Virtual Eye – Life Guard for Swimming Pool to Detect Active Drowning

A PROJECT REPORT

Submitted by

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1.INTRODUCTION

1.1 Project overview:

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 and barely people have them in their house backyard. Beginners, especially, often feel it difficult to breathe underwater which causes breathing trouble which in turn causes a drowning accident.

Worldwide, drowning produces a higher rate of mortality without causing injury to children. Children under six of their age are found to be suffering the highest drowning mortality rates worldwide. Such kinds of deaths account for the third cause of unplanned death globally, with about 1.2 million cases yearly. To overcome this conflict, a meticulous system is to be implemented along the swimming pools to save human life.

1.2 Purpose:

By studying body movement patterns and connecting cameras to artificial intelligence (AI) systems we can devise an underwater pool safety system that reduces the risk of drowning.

Usually, such systems can be developed by installing more than 16 cameras underwater and ceiling and analyzing the video feeds to detect any anomalies. but AS a POC we make use of one camera that streams the video underwater and analyses the position of swimmers to assess the probability of drowning, if it is higher then an alert will be generated to attract lifeguards' attention.

2. LITERATURE SURVEY

2.1 Existing problems:

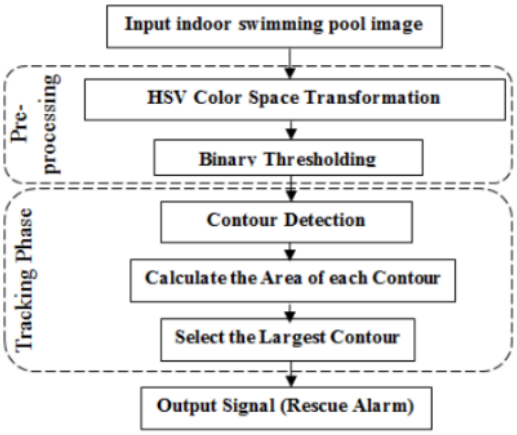
2.1.1 A Video-Based Drowning Detection System[1]:

This paper provides new insights into robust human tracking and semantic event detection within the context of a novel real-time video surveillance system capable of automatically detecting drowning incidents in a swimming pool. An effective background model that incorporates prior knowledge about swimming pools and aquatic environments enables swimmers to be reliably detected and tracked despite the significant presence of water ripples, splashes and shadows. The technical challenges faced are thus two-fold. First are problems related to object detection and tracking such as dealing with shadows, lighting changes and effects of moving elements of the background. Secondly and no less challenging is the interpretation of the objects' motions into a description of detected actions and interactions. This paper provides fresh insights into these and additional unique problems faced in the development of a novel real-time video surveillance system capable of detecting potential drowning incidents in a swimming pool.

Fast movements (swimmer in distress), activity index=2.44

2.1.2 An Automatic Video-based Drowning Detection System for Swimming Pools Using Active Contours[2]

In this paper we have proposed a method for automatic real-time detection of a person drowning in the swimming pools. Our system is based on real time video analysis of the cameras installed around the swimming pool in a way which the entire swimming pool can be covered. Each camera is mounted on pool walls oriented downwards with a sharp angle, so that it can minimize the effect of lightening system which causes occlusions and foreshadowing. In this work, a ODROID-XU as a distributed system is installed in the swimming pool to collect all the video signals collected from cameras and process them using computer vision methods. The used hardware including the distributing system known as ODROID-XU, and our Logitech HD Pro C920 webcam used to record all the video sequences .The system is used to firstly detect the background of the pool and then decide to send an alarm to rescue team if a previously detected person is missing in video frames for an specific and defined period of time. In the next sections of this paper, we try to explain the concepts we used to detect and track individuals in swimming pools.


Input indoor swimming pool image
Pre-processing
HSV Color Space Transformation
Binary Thresholding
Tracking Phase
Contour Detection
Calculate the Area of each Contour
Select the Largest Contour
Output Signal (Rescue Alarm)

2.1.3 A novel drowning detection method for safety of Swimmers[3]:

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.

2.1.4 A vision-based approach to early detection of drowning incidents in swimming pools[4]

The proposed approach consists of two main parts: a vision component which can reliably detect and track swimmers in spite of large scene variations of monitored pool areas, and an event-inference module which parses observation sequences of swimmer features for possible drowning behavioral signs. The vision component employs a model-based approach to represent and differentiate the background pool areas and foreground swimmers. The event-inference module is constructed based on a finite state machine, which integrates several reasoning rules formulated from universal motion characteristics of drowning swimmers. Possible drowning incidents are quickly detected using a sequential change detection algorithm. We have applied the proposed approach to a number of video clips of simulated drowning and obtained promising results as reported in this paper.

2.1.5 Drowning Detection Based on Background Subtraction[5]:

The main research subject in this paper is swimmer detection for visual surveillance of pool. A drowning detection method based on background subtraction is presented in this paper. The consecutive sequence of visual surveillance was obtained by the fixed camera installed in the pool wall. Each pixel is described by Gaussian mixed model, set up self-adapted background model and updating timely. When the foreground objects was separated, for getting good results, the shadows and noises must be removed. The experiments results show that this method is effective to detect the drowners and eliminate the shadows.

2.2 References:

[1] A. H. Kam, W. Lu, and W.-Y. Yau, “A Video-Based Drowning Detection System,” Lecture Notes in Computer Science, pp. 297–311, 2002, doi : 10.1007/3-540-47979-1_20.

[2] Salehi, Nasrin & Keyvanara, Maryam & Monadjemmi, Seyed. (2016). An Automatic Video-based Drowning Detection System for Swimming Pools Using Active Contours. International Journal of Image, Graphics and Signal Processing. 8. 1-8. 10.5815/ijigsp.2016.08.01.

[3] A. Roy and K. Srinivasan, "A novel drowning detection method for safety of Swimmers," 2018 20th National Power Systems Conference (NPSC), 2018, pp. 1-6, doi: 10.1109/NPSC.2018.8771844.

[4] Wenmiao Lu and Yap-Peng Tan, "A vision-based approach to early detection of drowning incidents in swimming pools," in IEEE Transactions on Circuits and Systems for Video Technology, vol. 14, no. 2, pp. 159-178, Feb. 2004, doi: 10.1109/TCSVT.2003.821980.

[5] L. Fei, W. Xueli and C. Dongsheng, "Drowning Detection Based on Background Subtraction," 2009 International Conference on Embedded Software and Systems, 2009, pp. 341-343, doi: 10.1109/ICESS.2009.35.

2.3 Problem Statement:

When people swim in the pools, it might not be a mandatory that they should know to swim . Even though they are good at swimming sometimes where they actually loose their control of balance and get themselves drowned. Hence a lifeguard is placed at all times . But it is ot possible for the lifeguard to always be aware of the situations . Hence an AI technology using YOLO model has to built in order to detect the active drowning of the swimmer and give the lifeguard an alarm to alert to the worse situation and help them save their lives.

The model is deployed in the cloud and the end user is the swimming pool owners which will help them improve the safety of the pools and get them advertised with the most safest pool and so on.

