

# Automatic Drowning Detection Surveillance System

A19

## 自動溺水偵測系統



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### Abstract

Drown detection system aims to assist lifeguards with swimming pool surveillance tasks. Each year, it is impossible to end a summer without hearing a single news of people drowning in swimming pools, rivers or beaches. Even when several well-trained lifeguards are taking charge of surveillance, they may sometimes miss out because of neglect or fatigue. Therefore, with a device that won't feel tired as long as the power is on, we could not only have a comprehensive view about what is going on in the area, but also, most importantly, save lives.

In our project, we have worked on both software and hardware part.

#### Software structure:



#### Hardware structure:



### Step2: Partial Occlusion Handling

When we have obtained foreground and background binary image, the next job is to keep track on every existing objects (swimmers). However, there are some times that partial occlusion happens among several objects, i.e. an object is partially covered by another object. Accordingly, occlusion handling is of great importance so as to avoid incorrect object tracking, which is based on finding contours of objects (established in the next section). The overall procedure of my occlusion handling method is shown as below.



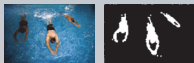
#### Experiment Result:



## Design & Implementation

### Step1: Background Model

My background model is primarily based on novelty detection and can be basically divided into two part, training and predicting. In training part, videos of a swimming pool with no swimmers or any other objects are inputs of training process, outputting a classifier that learn "what is a swimming pool". In predicting part, the classifier just mentioned will try to discriminate "what is a swimming pool", i.e. background, through videos of a regular swimming pool, and for those that the classifier think they are not a swimming pool will be labeled as foreground. The final output of the background model will be a binary image segmenting background from foreground.



### Step3: Multiple Object Tracking

After all objects including the occluded are well-segmented, we need to keep track on each object at every time points. Our implementation can be basically separated into 3 stages. First of all, we find the contour of every objects. Then, in order to eliminate noises, we abandon those with too small contour area. Last, all detected objects go through matching process associated with tracks with objects at previous time point. Finally, we can compute and record feature of objects on all occupied tracks.



#### Experiment Result:

