VirtualEye - LifeGuard for Swimming Pools to Detect Active Drowning

Team leader: Kumari Sravan
Team ID: PNT2022TMID36293

Roll number:110719104027

Mobile Number: 7286056011

Mail ID: kumarisravan15.2002@gmail.com

Name of the Team Member 1: G.Dhanush Naidu

Roll number: 110719104010

Mobile Number: 9391773871

Mail ID: gdhanushnaidu3@gmail.com

Name of the Team Member 2: G.Sai Akilesh

Roll number: 110719104009

Mobile Number: 8187007374

Mail ID: gsaiakilesh10@jnn.edu.in

Name of the Team Member 3: SK.Althaf

Roll number: 110719104044

Mobile Number: 7396392383

Mail ID: althaf3909@gmail.com

Abstract

Safety is the top priority in all swimming areas. The current systems expected to address the problem of ensuring pool safety have significant problems due to technical aspects such as underwater cameras and methodological aspects such as the need for human intervention in rescue missions. The use of an automated visual-based monitoring system can effectively help to reduce drownings and ensure pool safety. Due to their technical characteristics, such as underwater cameras, and methodological aspects, like the requirement for human engagement in the rescue mission, the present solutions supposed to handle the issue of maintaining safety at swimming pools have serious issues. The effective reduction of drownings and assurance of pool safety can be achieved through the implementation of an automated visual-based monitoring system. The proposed monitoring system detects a drowning person and triggers an alarm in the lifeguard’s monitoring device. This helps the lifeguard to take necessary actions promptly.

Literature Review

Existing drowning detection methods include wearable sensor-based systems and vision-based systems. A second division of vision-based technologies is between those that employ underwater cameras and those that employ above-water cameras. The disadvantage of underwater cameras is that they don't capture the initial battle above the water. A crucial concern to take into account in a time-critical emergency is the possibility of a longer rescue time if a drowning incident is not recognised as soon as possible. The biggest drawback of a wearable-based system is its pain, which may cause younger children to attempt to remove the gadget in order to feel better.

However, this idea is unproven. When compared to older techniques, it is claimed that the use of Convolutional Neural Network (CNN) architecture in Deep Neural Networks (DNNs) has added a significant shift in learning more complicated, informative characteristics in images. Furthermore, since the region-based convolutional neural network (R-CNN) architecture proposal, additional optimised models such as Fast R-CNN, Faster R-CNN, and YOLO have been constructed. R-CNN is faster than Fast R-CNN, which improves bounding box (BB) regression and classification, Faster R-CNN, which generates area suggestions using an extra sub-network, and YOLO, which detects objects using a fixed-grid regression. Based on basic CNN architectures, bounding box regression is used to recognise generic objects. To recognise salient objects, local contrast enhancement and pixel-level segmentation are used. The approaches utilised in detecting objects described in this chapter will be critical in laying the framework for the methodologies used to detect drowning and dangerous actions.

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