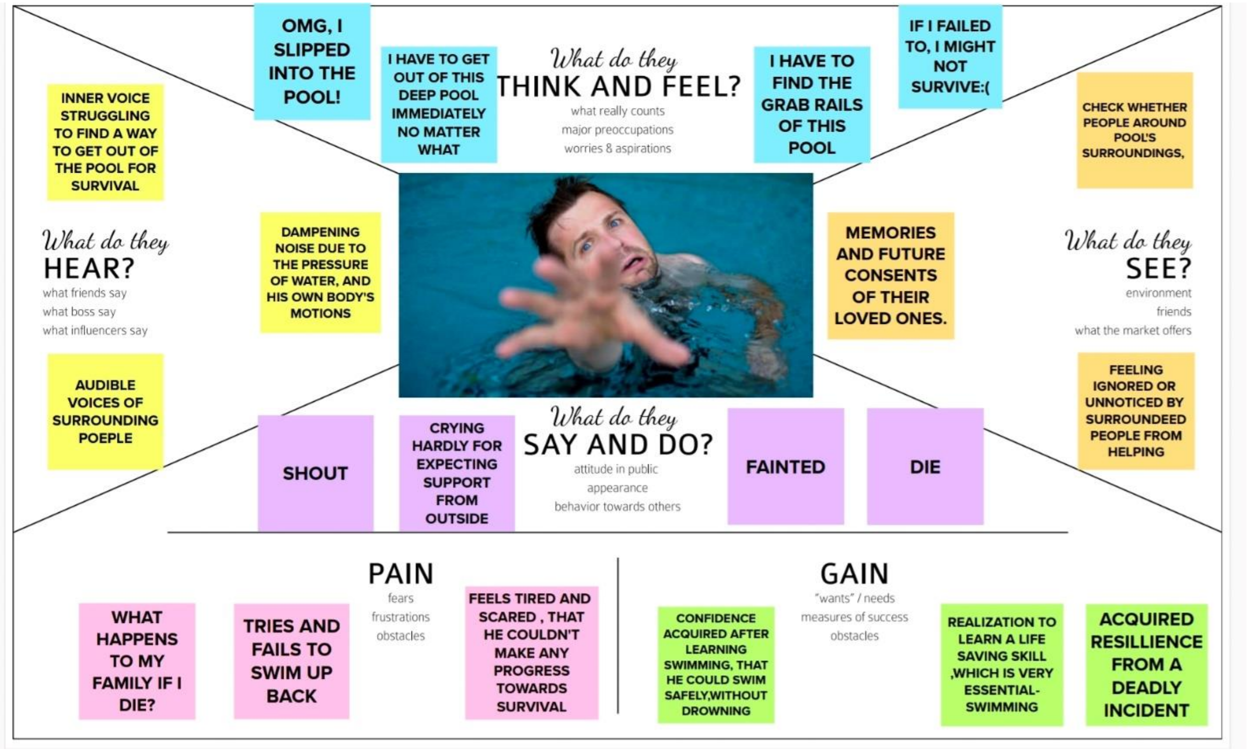
3. IDEATION AND PROBLEM SOLUTION

3.1 Empathy Map Canvas:

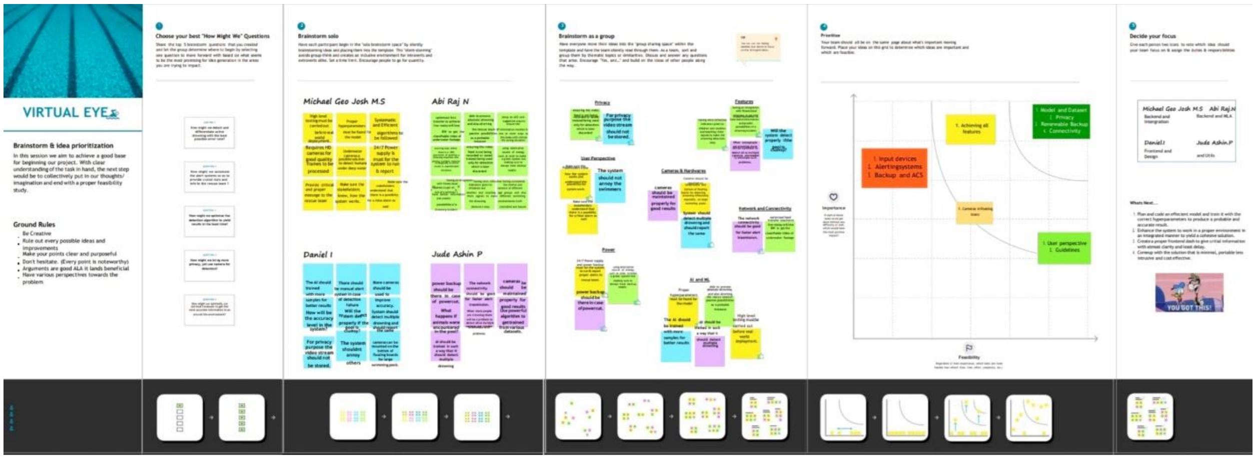
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user’s behaviours and attitudes.

It is a useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user’s perspective along with his or her goals and challenges.


OMG, I SLIPPED INTO THE POOL!
I HAVE TO GET OUT OF THIS DEEP POOL IMMEDIATELY NO MATTER WHAT
What do they THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
I HAVE TO FIND THE GRAB RAILS OF THIS POOL
IF I FAILED TO, I MIGHT NOT SURVIVE:(
INNER VOICE STRUGGLING TO FIND A WAY TO GET OUT OF THE POOL FOR SURVIVAL
CHECK WHETHER PEOPLE AROUND POOL'S SURROUNDINGS,
What do they HEAR?
what friends say
what boss say
what influencers say
DAMPENING NOISE DUE TO THE PRESSURE OF WATER, AND HIS OWN BODY'S MOTIONS
MEMORIES AND FUTURE CONSENTS OF THEIR LOVED ONES.
What do they SEE?
environment
friends
what the market offers
AUDIBLE VOICES OF SURROUNDING POEPLE
FEELING IGNORED OR UNNOTICED BY SURROUNDEED PEOPLE FROM HELPING
SHOUT
CRYING HARDLY FOR EXPECTING SUPPORT FROM OUTSIDE
What do they SAY AND DO?
attitude in public
appearance
behavior towards others
FAINTED
DIE
PAIN
fears
frustrations
obstacles
WHAT HAPPENS TO MY FAMILY IF I DIE?
TRIES AND FAILS TO SWIM UP BACK
FEELS TIRED AND SCARED , THAT HE COULDN'T MAKE ANY PROGRESS TOWARDS SURVIVAL
GAIN
"wants" / needs
measures of success
obstacles
CONFIDENCE ACQUIRED AFTER LEARNING SWIMMING, THAT HE COULD SWIM SAFELY,WITHOUT DROWNING
REALIZATION TO LEARN A LIFE SAVING SKILL ,WHICH IS VERY ESSENTIAL-SWIMMING
ACQUIRED RESILLIENCE FROM A DEADLY INCIDENT

3.2 Ideation and Brainstorming:



VIRTUAL EYE

Brainstorm & idea prioritization

In this session we aim to achieve a good base for beginning our project. With clear understanding of the task in hand, the next step would be to collectively put in our thoughts/ imagination and end with a proper feasibility study.

Ground Rules

- Be Creative
- Rule out every possible ideas and improvements
- Make your points clear and purposeful
- Don't hesitate. (Every point is noteworthy)
- Arguments are good ALA it lands beneficial
- Have various perspectives towards the problem

Choose your best "How Might We" Questions

Brainstorm solo

Michael Geo Josh M.S

- Systematic and Efficient algorithms to be followed
- 24/7 Power supply is must for the system to run & report
- Requires HD cameras for good quality frames to be processed

Abi Raj N

Daniel I

- The AI should trained with more samples for better results
- How will be the accuracy level in the system?
- For privacy purpose the video stream should not be stored.
- The system shouldnt annoy others

Jude Ashin P

- power backup should be there in case of powercut.
- What happens if animals were encountered in the pool?
- cameras should be maintained properly for good results

Brainstorm as a group

Privacy

- For privacy purpose the video stream should not be stored.

Features

- Will the system detect properly if the pool is clumsy?

User Perspective

- The system should not annoy the swimmers

Cameras & Hardwares

- cameras should be maintained properly for good results
- System should detect multiple drowning and should report the same

Network and Connectivity

- The network connectivity should be good for faster alert transmission.

Power

- power backup should be there in case of powercut.

AI and ML

- The AI should be trained with more samples for better results
- High level testing must be carried out before real world deployment.

