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A method of tracking workers contaminated with radioactive materials by visual recognition based on YOLO3

Workers can be unintentionally contaminated with radioactive materials when they work in radioactive environment. To detect this situation in time, a method is proposed to real-time detect and track workers with radioactive substances under stable background radiation conditions. In this method, visual recognition based on YOLO3 was used to recognize and track the source carrier, obtain the path information of the carrier by which the source-detector distance can be calculated. A cylindrical 3in.×3in. NaI(Tl) detector was used to monitor the variation of counting rate. According to the inverse ratio of the counting rate to the square of the distance, it is theoretically possible to attribute the source to a single person by comparing the variation rate of the counting rate with the variation rate of the square of the person-detector distance. This paper used Locality In-between Polylines(LIP) to measure the similarity of the curves generated by the variation of counting rate and the square of distance over time1. To make the coincidence between the counting rate and the distance more accurate, it is necessary to remove the background counting rate. In addition, the deviations due to scattering and detector geometry shape must be considered. Through the test and simulation of specific application sites, the empirical formula of the variation of these deviations with distance can be fitted. It was proved that the correlation degree between the variation of counting rate and the variation of distance can be significantly improved by modifying measured counting rate. There are always workers whose path information is similar to the source carrier, multiple workers with high similarity will be identified simultaneously, even though some of them are not contaminated, then we can use other more precise methods to detect the actual carrier. It was proved that contaminated workers can be accurately detected by the above method.

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