

Theme: Physics

Abstract No: **PTCOG-AO2025-ABS-0164**

Abstract Title: Iris Recognition-based Eye Tracking System for Non-Invasive Ocular Proton Beam Therapy

Author Names: Hye Jeong Yang, Dongho Shin, Se Byeong Lee, Young Kyung Lim, Jonghwi Jeong, Chankyu Kim, Haksoo Kim*

National Cancer Center Korea (NCCCK)

Background / Aims:

- Typically, tantalum markers are surgically implanted in the conventional ocular proton therapy to achieve precise localization of eye.
- In this study, we propose an iris recognition-based eye tracking system for **clipless** ocular proton therapy, enabling non-invasive and precise localization without surgical markers.

Subjects and Methods:

- The eye tracking system initiated the acquisition of iris frame sequences captured by an IR camera. Based on the segmentation results, the iris region is localized between the pupil and the iris boundaries. The proposed iris recognition-based algorithm is illustrated in *Fig. 1*.
- To compute the iris tracking algorithm, it searches iris' characteristics in the set region of interest (ROI) with the feature extraction and determine the template. It keeps overlaying the ROI until matching the reference features.
- Scale-Invariant-Feature Transform (SIFT) was chosen to detect keypoints of patient-specific features.

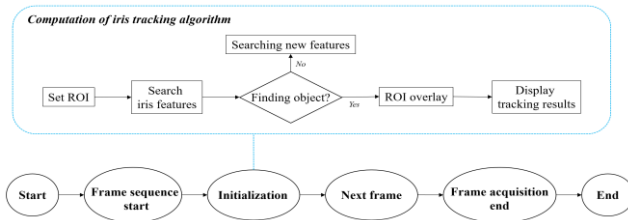


Fig. 1. Computation of iris tracking algorithm

- It analyzed and quantitatively evaluated matching the features in the same ROI of the potential patients treated with the conventional method.
- The performance of the proposed algorithm will be validated through comparison with the conventional clip-based localization method used in ocular proton therapy.

Result:

- We confirmed the feasibility of iris-recognition tracking with the algorithm of the keypoints matching the video recording and the captured image. *Fig.2 shows the result of matching iris images.*

➤ You can check the results by scanning the QR code on the right.



Fig. 2. QR code

- This ongoing study will validate the iris recognition-based tracking system with further algorithmic improvements, and to enable non-invasive ocular proton therapy. The developed system is planned to be implemented in the near future clinical applications.