Prioritize

1. Input devices
1. Alertingsystems
1. Backup and ACS

1. Achieving all features

1. Model and Dataset
1. Privacy
1. Renewable Backup
1. Connectivity

1. Camera infusing team

1. User perspective
1. Guidelines

Importance

Feasibility

Decide your focus

Michael Geo Josh M.S — Backend and Intergration

Abi Raj.N — Backend and MLA

Daniel.I — Frontend and Design

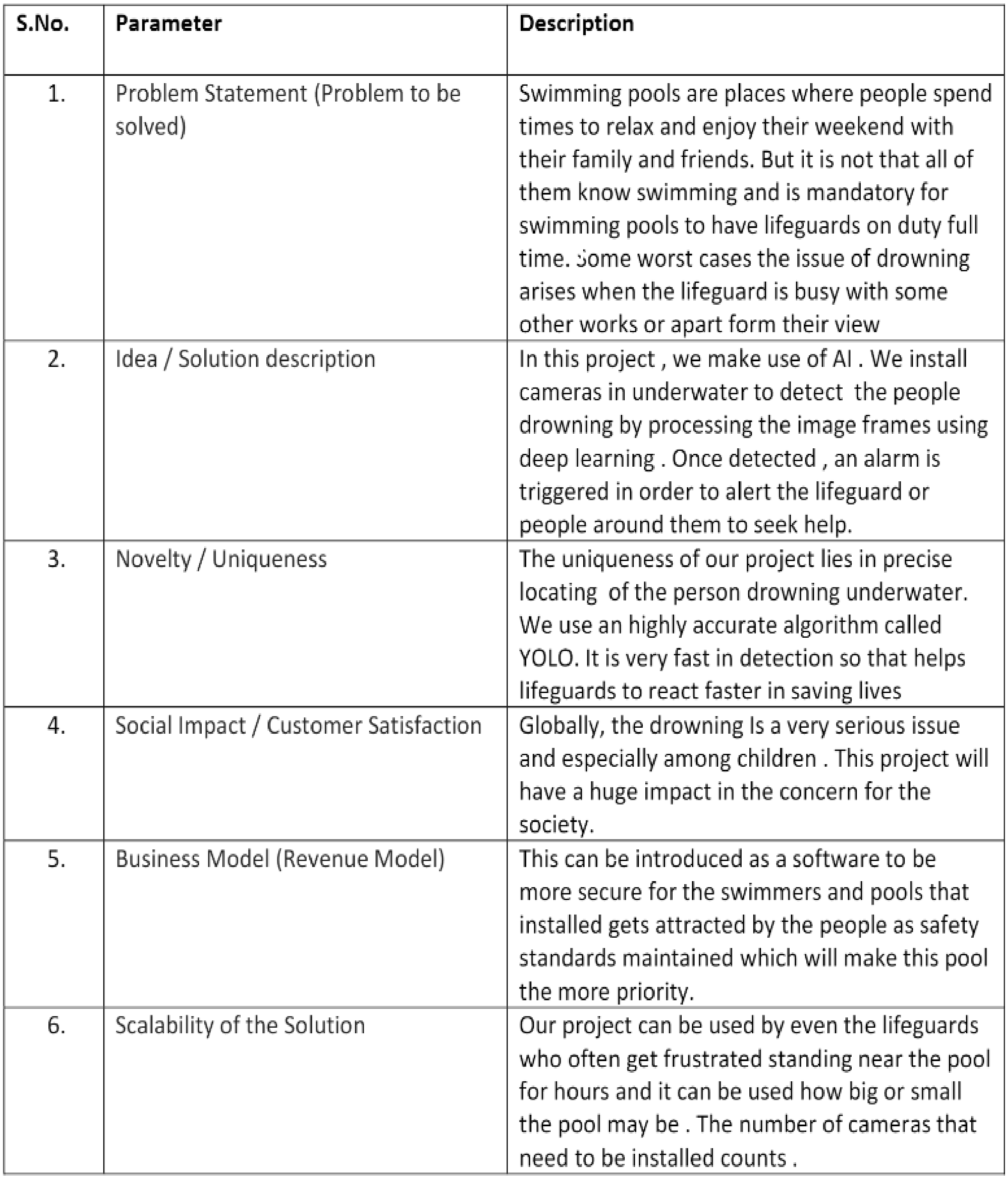
Jude Ashin.P — and Utils

Whats Next...

1. Plan and code an efficient model and train it with the correct hyperparameters to produce a probable and accurate result.
1. Enhance the system to work in a proper environment in an integrated manner to yield a cohesive solution.
1. Create a proper frontend dash to give critical information with utmost clarity and least delay.
1. Comeup with the solution that is minimal, portable less intrusive and cost effective.

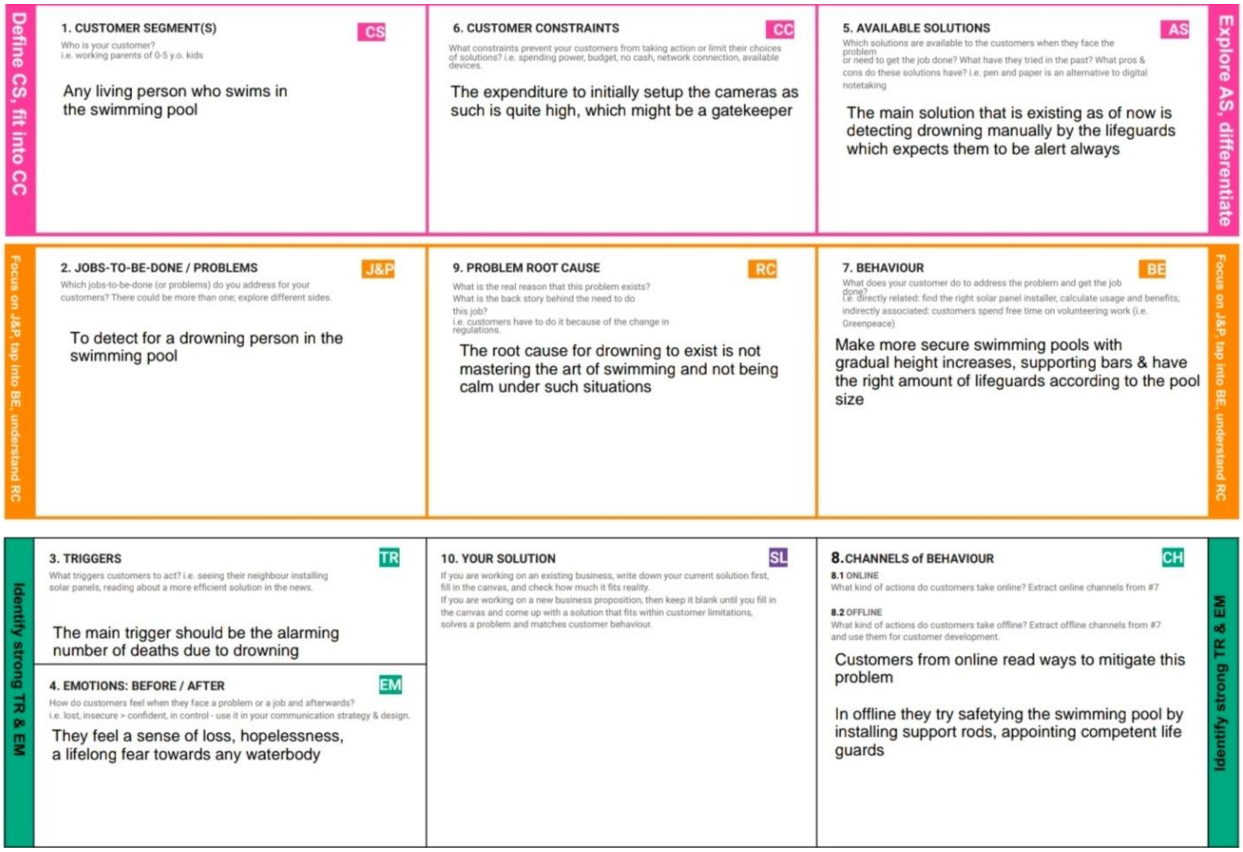
In this phase , the ideas and the solutions are brainstormed among the team members and the appropriate solution for the problem statement is arrived.

3.3 Proposed Solution:



S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Swimming pools are places where people spend times to relax and enjoy their weekend with their family and friends. But it is not that all of them know swimming and is mandatory for swimming pools to have lifeguards on duty full time. Some worst cases the issue of drowning arises when the lifeguard is busy with some other works or apart form their view
2.	Idea / Solution description	In this project , we make use of AI . We install cameras in underwater to detect the people drowning by processing the image frames using deep learning . Once detected , an alarm is triggered in order to alert the lifeguard or people around them to seek help.
3.	Novelty / Uniqueness	The uniqueness of our project lies in precise locating of the person drowning underwater. We use an highly accurate algorithm called YOLO. It is very fast in detection so that helps lifeguards to react faster in saving lives
4.	Social Impact / Customer Satisfaction	Globally, the drowning Is a very serious issue and especially among children . This project will have a huge impact in the concern for the society.
5.	Business Model (Revenue Model)	This can be introduced as a software to be more secure for the swimmers and pools that installed gets attracted by the people as safety standards maintained which will make this pool the more priority.
6.	Scalability of the Solution	Our project can be used by even the lifeguards who often get frustrated standing near the pool for hours and it can be used how big or small the pool may be . The number of cameras that need to be installed counts .

3.4 Problem solution fit:



Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Any living person who swims in the swimming pool

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

The expenditure to initially setup the cameras as such is quite high, which might be a gatekeeper

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem
or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

The main solution that is existing as of now is detecting drowning manually by the lifeguards which expects them to be alert always

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

To detect for a drowning person in the swimming pool

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

The root cause for drowning to exist is not mastering the art of swimming and not being calm under such situations

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Make more secure swimming pools with gradual height increases, supporting bars & have the right amount of lifeguards according to the pool size

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

The main trigger should be the alarming number of deaths due to drowning

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

They feel a sense of loss, hopelessness, a lifelong fear towards any waterbody

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

Customers from online read ways to mitigate this problem

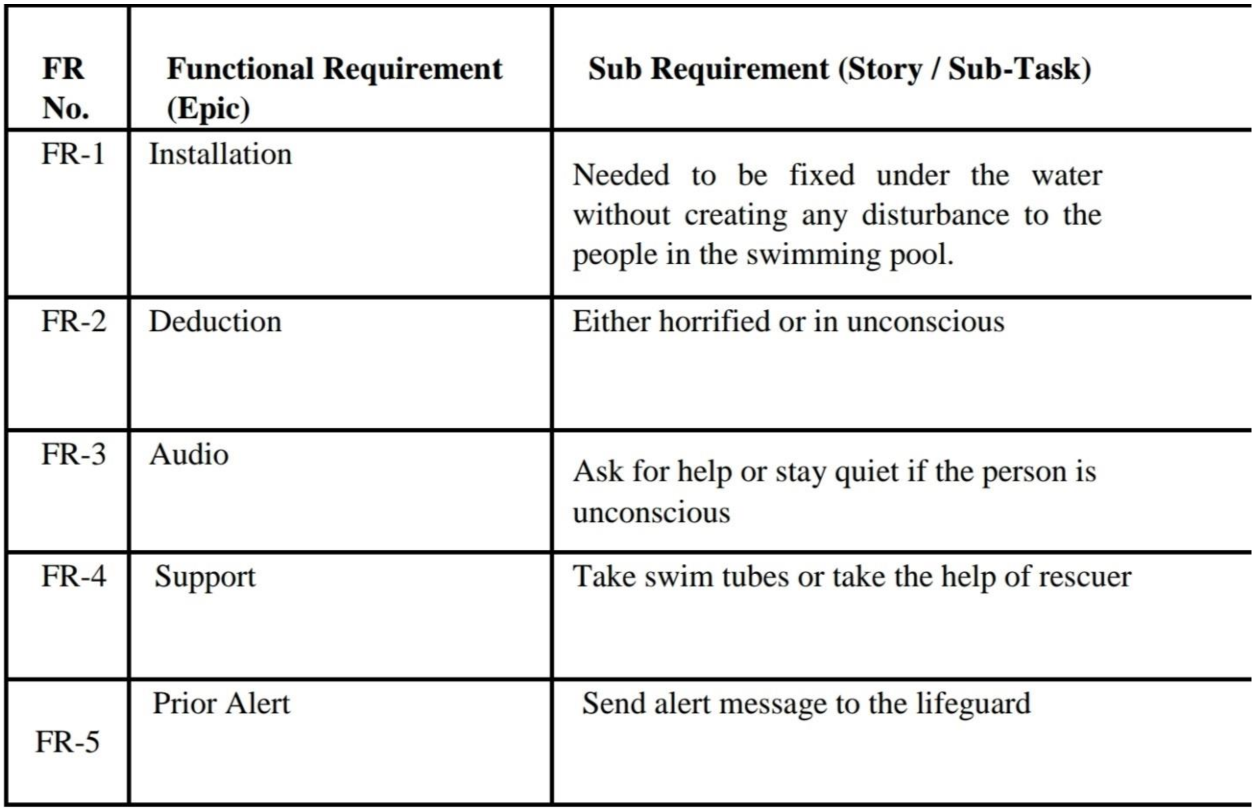
In offline they try safetying the swimming pool by installing support rods, appointing competent life guards

Identify strong TR & EM

4.REQUIREMENT ANALYSIS

4.1 Functional Requirement:

Functional requirements are product features that developers must implement to enable the users to achieve their goals. They define the basic system behavior under specific conditions. **Functional requirements** should not be confused with other types of requirements in product management



FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Installation	Needed to be fixed under the water without creating any disturbance to the people in the swimming pool.
FR-2	Deduction	Either horrified or in unconscious
FR-3	Audio	Ask for help or stay quiet if the person is unconscious
FR-4	Support	Take swim tubes or take the help of rescuer
FR-5	Prior Alert	Send alert message to the lifeguard

In this project , the functional requirements are the required functions that our application has to perform . The application has

User registration- There may be different users who use this application at different locations and they have to be distinguished

