Virtual Eye - Life Guard for Swimming Pools to Detect Active Drowning

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PRE-REQUESITE:

To complete this project, you must require the following software, concepts, and packages

- Python IDE (IDLE / Spyder / PyCharm)(Python 3.7)
- Python Packages need to be installed
- Anaconda navigator
- Tensorflow
- Keras
- Flask

GITHUB ACCOUNT:

I have created my github account with the email id jonathansanjeevprakash@gmail.com in the https://github.com website. Github team ID is **IBM-Project-47532-1660800090**.

INSTALLATION OF IDE'S:

Download and install the latest version of python from the python.org website.

ABSTRACT

Lifeguard surveillance is a complex task that is crucial for swimmer safety, though few studies of applied visual search have investigated this domain. This current study compared lifeguard and non-lifeguard search skills using dynamic, naturalistic stimuli (video clips of confederate swimmers) that varied in set size and type of drowning. Lifeguards were more accurate and responded faster to drowning targets. Differences between drowning targets were also found: passive drownings were responded to less often, but more quickly than active drownings, highlighting that passive drownings may be less salient but are highly informative once detected. Set size effects revealed a dip in reaction speeds at an intermediate set-size level, suggesting a possible change in visual search strategies as the array increases in size. Nonetheless, the ability of the test to discriminate between lifeguards and non-lifeguards offers future possibilities for training and assessing lifeguard surveillance skills.

LITERATURE SURVEY

REVIEW-1:

Title of the Paper:

An automatic video based drowning detection system for swimming pools using active contours.

Name of the Author:

Nasrin Salehi, Maryam Keyvanara and Seyed Amirhassan Monadjemmi, University of Isfahan, Faculty of Computer Engineering, Department of Artificial Intelligence, Isfahan, 81744, Iran.

Problem Description:

Safety in swimming pools is a crucial issue. In this paper, a real time drowning detection method based on HSV color space analysis is presented which uses prior knowledge of the video sequences to set the best values for the color channels. Our method uses a HSV thresholding mechanism along with Contour detection to detect the region of interest in each frame of video sequences. The presented software can detect drowning person in indoor swimming pools and sends an alarm to the lifeguard rescues if the previously detected person is missing for a specific amount of time. The presented algorithm for this system is tested on several video sequences recorded in swimming pools in real

conditions and the results are of high accuracy with a high capability of tracking individuals in real time. According to the evaluation results, the number of false alarms generated by the system is minimal and the maximum alarm delay reported by the system is 2.6 sec which can relatively be reliable compared to the acceptable time for rescue and resuscitation.

REVIEW-2:

Title of the Paper:

The effect of lifeguard experience upon the detection of drowning victims in a realistic dynamic visual search task.

Name of the Author:

Victoria Laxton and David Crundall Department of Psychology, School of Social Sciences, Nottingham Trent University, UK.

Problem Description:

Drowning incidents are potentially severe but thankfully rare for most lifeguards. Due to the infrequency of drowning incidents, the visual search for such occurrences is challenging (Lanagan-Leitzel, Skow & Moore, 2015). The difficulties involved in detecting infrequent drowning targets are reflected in other areas of real-world visual search with uncommon target items, such as airport

security screenings (Wolfe, Horowitz & Kenner, 2005; Biggs & Mitroff, 2015). For example, Wolfe et al., (2005) found low-prevalence targets (occurring on 1% of trials) were missed more frequently than high-prevalence targets (occurring on 50% of trials), with error rates of 30% and 7%, respectively.

REVIEW-3:

Title of the Paper:

Poseidon - Video based drowning detection system in the swimming pool.

Problem Description:

Swimming pool drowning monitoring system based on video technology is mostly reported in the literature. There are three kinds drowning monitoring system according to the different position of the camera. One is that the camera is mounted on the underwater swimming pool wall, then monitor underwater swimmer status. A limitation of this equipment is that if too many swimmers, the occlusion problem arises. The other is that the camera is mounted upon the water, and monitors the Swimmer posture change. The reflection and refraction of light in air-water interference will affect the image quality, and drowning man feature this method detected is not easy to distinguish swimmers

and divers obviously. The third is a combination of the two, underwater camera and aerial camera matched, monitoring the swimmer posture. This system needs constant observation which is the main disadvantage.

REVIEW-4:

Title of the Paper:

Wearable devices for early monitoring and alarming for drowning incidents.

Problem Description:

The wearable drowning monitor device can detect drowning accident and alarm. The device has seven main modules, including microprocessor, power module, SD memory card module, LED warning module, acceleration sensor module, water pressure sensor module, and keys module. When swimming the human arm must constantly waving in the water, if drowning, arm motion of floating is significantly reduced, and if falling into the water, almost motionless. According to the physiological response of human drowning, it can detect drowning accident by recording arm motion real-time through wearable wrist accelerometer device. This accelerometer is packed with embedded functions with edible user programmable options,

configurable to two interrupt pins. The pressure sensor is installed to judge whether the human body is in the water. The red LED is used for drowning warning. One blue LED is used to get the work status of the device which wills flash every few seconds in order to save the precious energy. Because LED lightemitting angle generally relatively small, 5 red LED lights of upward and around direction is installed to make LED alarm signal caller. Two keys are designed for the demo device. One is the switch for power. The other is a self-help button. If drowning danger occurs, the swimmer can push the button and the blue LED will shine for help, and if a swimmer accidentally hit the button, he can push the button to cancel the alarm. If the swimmer lost consciousness because of drowning, the device detects the drowning accident and will ON LED light to inform the lifeguard. The device is worn on the wrist and move in large amplitude along with the wrist when a human is swimming in the water, and the data acquired from accelerator will dramatically change. If a human is drowning in water, his or her wrist almost motionless, and the data acquired from accelerator will have only small changes due to water movement. The drowning detection method uses threshold. First, data from a water pressure sensor is used to judge whether the human body in the water, if the body in the water, then start

drowning judgment process. Then, analog signal obtained from the three axis acceleration sensor is converted to digital signal and three axis acceleration values are gained. Hanning filtering method and the moving average filtering are used to reduce noise error.

REVIEW-5:

Title of the Paper:

LDR based automated drowning detection system in the swimming pool.

Problem Description:

In this method the human identification in the swimming pool depends on the LDR and laser. First, data from a water pressure sensor is used to judge whether the human body in the water, if the body in the water,then start downloading judgment process.The iron metal plate is placed in the floor of the swimming pool. The laser and the LDR source are placed in the side of the wall. Here we are using an ATmega8l microcontroller to control the whole process. Embedded c language is used for the coding. Initially the laser source which spreads over the swimming pool and the LDR which sense the laser light and which produces the resistance value. Depends on the resistance value

the process has been taken.When the LDR value will be kept constant then the alarm will be activated.The resistance value will be changed with respect to the human movement. The message will be sent to the administration by using the GSM service. After 30 seconds there is no change which means the plate will lift automatically using the motor and motor driver. The human has safe in this technique.

Paper Reference:

- Victoria Laxton and David Crundall Department of Psychology, School of Social Sciences, Nottingham Trent University, UK. Post-print article: Laxton, V., and Crundall, D. (2017). The effect of lifeguard experience upon the detection of drowning victims in a realistic dynamic visual search task. Applied Cognitive Psychology, Epub ahead of online print. DOI: 10.1002/acp.3374.
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