

Ideation Phase Literature Survey

Date	18 September 2022
Team ID	PNT2022TMID23090
Project Name	VirtualEye - Life Guard for Swimming Pools to Detect Active Drowning
Maximum Marks	-

Problem statement:

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

Abstract:

- Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle.
- Swimming pools are found larger in number in hotels, and weekend tourist spots.
- Beginners, especially, often feel it difficult to breathe underwater which causes breathing trouble which in turn causes a drowning accident.
- Children under six of their age are found to be suffering the highest drowning mortality rates worldwide.

1. A Live Visual Surveillance System for Early Drowning Detection at Pool.

([How-Lung Eng](#) , Published date: February 2008)

- The system is designed to automatically recognize different swimming activities and to detect occurrence of early drowning incidents.
- They named this system the Drowning Early Warning System (DEWS).
- foreground detection.

Foreground detection is one of the major tasks in the field of computer vision and image processing whose aim is to detect changes in image sequences.

All the results show that the method proposed in this paper meets the real-time detection requirements and does well in swimmer behaviour recognition and provides technical support for reducing drowning accidents in public swimming pools.

2. Drowning behavior detection in swimming pool based on deep learning.

([Hengyu Zhu's Fei Lei's](#), Published date: 07 October 2020)

- Swimming is the best exercise practice followed by many from the old days till now. Often the beginners feel it difficult to breathe under water and causes choking water, then as a loss of balance it causes a drowning accident.
- To overcome these types of accidents, an intelligent system should be integrated with the swimming pools to save human lives.
- Ultrasonic sensor is used to recognize whether the person drown under water or in a safer level by fixing a threshold value.

PIR sensor is used to find whether the drown object is human or animal or any other non-living objects. They collected real-life data from the swimming pool and conducted related experiments. This method can easily and efficiently detect the swimmer who is in danger at an early stage and provide necessary rescue reminders to lifeguards.

Some Challenges:

- Object detection is one of the most important tasks in the field of Computer Vision. Locating a specific object in an image is a trivial task for humans, but can be quite challenging for machines.
- Deep Learning models require a large number of training examples to produce good results.
- There is a golden rule, *'the more the data, the better the result.'*

3. Off-time swimming pool surveillance using thermal imaging system.

([Wai Kit Wong](#)[Joe How Hui](#), Published date: 18 November 2011)

- This the detection algorithm for an off-time swimming pool surveillance using thermal imaging system.
- Two sub-algorithms are developed for detection outside and inside swimming pool regions.
- The algorithm can detect not only moving human in different directions, but also any water activity in the swimming pool caused by human intruder such as swimming, water-splashing.
- Experimental results show that the intruder detection algorithm achieved high accuracy of 95.58% for region outside swimming pool and 92.44% for region inside swimming pool.

Some Challenges:

- Overall temperature - Hotter than usual results could indicate poor cooling or internal problems.
- Use the thermal Camera - check overall temperature, especially of smaller motors that may not get the kind of maintenance they should. Often these motors overheat before anyone notices. Use the motor temperature rating on its nameplate as a guide. Exterior motor temperatures generally are about 36°F cooler than interior temperatures.

4. Video Based Drowning Detection System.

([Abdel Ilah N. Alshbatat](#), Published date: 16 June 2020)

- Accordingly, a real-time system that will track swimmers in a pool using machine learning techniques and prevents drowning accidents is proposed.
- To protect the people from drowning in swimming pool, we are using machine learning and mesh lifting system to prevent drowning incidents. The mesh will be controlled by stepper motor.
- 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.

Advantages:

This system doesn't have to wait until life guard comes to rescue because it has uplifting mesh. This is very fast process.

Challenges:

Internet connection is necessary to use GPS or sending alert messages. Sometimes to send messages SIM balance may be required

5. AUTOMATED VISION-BASED SURVEILLANCE SYSTEM TO DETECT DROWNING INCIDENTS IN SWIMMING POOLS

([Pavithra P](#) , [Nandini S Nanthana A](#) , [Noor Tabreen Aslam](#), Published date: 11 June 2021)

- Most of the swimming pool accidents or incidents occur due to improper security.
- So, Video based drowning detection system is designed.
- 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 (General Purpose Input/Output) system for alerting and short message service.

Some Challenges:

- **Boot Issues**
- **Raspberry Pi Not Working with HDMI Based Display**
- **Raspberry Pi Camera not working**

6. Comprehensive and Comparative Study of Drowning Person Detection and Rescue Systems.

([Muhammad Aftab Hayat](#)[Goutian Yang](#), Published date: 17 November 2019)

- Different aspects of human drowning systems are discussed here with their core technologies and applications
- Various methodologies have been adopted for autonomous swimming pool safety with their intelligent control systems.
- Different detection and rescue techniques like motion detection, pressure sensing, image processing, heartbeat sensing, video-based detection, HSV based detection, and LASER-LDR mechanism have been used