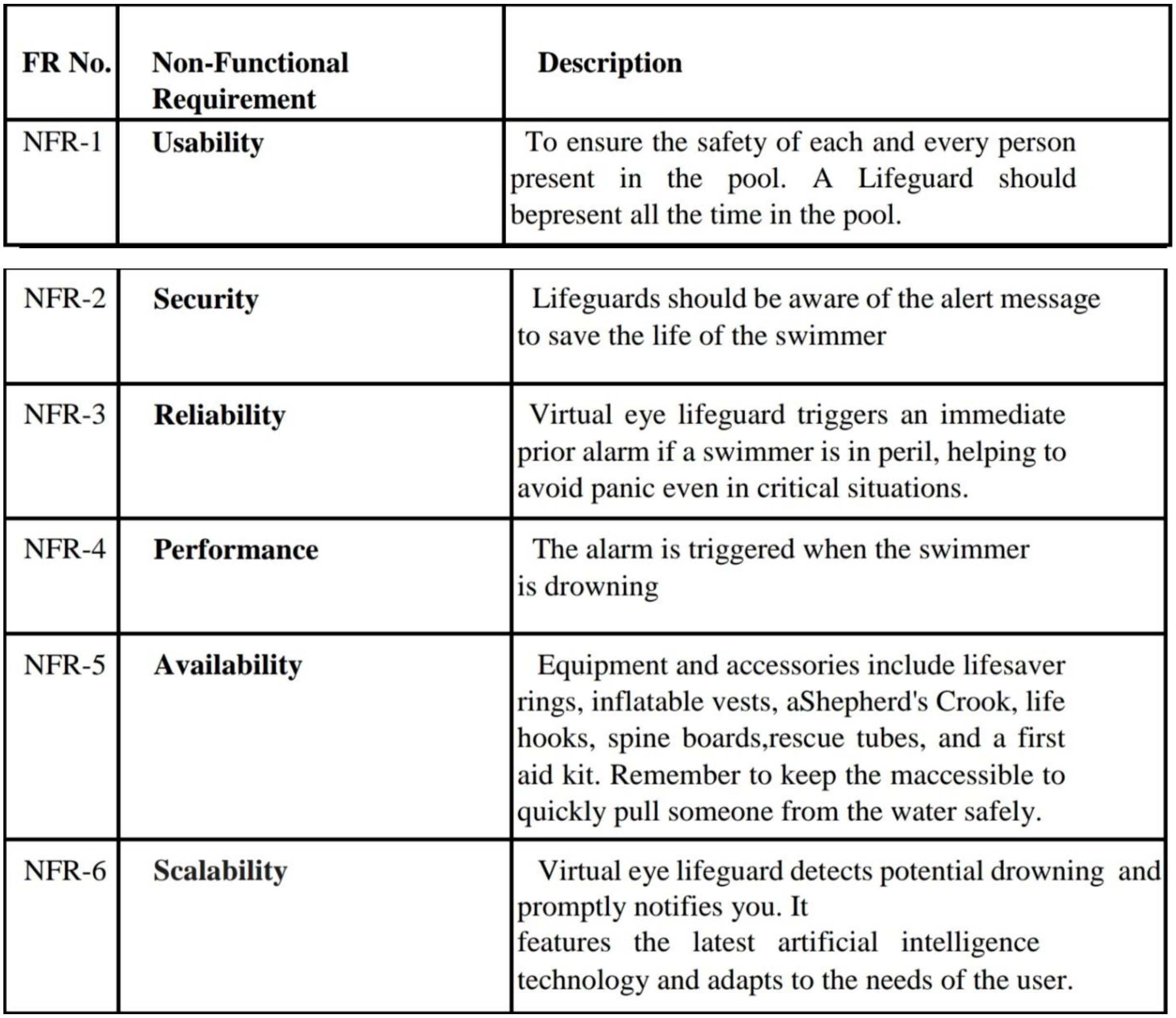
User confirmation- Once the user details has been registered , the user is confirmed by login.

Camera Installations- The main source for the detection is the image frames obtained from cameras, which captures live action

Alarms- Once the drowning is detected , the lifeguards are alerted in no delay to save the drowning people

4.2 Non-Functional Requiements:

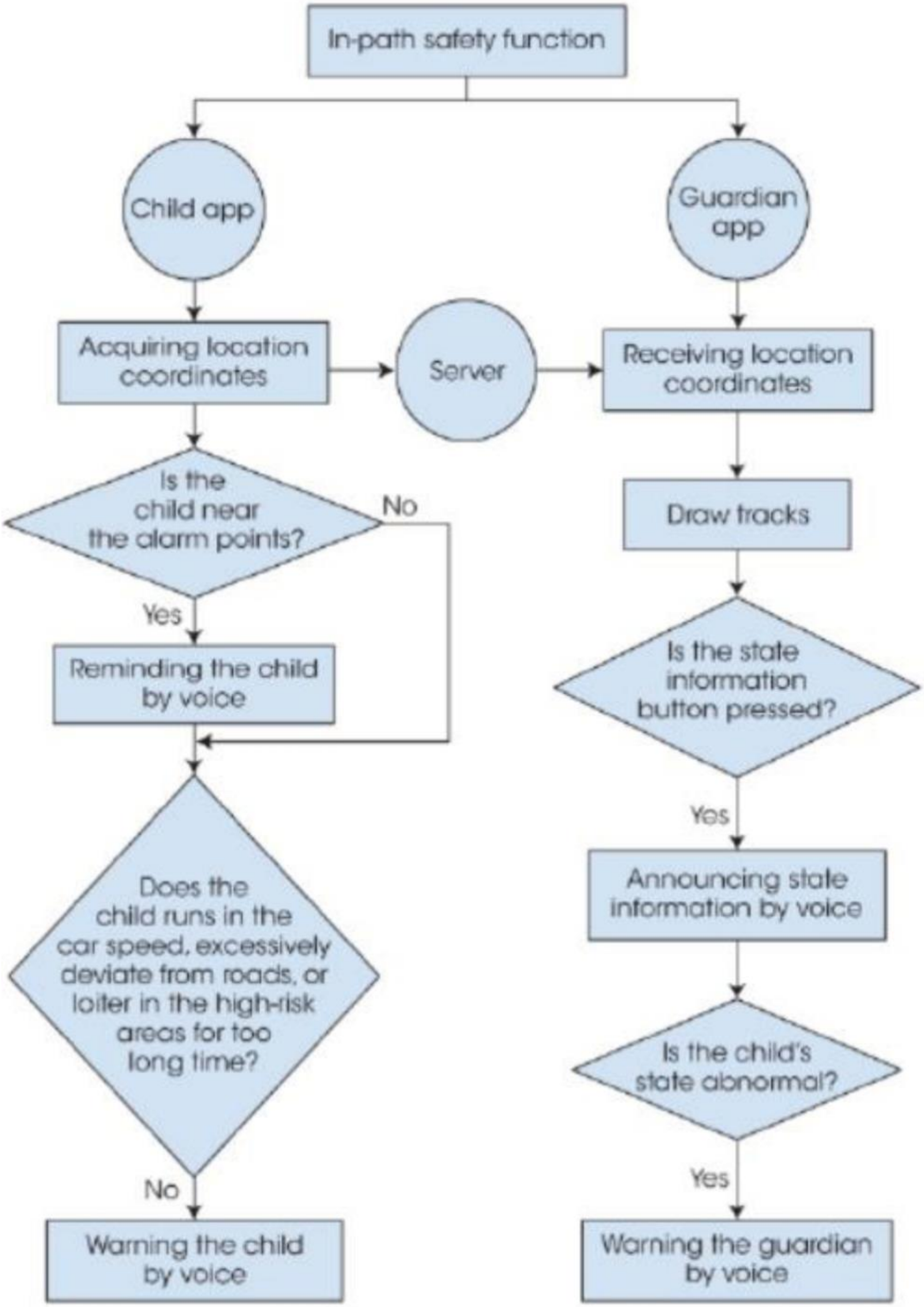
In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviour.



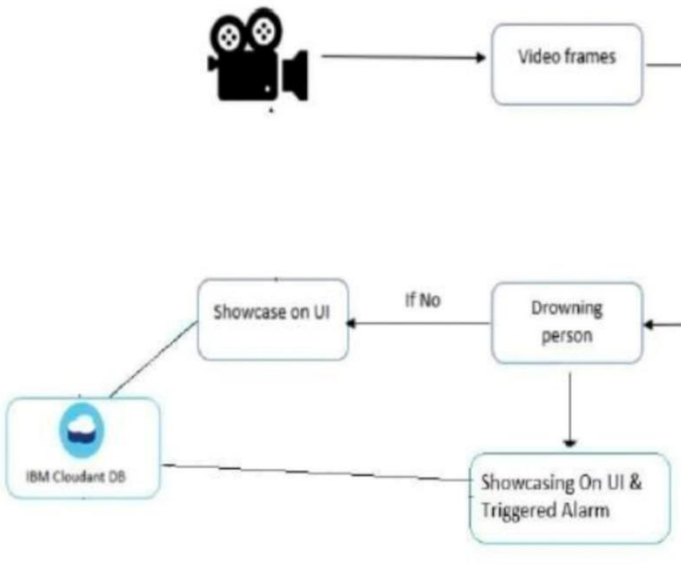
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	To ensure the safety of each and every person present in the pool. A Lifeguard should bepresent all the time in the pool.
NFR-2	**Security**	Lifeguards should be aware of the alert message to save the life of the swimmer
NFR-3	**Reliability**	Virtual eye lifeguard triggers an immediate prior alarm if a swimmer is in peril, helping to avoid panic even in critical situations.
NFR-4	**Performance**	The alarm is triggered when the swimmer is drowning
NFR-5	**Availability**	Equipment and accessories include lifesaver rings, inflatable vests, aShepherd's Crook, life hooks, spine boards,rescue tubes, and a first aid kit. Remember to keep the maccessible to quickly pull someone from the water safely.
NFR-6	**Scalability**	Virtual eye lifeguard detects potential drowning and promptly notifies you. It features the latest artificial intelligence technology and adapts to the needs of the user.

