A computer vision-based system to assess radiation dose received by nuclear plant personnel

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This work reports a video-based surveillance system developed for safety purposes in nuclear plants [1]. This system aims at assessing radiation dose received by nuclear plant personnel, while executing their tasks. The purpose is to supply further and faster means of assessing received doses. Common monitoring approaches make use of TLD or pen dosimeters. The former take typically a month to supply results, while the latter lack precision.

The developed system is based on markerless computer vision methods to detect, track and identify people along videos. Cameras were installed within Argonauta research reactor room to supply the video database. Radiation dose rate distribution was also measured. By combining both the tracked positions of each person with the radiation dose rate data, the system integrates the doses received by each one. The video database is challenging because it is common that people use clothes of the same color. Also, people usually stand still to execute tasks, and cross each other. Thus, the developed system must correctly detect, track and identify each person, to reliably compute the doses received by each one. The video database was made publicly available for further research [1].

Computed dose results were compared to ground truth (GT), the latter obtained through manual markings of each person along videos.

The system makes use of one of two approaches to identify people [1]: (i) face/head colors, or (ii) SURF points. The SURF method performed better. The system uses targets identities' history to avoid errors in people identification. The system also comprises a post-processing correcting stage and camera switching among the two used, to better account for occlusion situations [1]. The main code was implemented in Matlab, calling for some few external programs written in C.

All these stages were integrated, resulting in a friendly interface for users, parallelization was implemented to shorten the processing times, by using the *Pool* resource of Matlab [2, 3].

Figure 1 shows results for a two-person experiment. "Target Dose" correspond to the system results. The span around the dose values are due to the precision (±20 %) of the piece of equipment used for radiation measurement [1].

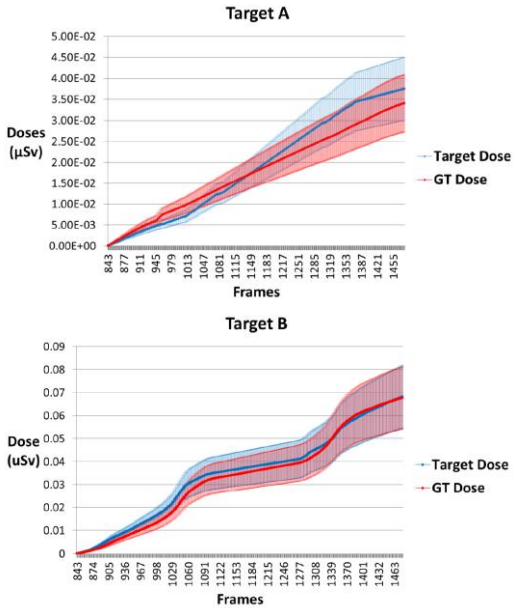

Figure 1. Comparative analysis between computed and GT dose results.

The system was also compared to a state-of-the-art method available in the literature, the Führ-Jung method, which showed the best performance among other ones, when applied to our problem [1]. However, our results were even better than the Führ-Jung ones [1].

References

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