IBM Team 12

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Domain Name: Safety.

Use case Name: VirtualEye – Life Guard for Swimming Pools to Detect Active Drowning.

Paper 1

<u>Authors:</u> Abdel Ilah N. Alshbatat, Shamma Alhameli, Shamsa Almazrouei, Salama Alhameli, Wadhha Almarar.

Year: 2020

<u>Title:</u> Automated Vision - based Surveillance System to Detect Drowning Incidents in Swimming Pools.

<u>Methodology:</u> The proposed system is based on the color-based algorithm to position and rescue swimmers who are drowning. The device then sends an alarm to the lifeguards. To verify the performance of the proposed system, a prototype has been developed, implemented, and tested.

<u>Advantage:</u> The system has a unique capability to monitor and track swimmers, thereby enabling it to mitigate and curb the number of deaths by drowning.

<u>Disadvantage:</u> A current limitation of the use of such a system is discomfort. This discomfort is especially felt by younger children.

Paper 2

Authors: S. Karthik, Dhivya Priya E L, Gokul Anand K R, A Sharmila.

Year: 2020

<u>Title:</u> IoT Based Safety Enhanced Swimming Pool with Embedded Techniques to reduce drowning accidents.

<u>Methodology:</u> The proposed system prevents the person who drowns in the swimming pool by switching on the alarm and lift the person upward using plate. Ultrasonic sensor is used to recognize whether the person drown under water or in a safer level by fixing a threshold value.

<u>Advantage:</u> This intelligent system helps in reducing the mortality rate, especially in concern with the children mortality rate.

<u>Disadvantage:</u> The response time measured in the proposed model will be different from that of the real time implementation as the hardware complexity increases.

Paper 3

Authors: Hanbing Liu, Mohamed Ben Haj Frej, Bo Wen.

Year: 2019

<u>Title:</u> A Novel Method for Recognition, Localization, and Alarming to Prevent Swimmers from Drowning.

<u>Methodology:</u> A novel method allowing precise positioning, efficient identification, and timely alarms to help rescue swimmers from drowning are proposed. The purpose of this study is to mainly focus on determining whether swimmers are drowning or not while they are in the pool.

<u>Advantage:</u> An acoustic simulator has been used to analyze the distance information obtained by the ultrasonic waves. algorithm can precisely calculate the 3D position of the swimmer.

<u>Disadvantage:</u> The market target is for small and medium-sized swimming pools. The risk is the waterproofness of the underwater equipment since a good waterproofing ensures the proper operation of the equipment.

Paper 4

Authors: J. Geetha Ramani, J.Gayathri, R.Aswanth, M.Gunasekaran.

Year: 2019

<u>Title:</u> Automatic prevention of drowning by inflatable wrist band system.

<u>Methodology:</u> An automatic opening of airbag system in the hand by the detection of the motion of the person's body by the sensor is sent to trigger the inflator system of the airbag.

<u>Advantage:</u> This automatic opening of the airbag in the hand of the person who is drowning helps him to get help from the neighbour.

<u>Disadvantage:</u> The idea of using GSM technology under water since it is risky and it is unpredictable with its accuracy.

Paper 5

Authors: Yaswanthkumar S K, Praveen O K, Rohit R V.

Year: 2019

<u>Title:</u> Autonomous Utility Vehicle (AUV's) based emergency human drowning detection system using sonar and thermal detection methods.

<u>Methodology:</u> The devised system has the ability to automatically detect drowning people by making use of two main concepts – one is Sonar (SOund NAvigation & Ranging detection) and the other one is Thermal detection.

<u>Advantage</u>: The proposed approach is a viable solution to devise an innovative, portable, low cost and customizable drowning detection system.

<u>Disadvantage:</u> This system is interfacing a low quality video camera in order to use image processing to detect humans under water who are facing a difficult starvation of air in their life.

Paper 6

<u>Authors:</u> Abdelaziz M. Shehata, Eslam M. Mohamed, Khaled L. Salem, Ahmed M. Mohamed, Mustafa Abdul Salam, Mennatullah M. Gamil.

Year: 2021

<u>Title:</u> A Survey of Drowning Detection Techniques

<u>Methodology:</u> This paper reviews different methods used for drowning detection in swimming pools, that applied the concepts of image processing, accelerometer, pulse and pressure sensing and LASER-LDR techniques.

<u>Advantage:</u> The reviews discussed the process, reliability and goals of each system. By surveying this we represented a comparison between the provided systems. A further discussion of the future challenges facing these systems is also mentioned with ideas to overcome them.

<u>Disadvantage:</u> The major challenge that faces those drowning behavior studies is finding videos of drowning people either under or above water.