5.PROJECT DESIGN

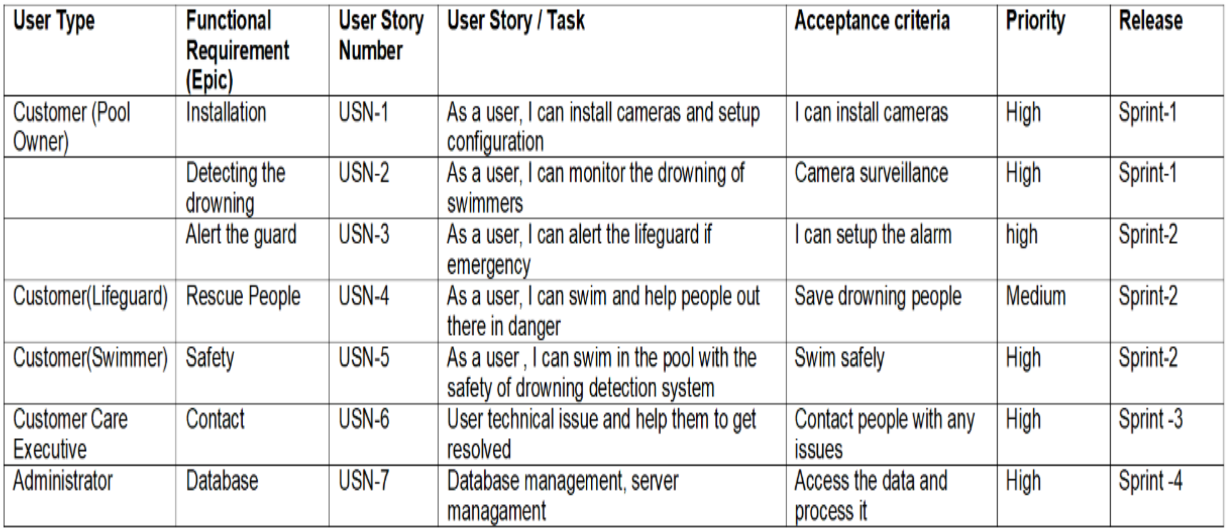
5.1 Dataflow Diagrams:


In-path safety function
Child app
Guardian app
Acquiring location coordinates
Server
Receiving location coordinates
Is the child near the alarm points?
No
Yes
Reminding the child by voice
Draw tracks
Is the state information button pressed?
Yes
Announcing state information by voice
Does the child runs in the car speed, excessively deviate from roads, or loiter in the high-risk areas for too long time?
No
Warning the child by voice
Is the child's state abnormal?
Yes
Warning the guardian by voice

5.2 Solution and Technical architecture:



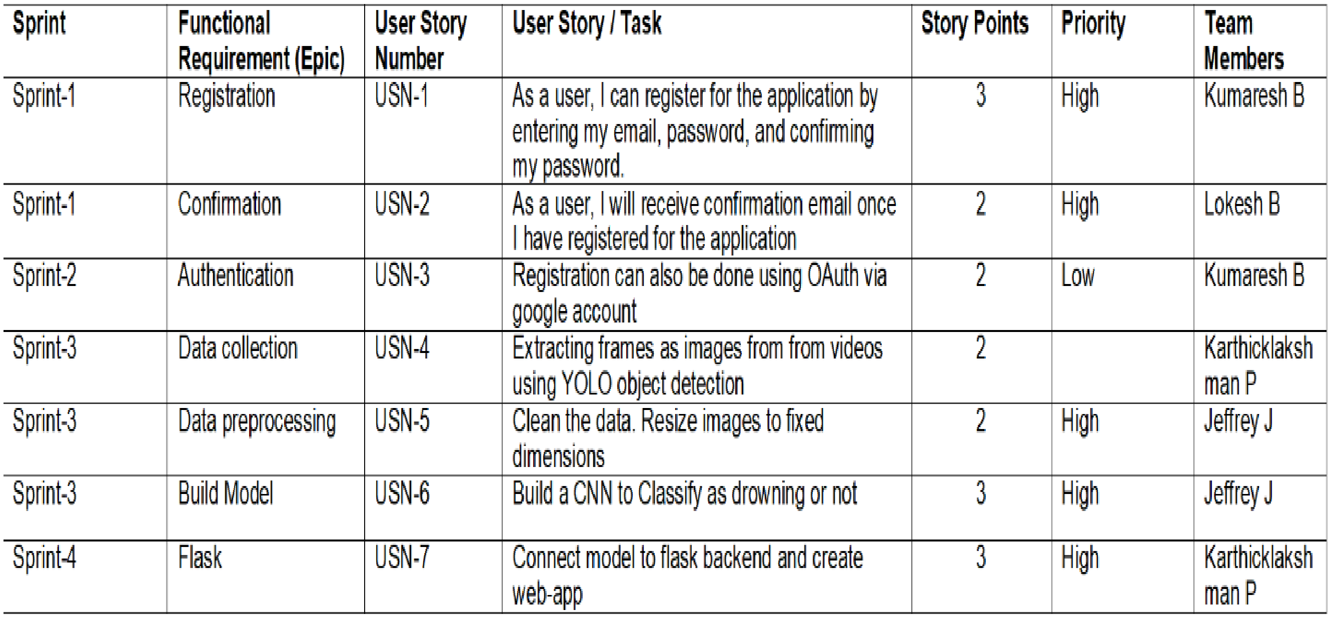
5.3 User Stories:



User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Pool Owner)	Installation	USN-1	As a user, I can install cameras and setup configuration	I can install cameras	High	Sprint-1
	Detecting the drowning	USN-2	As a user, I can monitor the drowning of swimmers	Camera surveillance	High	Sprint-1
	Alert the guard	USN-3	As a user, I can alert the lifeguard if emergency	I can setup the alarm	high	Sprint-2
Customer(Lifeguard)	Rescue People	USN-4	As a user, I can swim and help people out there in danger	Save drowning people	Medium	Sprint-2
Customer(Swimmer)	Safety	USN-5	As a user , I can swim in the pool with the safety of drowning detection system	Swim safely	High	Sprint-2
Customer Care Executive	Contact	USN-6	User technical issue and help them to get resolved	Contact people with any issues	High	Sprint -3
Administrator	Database	USN-7	Database management, server managament	Access the data and process it	High	Sprint -4

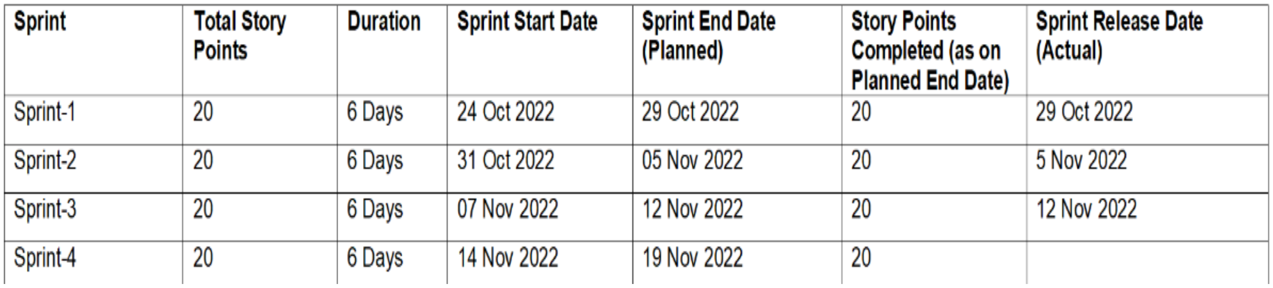
6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint planning and estimation:



Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	3	High	Kumaresh B
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	2	High	Lokesh B
Sprint-2	Authentication	USN-3	Registration can also be done using OAuth via google account	2	Low	Kumaresh B
Sprint-3	Data collection	USN-4	Extracting frames as images from from videos using YOLO object detection	2		Karthicklakshman P
Sprint-3	Data preprocessing	USN-5	Clean the data. Resize images to fixed dimensions	2	High	Jeffrey J
Sprint-3	Build Model	USN-6	Build a CNN to Classify as drowning or not	3	High	Jeffrey J
Sprint-4	Flask	USN-7	Connect model to flask backend and create web-app	3	High	Karthicklakshman P

6.2 Sprint Delivery Schedule:



Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	5 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	

7.CODING

AND

SOLUTIONING

7.1 Feature 1:

The application enables user to login and register to access the functionalities . This is achieved through firebase oauth system.

```
<!DOCTYPE html>

<html>

  <head>

    <meta charset="utf-8">

    <title>Virtual Eye</title>

     <!-- Cool Google Fonts -->

     <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.5.1/jquery.min.js"></script>

    <link rel="preconnect" href="https://fonts.gstatic.com">

    <link href="https://fonts.googleapis.com/css2?family=Montserrat&display=swap" rel="stylesheet">

    <link href="https://fonts.googleapis.com/css2?family=Montserrat:wght@900&display=swap" rel="stylesheet">

    <link href="https://fonts.googleapis.com/css2?family=Montserrat:wght@500&display=swap" rel="stylesheet">
```

```
            <link
href="https://fonts.googleapis.com/css2?family=Bowlby+One+SC&display=swap"
rel="stylesheet">

            <!-- Our stylesheet -->

            <link rel="stylesheet" type="text/css" href="index.css">

        </head>

        <body>

            <div id="content_container">

                <div id="form_container">

                    <div id="form_header_container">

                        <h2 id="form_header"> Virtual Eye </h2>

                    </div>



                    <div class="navigation" style="display: flex;justify-content: space-
around;padding:20px">

                        <div class ="nav_object">

                            <h2 class="form_options first_option"
onclick="showLogin()">Login</h2>

                        </div>
                        <div>
                            <h2 class="form_options" onclick="showRegister()">Register</h2>
                        </div>
                    </div>

                    <div id="form_content_container0" >
                        <div id="form_content_inner_container">
                            <input type="text" id="loginemail" placeholder="Email">
                            <input type="password" id="loginpassword" placeholder="Password">

                            <div id="button_container">
                                <button onclick="login()">Login</button>
                            </div>

                        </div>
                    </div>
```

```
            <div id="form_content_container1">
                <div id="form_content_inner_container">
                    <input type="text" id="Username" placeholder="Username">
                    <input type="email" id="email" placeholder="Email">
                    <input type="password" id="password" placeholder="Password">

                    <div id="button_container">
                        <button onclick="register()">Register</button>
                    </div>

                </div>
            </div>
        </div>
    </div>
</body>

<!-- The core Firebase JS SDK is always required and must be listed first -->
```

```
        <script src='https://ajax.googleapis.com/ajax/libs/jquery/1.11.1/jquery.min.js'></script>

        <script src="https://www.gstatic.com/firebasejs/9.14.0/firebase-app.js"></script>


        <!-- TODO: Add SDKs for Firebase products that you want to use

            https://firebase.google.com/docs/web/setup#available-libraries -->

        <script src="https://www.gstatic.com/firebasejs/9.14.0/firebase-auth.js"></script>

        <script src="https://www.gstatic.com/firebasejs/9.14.0/firebase-database.js"></script>


        <!-- Our script must be loaded after firebase references -->

        <script src="index.js">


        </script>


    </html>
```

Index.js

```
firebase.initializeApp(firebaseConfig);
  // Initialize variables
  const auth = firebase.auth()
  const database = firebase.database()

  // Set up our register function
  function register () {
    // Get all our input fields
    email = document.getElementById('email').value
    password = document.getElementById('password').value
    username = document.getElementById('Username').value

    // Validate input fields
    if (validate_email(email) == false || validate_password(password) == false) {
      alert('Email or Password is Outta Line!!')
      return
      // Don't continue running the code
```

```
}

// if (validate_field(full_name) == false || validate_field(favourite_song) == false || validate_field(milk_before_cereal) == false) {

//   alert('One or More Extra Fields is Outta Line!!')

//   return

// }


// Move on with Auth

auth.createUserWithEmailAndPassword(email, password)

.then(function() {

  // Declare user variable

  var user = auth.currentUser


  // Add this user to Firebase Database

  var database_ref = database.ref()


  // Create User data

  var user_data = {
})

    email : email,

    username : username,

    last_login : Date.now()

  }



  // Push to Firebase Database

  database_ref.child('users/' + user.uid).set(user_data)



  // DOne

  alert('User Created!!')

})

.catch(function(error) {

  // Firebase will use this to alert of its errors

  var error_code = error.code

  var error_message = error.message



  alert(error_message)

})
```

```
}

// Set up our login function
function login () {
  // Get all our input fields
  email = document.getElementById('loginemail').value
  password = document.getElementById('loginpassword').value

  // Validate input fields
  if (validate_email(email) == false || validate_password(password) == false) {
    alert('Email or Password is Outta Line!!')
    return
    // Don't continue running the code
  }

  auth.signInWithEmailAndPassword(email, password)
  .then(function() {
    // Declare user variable
  var user = auth.currentUser

  // Add this user to Firebase Database
  var database_ref = database.ref()

  // Create User data
  var user_data = {
    last_login : Date.now()
  }

  // Push to Firebase Database
  database_ref.child('users/' + user.uid).update(user_data)

  // DOne
  alert('User Logged In!!')

})
.catch(function(error) {
}
    // Firebase will use this to alert of its errors
    var error_code = error.code
    var error_message = error.message

    alert(error_message)
  })
}
// Validate Functions
function validate_email(email) {
  expression = /^[^@]+@\w+(\.\w+)+\w$/
  if (expression.test(email) == true) {
    // Email is good
    return true
  } else {
    // Email is not good
    return false
  }
}
```

```
function validate_password(password) {
  // Firebase only accepts lengths greater than 6
  if (password < 6) {
    return false
  } else {
    return true
  }
}

function validate_field(field) {
  if (field == null) {
    return false
  }
  if (field.length <= 0) {
    return false
  } else {
    return true
```

```
           }

         }

         function showRegister()

         {

           document.getElementById("form_content_container0").style.display          =
"none";

           document.getElementById("form_content_container1").style.display          =
"flex";

         }

         function showLogin()

         {

           document.getElementById("form_content_container1").style.display          =
"none";

           document.getElementById("form_content_container0").style.display          =
"flex";

         }
```

Feature 2

The application senses the drowning of people by analysing the frames

```
<!DOCTYPE html>
```

