

## **Literature Survey**

**Title** : A Novel Drowning Detection method for safety of swimmers.

**Authors:** Ajil Roy, Dr.K.Srinivasan (Department of Instrumentation and Control Engineering).

**Year** : 2018

**Description:** 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.

### **Pros:**

- The alarm receivers can be placed at different locations in the water bodies which are having high chance of drowning.
- Another major advantage of this approach unlike other approach is the ease of use in all atmospheric conditions, like rain or wind to day or night.

### **Cons:**

- The average time a child of age between 5-10 years can hold their breath for 10 seconds underwater.
- This feature should be valid only if the GPS connectivity was alive with minimum of 10 minutes before the drowning, as a very old GPS value will give a wrong location itself.

**Title** : Automated Drowning Detection And Security in Swimming Pool.

**Authors:** Kanchana A, Kavya G.R, Kavitha C, Soumyashree V, Salila Hedge  
(Department of Electronics and Communication).

**Year** : 2019

**Description:** Swimming pool surveillance systems plays an essential role in safeguarding the premises. In this project, differential pressure approach is used for detection of drowning incidents in swimming pools at the earliest possible stage. The automated drowning detection system works on the principle of differential pressure. The system contains two fundamental modules: to begin with the wristband consisting of pressure sensors on the transmitter side. Second, the receiver module at the swimming pool territory should wear the wristband. The pressure at underwater is different and greater than the pressure at the air-water interface. The pressure at a particular depth is measured and set as the threshold.

**Pros:**

- The children's life is saved during drowning incidents in this swimming pool by lifting the acrylic plate.
- The demo system is based on pressure sensor which has an advantage of convenience, cost saving and simple algorithm.

**Cons:**

- The reflection and refraction of light in air water interference will affect the image quality and drowning man feature in this method does not easily distinguish swimmers and divers obviously.
- This system needs constant observation which is the main disadvantage.

**Title :** Automated and Intelligent System for Monitoring Swimming Pool Safety Based on the IoT and Transfer Learning.

**Author:** Aziz Alotaibi (College of Computer and Information Technology).

**Year :** 2020

**Description:** Recently, integrating the Internet of Things (IoT) and computer vision has been utilized in swimming pool automated surveillance systems. Several studies have been proposed to overcome off-time surveillance drowning incidents based on using a sequence of videos to track human motion and position. This paper proposes an efficient and reliable detection system that utilizes a single image to detect and classify drowning objects, to prevent drowning incidents. The performance of the specialized model is evaluated by using a prototype experiment that achieves higher accuracy, sensitivity, and precision, as compared to other deep learning algorithms. The collected data from different physical devices were processed by using ML techniques, to generate an action value.

**Pros:**

- This system utilizes the IoT and transfer learning to provide an intelligent and automated solution for off-time monitoring swimming pool safety.
- A specialized transfer-learning-based model utilizing a model pre-trained on “ImageNet”, which can extract the most useful and complex features of the captured image to differentiate between humans, animals, and other objects.

**Cons:**

- A generative adversarial network should be applied to generate synthesis data, in order to increase the size of the training dataset.
- More classes should be added to explore and investigate the efficiency.

**Title** : Automated Vision Based Swimming Pool Surveillance System.

**Authors:** Darshan V, Sai Anish R, Shiddaramanaguda T, Achintha Holla, Swetha T (Department of Computer Science and Engineering).

**Year** : 2021

**Description:** Automated vision based surveillance for a real time human behaviour analysis provides an efficient way of detecting the occurrence of any abnormal events amid our surroundings. The technical challenges faced encompass the need to reliably detect and track moving targets within possibly dynamic background and inference module that interprets targets behaviour patterns as events with semantic meaning. The drowning person is detected machine learning, using pi camera underwater which is trained to detect these kind of situations, the pi camera is connected to the Raspberry pi, this system is used to monitor the swimming pool, track swimmers in that, if any person is in drowning condition raspberry pi will detect it and it will send command to Arduino Nano board to lift the mesh up. With the help of stepper motors, the mesh will lift up along with the drowning person.

**Pros:**

- This system doesn't have to wait until life guard comes to rescue because it has uplifting mesh.
- More effective and cost efficient than previous other models.

**Cons:**

- Internet connection is necessary to use GPS or sending alert messages. Sometimes to send messages SIM balance may be required.
- The system can be improved by attaching an infrared LED to the swimmer's vest.

**Title** : Drowning Detection System using LRCN Approach.

**Authors:** Shardul Sanjay Chavan, Sanket Tukaram Dhake, Shubham Virendra Jadhav, Prof. Johnson Mathew (Department of Computer Engineering).

**Year** : 2022

**Description:** This project provides the insights of a real-time video surveillance system capable of automatically detecting drowning incidents in a swimming pool. Drowning is the third reason for the highest unintentional deaths, and that's why it is necessary to create trustable security mechanisms. Currently, most of the swimming pool's security mechanisms include CCTV surveillance and lifeguards to help in drowning situations. But this method is not enough for huge swimming pools like in amusement parks. Some of security systems are using AI for drowning detection using cameras situated underwater at a fixed location and also by using floating boards having a camera mounted on the bottom side so that underwater view can be captured. But the main problem in this system arises when the pool is crowded and vision of the cameras are blocked by people.

**Pros:**

- This system aims to create a system that will be able to automatically detect drowning incidents in the swimming pool using human action detection.
- The classifier model is trained using a Long-term Recurrent Convolutional Network which is a combination of convolutional neural network and recurrent neural network which is suitable for large-scale visual understanding tasks such as activity recognition and image captioning.

**Cons:**

- Availability of better dataset, modern methodologies, and technologies with high computational power accompanied by high-quality surveillance cameras, will help to improve the accuracy of drowning detection and even can be used in adverse conditions.

