAST	R breast	RT BREAST	R breast	RT BREAST	R breast	RT BREAST	R breast
field_label	2	2	3	3	4	4	5	5
field_name	RMT	RMT	RMT W	RMT W	RLT	RLT	RLT W	RLT W
machine	VersaHD	Vault 4HD	VersaHD	Vault 4HD	VersaHD	Vault 4HD	VersaHD	Vault 4HD
energy	10	10	6	6	10	10	6	6
monitor_units	13	13.000	604.6	604.600	29.9	29.900	100.4	100.400
fraction_dose	200	200.00	200	200.00	200	200.00	200	200.00
total_dose	5000	5000.00	5000	5000.00	5000	5000.00	5000	5000.00
fractions	25	25	25	25	25	25	25	25
gantry_angle	46	46.0	46	46.0	229	229.0	229	229.0
collimator_angle	0	0.0	270	270.0	0	0.0	90	90.0
ssd	94.7	94.7	94.7	94.7	86.2	86.2	86.2	86.2
sad	100	100.0	100	100.0	100	100.0	100	100.0
iso_x	-4.00252	-4.0000	-4.00252	-4.0000	-4.00252	-4.0000	-4.00252	-4.0000
iso_y	-5.63215	-5.6300	-5.63215	-5.6300	-5.63215	-5.6300	-5.63215	-5.6300
iso_z	11.8	11.8000	11.8	11.8000	11.8	11.8000	11.8	11.8000
field_x	9.5	40.0	20	40.0	10	40.0	20	40.0
coll_x1	-9.5	-20.0	0	-20.0	0	-20.0	-20	-20.0
coll_x2	0	20.0	20	20.0	10	20.0	0	20.0
field_y	20	20.0	9.5	9.5	20	20.0	10	10.0
coll_y1	-20	-20.0	-9.5	-9.5	-20	-20.0	-10	-10.0
coll_y2	0	0.0	0	0.0	0	0.0	0	0.0
couch_vrt		0.0		-23.9		0.0		-23.9
couch_lat		0.0		5.6		0.0		5.6
couch_lng		0.0		18.5		0.0		18.5
couch_ang	0	0.0	0	0.0	0	0.0	0	0.0
tolerance	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
meterset_rate	0	0.000	0	0.000	0	0.000	0	0.000

CONCLUSIONS

The data transfer portion of a pre-treatment check can be automated and used to drastically reduce the amount of time required to complete the task while minimizing opportunity for human error. Implementing this into clinical workflow has the potential to increase efficiency while also increasing error detection sensitivity.

DISCUSSION

The results of the data-transfer check are currently being output as an excel spreadsheet. This will soon be converted into a Streamlit application which will provide more ease of use and allow for simpler implementation within the clinic. The goal is to eventually include this application in a future version of PyMedPhys. Once this has been completed, testing within the clinic will be performed to determine the degree to which time can be saved by using this application.

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CONTACT

E-mail: rembishj@livemail.uthscsa.edu