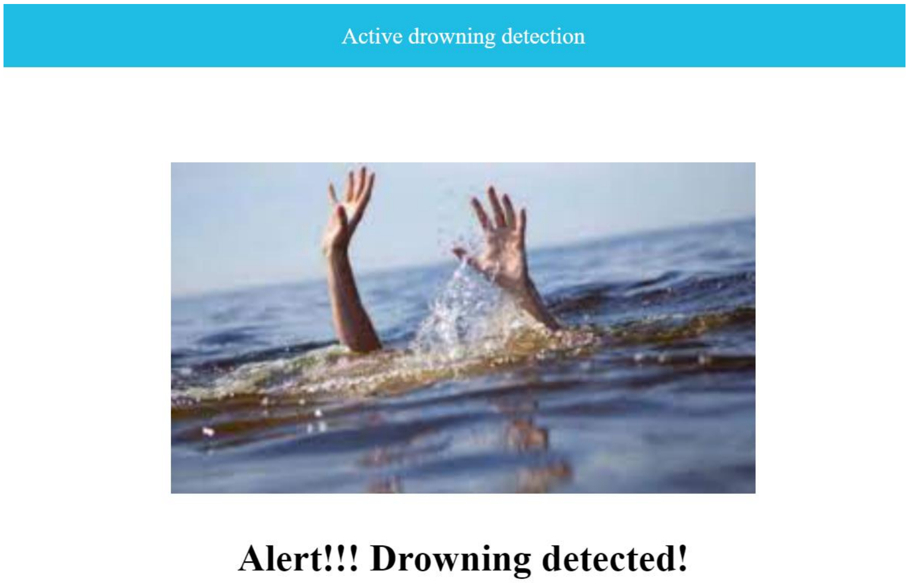
```
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Document</title>
</head>
<body>
    <div style="border: solid 1px #ccc; padding: 10px; text-align: center;">
        <video id="video" width="320" autoplay controls="true">
            <source src="video.ogv"><!-- FireFox 3.5 -->
            <source src="movie.mp4"><!-- WebKit -->
            Your browser does not support HTML5 video tag. Please download FireFox 3.5 or higher.
        </video><br/>
        <button onclick="shoot()" style="width: 64px;border: solid 2px #ccc;">Capture</button><br/>
        <div id="output" style="display: inline-block; top: 4px; position: relative ;border: dotted 1px #ccc; padding: 2px;"></div>
    </div>
</body>


<script>
var videoId = 'video';
var scaleFactor = 0.25;
var snapshots = [];



var video = document.querySelector("#video");


if (navigator.mediaDevices.getUserMedia) {
  navigator.mediaDevices.getUserMedia({ video: true })
    .then(function (stream) {
      video.srcObject = stream;
    })
    .catch(function (err0r) {
      console.log("Something went wrong!");
    });
    // setInterval(function(){shoot()},1000);
}
window.onload = () =>{
    setInterval(function (){shoot()},1000);
}
function capture(video, scaleFactor) {
    if(scaleFactor == null){
        scaleFactor = 1;
    }
    var w = video.videoWidth * scaleFactor;
    var h = video.videoHeight * scaleFactor;
    var canvas = document.createElement('canvas');
        canvas.width  = w;
        canvas.height = h;
    var ctx = canvas.getContext('2d');
        ctx.drawImage(video, 0, 0, w, h);
    return canvas;
```

```
}

/**
 * Invokes the &lt;code&gt;capture&lt;/code&gt; function and attaches the canvas element to the DOM.
 */
function shoot(){
    var video  = document.getElementById(videoId);
    var output = document.getElementById('output');
    var canvas = capture(video, scaleFactor);
        canvas.onclick = function(){
            window.open(this.toDataURL());
        };
    snapshots.unshift(canvas);
    output.innerHTML = '';
    for(var i=0; i<=4; i++){
        output.appendChild(snapshots[i]);
    }
    formData = new FormData();
    formData.append('imageFrame',snapshots[0]);
    fetch('http://example.com/movies.json',{
        method:"POST",
        headers: {
        'Content-Type': 'application/json'
      // 'Content-Type': 'application/x-www-form-urlencoded',
    },
    body:formData
    })
  .then((response) => response.json())
  .then((data) => console.log(data));
}

</script>
</html>
```

8.TEST CASES

8. Test Cases:

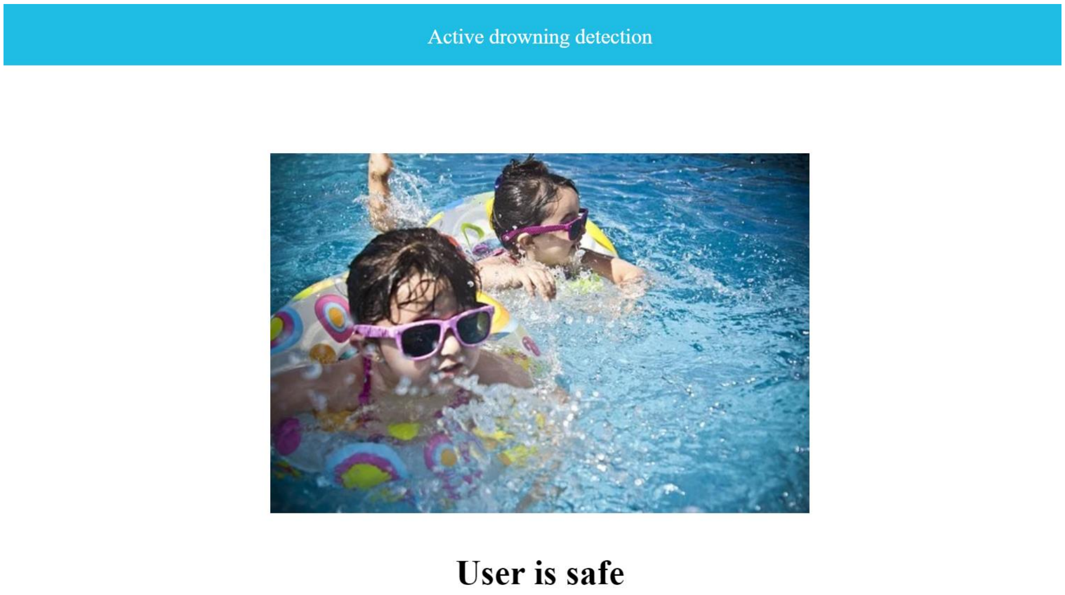
Drowning detected:



Active drowning detection

Alert!!! Drowning detected!

User is safe:



Active drowning detection

User is safe

9.RESULTS

9. Results:

Drowning Detection and Tracking Results The YOLO detection algorithm [19] uses 416X416 as its input dimensions. The drowning victims are detected in three stages using a YOLO-based detection technique. Even though the swimmer stayed underwater for an extended period, the Deep SORT algorithm [33] could keep track of them.

Accuracy = (TP + TN) / (TP + TN + FP + FN)

TP - True Positives

FP - False Positives

TN - True Negatives

FN - False Negatives

ACCURACY VARIABLES

COUNT

TP

220

TN

208

FP

42

FN

30

TOTAL ACCURACY

85.6%

Hazardous Activities Because of the noise elimination via picture masking, the posture estimate accuracy was greatly improved. To allow the pose estimation algorithm to make more radical judgments, the default threshold value for the OpenPose body parts heat map was changed from 0.2 to 0.1. Although frame-by-frame identifications were only identified with a probability of 53% due to the threshold adjustment, the total system, which examined a frame in real-time, was able to identify a hazardous activity with much greater ease within 60 seconds, with a mean accuracy of 91.4 percent, after the threshold was changed. A close examination of the misclassified postures among the testing sets revealed that a posture was more prone to misclassification as it approached the far end of the camera, indicate the need for a secondary camera to improve accuracy and confirm the true positives from the Primary camera, as shown in Table II. Although employing a higher quality camera to fix this problem is a good idea, the requisite hardware and the near-real-time CNN techniques used to detect further objects may not be up to standard at present.

10.CONCLUSION

10. Conclusion:

Consistently numerous people, including kids, are suffocated or near suffocating in the deeps of the swimming pools, and the lifeguards are not prepared all around to deal with these issues. In this manner raises the necessities for having a framework that will thus recognize the suffocating people and alert the lifeguards at such hazards. It can be installed in International standardized schools where classes are held for training kids.

11.FUTURE WORK

11. Future Work:

One of the most promising solution for the life saving mechanism of active drowning detection, it can be made mandatory for all the licensed pools to install this drowning detection system . The model maybe modified in such a way that they can be used in other water bodies and make it a widespread application for social use.

GitHub Repo link:

IBM-EPBL/IBM-Project-44424-1660724647: VirtualEye - Life Guard for Swimming Pools to Detect Active Drowning (github.com)