S.No	Author	Title of the Paper	Methodology	Pros (Advantage)	Cons (Disadvantage)
1.	Abdel Ilah N. Alshbatat, Shamma Alhameli, Shamsa Almazrouei, Salama Alhameli, Wadhha Almarar. (2020)	Automated Vision - based Surveillance System to Detect Drowning Incidents in Swimming Pools.	The proposed system is based on the colorbased algorithm to position and rescue swimmers who are drowning. The device then sends an alarm to the lifeguards. To verify the performance of the proposed system, a prototype has been developed,	The system has a unique capability to monitor and track swimmers, thereby enabling it to mitigate and curb the number of deaths by drowning.	A current limitation of the use of such a system is discomfort. This discomfort is especially felt by younger children.

			implemented, and tested.		
2.	S. Karthik, Dhivya Priya E L, Gokul Anand K R, A Sharmila. (2020)	IoT Based Safety Enhanced Swimming Pool with Embedded Techniques to reduce drowning accidents.	The proposed system prevents the person who drowns in the swimming pool by switching on the alarm and lift the person upward using plate. Ultrasonic sensor is used to recognize whether the person drown under water or in a safer level by fixing a threshold value. To identify the difference in the drown object, PIR sensor is used to find whether the drown object is human or animal or any other non-living objects.	This intelligent system helps in reducing the mortality rate, especially in concern with the children mortality rate.	The response time measured in the proposed model will be different from that of the real time implementation as the hardware complexity increases.
3.	Hanbing Liu, Mohamed Ben Haj Frej, Bo Wen. (2019)	A Novel Method for Recognition, Localization, and Alarming to Prevent Swimmers from Drowning.	A novel method allowing precise positioning, efficient identification, and timely alarms to help rescue swimmers from drowning are proposed. The purpose of this study is to mainly focus on determining whether swimmers are	Ultrasonic transmitters and receivers are used to determine the swimmer position. Hydraulic pressure detectors are also used to determine how deep the swimmer is going. The hydraulic data is	The market target is for small and medium-sized swimming pools. The risk is the waterproofness of the underwater equipment since a good waterproofing ensures the proper operation of the

			1	4	
			drowning or not	transmitted	equipment.
			while they are in	wirelessly to be	
			the pool.	processed. An	
				acoustic	
				simulator has	
				been used to	
				analyze the	
				distance	
				information	
				obtained by the	
				ultrasonic waves.	
				algorithm can	
				precisely	
				calculate the 3D	
				position of the	
				swimmer.	
4.	J. Geetha	Automatic	A device that can	This automatic	The idea of
	Ramani,	prevention of	save the life of a	opening of the	using GSM
	J.Gayathri,	drowning by	person can be	airbag in the	technology
	R.Aswanth,	inflatable	brought up. An	hand of the	under water
	M.Gunasekaran.	wrist band	automatic	person who is	since it is risky
				-	and it is
	(2019)	system.	opening of airbag	drowning helps	
			system in the	him to get help	unpredictable
			hand by the	from the	with its
			detection of the	neighbour.	accuracy.
			motion of the		
			person's body by		
			the sensor is sent		
			to trigger the		
			inflator system of		
			the airbag.		
5.	Yaswanthkumar	Autonomous	The devised	The proposed	This system is
	S K, Praveen O	Utility	system has the	approach is a	interfacing a low
	K, Rohit R V.	Vehicle	ability to	viable solution to	quality video
	(2019)	(AUV's)	automatically	devise an	camera in order
		based	detect drowning	innovative,	to use image
		emergency	people by making	portable, low	processing to
		human	use of two main	cost and	detect humans
		drowning	concepts – one is	customizable	under water who
		detection	Sonar (SOund	drowning	are facing a
		system using	NAvigation &	detection system.	difficult
		sonar and	Ranging	detection system.	starvation of air
		thermal	detection) and the		in their life.
		detection	other one is		m uich me.
			Thermal		
		methods.			
			detection. Both		

		1		<u> </u>	<u> </u>
			of these detection		
			techniques are		
			used for detection		
			of human body		
			underwater.		
			Thus, the results		
			obtained from		
			individual		
			sensors of both		
			detection		
			techniques		
			illustrate the		
			effectiveness of		
			the proposed		
			approach in		
			saving the life of		
			humans from		
			drowning		
			underwater.		
6.	Abdelaziz M.	A Survey of	This paper	The reviews	The major
	Shehata, Eslam	Drowning	reviews different	discussed the	challenge that
	M. Mohamed,	Detection	methods used for	process,	faces those
	Khaled L.	Techniques	drowning	reliability and	drowning
	Salem, Ahmed	1	detection in	goals of each	behavior studies
	M. Mohamed,		swimming pools,	system. By	is finding videos
	Mustafa Abdul		that applied the	surveying this	of drowning
	Salam,		concepts of	we represented a	people either
	Mennatullah M.		image	comparison	under or above
	Gamil.		processing,	between the	water.
	(2021)		accelerometer,	provided	
	(===-)		pulse and	systems. A	
			pressure sensing	further	
			and LASER-	discussion of the	
			LDR techniques.	future challenges	
				facing these	
				systems is also	
				mentioned with	
				ideas to	
				overcome them.	
				overcome mem.	