Purpose

The treatment plan validation by the human is slow and error-prone due to the human limitation. We present a possible solution to improve the validation efficiency and quality by adopting graphical fingerprint. We aim to produce a digital fingerprint from various treatment plan parameters and present the fingerprint in a graphical format for easy recognition by human.

Method and Materials

Since large amount information exists in the treatment plan, it is not realistic to ask the therapists to verify manually. We resort to use the hash function to generate a fingerprint for each copy of the plan. In this study, Message-Digest algorithm 5 (MD5) is used mainly due to its relative short output (128bit). To make sure the difference can be readily recognized by human, we adopt the approach used in random art to produce an image (refereed as to graphical fingerprint) for each MD5 output. To ensure there is no result collision, we employed a result checking mechanism to ensure all images produced are valid.

Results

1000 MD5 stings are generated to produce the images we need. The 1000 images are randomly selected to form 20 groups, where each group contains 100 images. Each group is printed out on paper and visually inspected by human. It turns out all groups reach the same conclusion that they contains
completely different images and none of the inspections exceeds 2 minutes.

Conclusion

Wpresented a possible treatment plan validation approach through graphical fingerprint. It aims to address the human weakness during the manual validation. The approach allows fast recognition of errors by providing an graphical representation for the output of hash functions.