Better cancer care; Improving the accuracy of radiotherapy

[20-Nov-2018, Helsinki] The new methods for planning the radiation treatment of cancer patients indicate better accuracy of the predictions on dose deposition, leading to reduced normal tissue radiation and lesser risk of treatment-related complications.

In his master’s thesis, Roni Hytönen studied the applicability of dual-energy computed tomography (DECT) for radiotherapy planning. The planning of radiotherapy, i.e. the treatment of cancer by ionizing radiation, has for decades been done based on computed tomography (CT) images. Now, as the more modern dual-energy CT scanners are becoming more common in the clinical environment, the interest towards them has peaked also in the field of radiation treatment with promises of more accurate treatment planning.

The thesis, written as a part of an internship at Varian Medical Systems, covers the relevant backgrounds of radiotherapy and single- and dual-energy computed tomographies, as well as the physical theory behind the DECT-based treatment planning. The existing state-of-the-art methods are presented and discussed, and new methods - both novel and ones based on the existing methodology - are developed. The different methods are compared against each other, and it is concluded that the DECT offers an unquestionable advantage over the single-energy CT-based treatment planning. Additionally, the novel methods are deemed to perform comparably or better than the methodology suggested thus far.

The findings have potential to reduce the normal tissue irradiation, leading to the lower overall risk of treatment-related complications. Furthermore, they offer a number of alternative, previously unexplored ways to approach the incorporation of DECT to treatment planning.

More information:

Roni Hytönen
roni.hytonen@aalto.fi