THEORY & COLLECTION OF VIRTUAL EYE DROWNING SWIMMING POOL SYSTEM

ABSTRUCT-Safety is paramount in all swimming pools. The current systems expected to address the problem of ensuring safety at swimming pools have significant problems due to their technical aspects, such as underwater cameras and methodological aspects such as the need for human intervention in the rescue mission. The use of an automated visual-based monitoring system can help to reduce drownings and assure pool safety effectively. This study introduces a revolutionary technology that identifies drowning victims in a minimum amount of time and dispatches an automated drone to save them. Using convolutional neural network (CNN) models, it can detect a drowning person in three stages. Whenever such a situation like this is detected, the inflatable tube-mounted selfdriven drone will go on a rescue mission, sounding an alarm to inform the nearby lifeguards. The system also keeps an eye out for potentially dangerous actions that could result in drowning. This system's ability to save a drowning victim in under a minute has been demonstrated in prototype experiments' performance evaluations

Keywords—Drowning, Lifeguard system, Object detection, Computer vision, Pose estimation, Drone, Convolutional Neural Network (CNN)

Abstract:
At present, there are swimming pools in every part of the world. Most of the swimming pool accidents or incidents occur due to improper security. Therefore, Accidental deaths in swimming pools are actually

increasing. So, Video based drowning detection system is designed in this article. The proposed system structure comprises raspberry pi (Single Board Computer) equipped with a USB camera for taking the live feed from the pool area. The system also covers the alerting phenomena using a buzzer so that necessary actions are taken intermittently without any delay. The working structure starts from the raspberry pi with image processing for video feed intake, deep learning for activity recognition and finally GPIO system for alerting and short message service.

Published in: *2021 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C)*

Abstract

Drowning is considered amongst the top 10 causes of unintentional death, according to the World Health Organization (WHO). Therefore, anti-drowning systems that can save lives by preventing and detecting drowning are much needed. This paper proposes a robust and waterproof sensor-based device to detect distress in swimmers at varying depths and different types of water environments. The proposed device comprises four main components, including heart rate, blood oxygen level, movement, and depth sensors. Although these sensors were designed to work together to boost the system's capability as an anti-drowning device, each could operate independently. The sensors were able to determine the heart rate to an accuracy of 1 beat per minute (BPM), 1% SpO_2, the acceleration with adjustable sensitivities of ±2 g, ±4 g, ±8 g, and ±16 g, and the depth up to 12.8 m. The data obtained from the sensors were sent to a microcontroller that compared the input data to adjustable threshold values to detect dangerous situations. Being in hazardous situations for more than a specific time activated the alarming system. Based on the comparison made in the program and measuring the time of submersion, a message indicating drowning or safe was sent to a lifeguard to continuously monitor the swimmer'

condition via Wi-Fi to an IP address reachable by a mobile phone or laptop. It is also possible to continuously monitor the sensor outputs on the device's display or the connected mobile phone or laptop. The threshold values could be adjusted based on biometric parameters such as swimming conditions (swimming pool, beach, depth, etc.) and swimmers health and conditions. The functionality of the proposed device was thoroughly tested over a wide range of parameters and under different conditions, both in air and underwater. It was demonstrated that the device could detect a range of potentially hazardous aquatic situations. This work will pave the way for developing an effective drowning sensing system that could save tens of thousands of lives across the globe every year.

Keywords: drowning detection, heart rate, oxygen saturation, accelerometer, water depth, time of submersion, adjustable threshold values

A Smart Multi-Sensor Device to Detect Distress in Swimmers

Published online 2022 Jan 29. doi: 10.3390/s22031059

Abstract - Effective drowning detection methods are essential for the safety of swimmers. In this paper, a novel type of drowning detection method addressing many limitations of prevailing drowning detectors is proposed. The proposed method ensures detection of drowning and reporting at the earlier stages. The proposed drowning detection method is also a generic solution that suites different water bodies from pools to oceans, and an economically viable method useful for both low and middle income countries. The prototype of the drowning detection method is developed and demonstrated and model of the system is simulated in Proteus design suite. The results of the simulation and hardware experimentation are also reported.

Keywords - drowning detection, smart sensor surveillance, swimming safety. I

Eight areas of work were initially identified. These are outlined below, with outcomes and results from each area following in the report. As the project progressed, it became apparent that it would not be possible to complete area six 'Analysis of current DDS test documentation with reference to published standards', as there was limited instances of recorded test results that were available to analyse. Following discussion with the stakeholder group, it was also apparent that more emphasis on gathering insight from lifeguards would be useful, with the consequence that we undertook a lifeguard surveying exercise in addition to the work areas identified below

DDS Research Project

REFRENCES:

AngelEye. (2019). AngelEye – Distributors. Retrieved from: https://www.angeleye.it/news.php?id=28&newscat=10

Aquatics International. (2007). Traumatic Experiences – Should we make our youngest lifeguards come face to face with death? Retrieved from: https://www.aquaticsintl.com/facilities/traumaticexperiences_o

British Standards Institution. (2018). BS EN 15288-1, Swimming pools for public use. Safety requirements for design. Retrieved from: https://shop.bsigroup.com/ProductDetail/?pid=000000000030360254 DDS Research Project 17 British Standards Institution 1. (2018). BS EN 15288-2, Swimming pools for public use. Safety requirements for operation. Retrieved from: https://shop.bsigroup.com/ProductDetail/?p id=000000000030360257

Drowning Prevention. (2017). The Need. Retrieved from: https://www.drowningprevention.com.au/

German Institute for Standardization. (2019). German national guideline DGfdB R 94.15 "Test methods for camera-based drowning detection systems under operational conditions" (German Association for Public Swimming Pools).

Haizhou Li, Haizhou Li, Kar-Ann Toh and Liyuan Li. (2012). Advanced Topics in Biometrics, World Scientific Publishing Co. Pte. Ltd., ISBN-13 978-981-4287-84-5

Health and Safety Executive. (2018). HSG179, Health and safety in swimming pools (Fourth edition). ISO (2017)

ISO_20380, First edition, Public swimming pools — Computer vision systems for the detection of drowning accidents in swimming pools — Safety requirements and test methods