INTERNATIONAL STANDARD

ISO 20380

First edition
2017-11

Public swimming pools — Computer vision systems for the detection of drowning accidents in swimming pools — Safety requirements and test methods

Background & History

Background & Disclosure

Maytronics

Global Public Company

Poseidon France

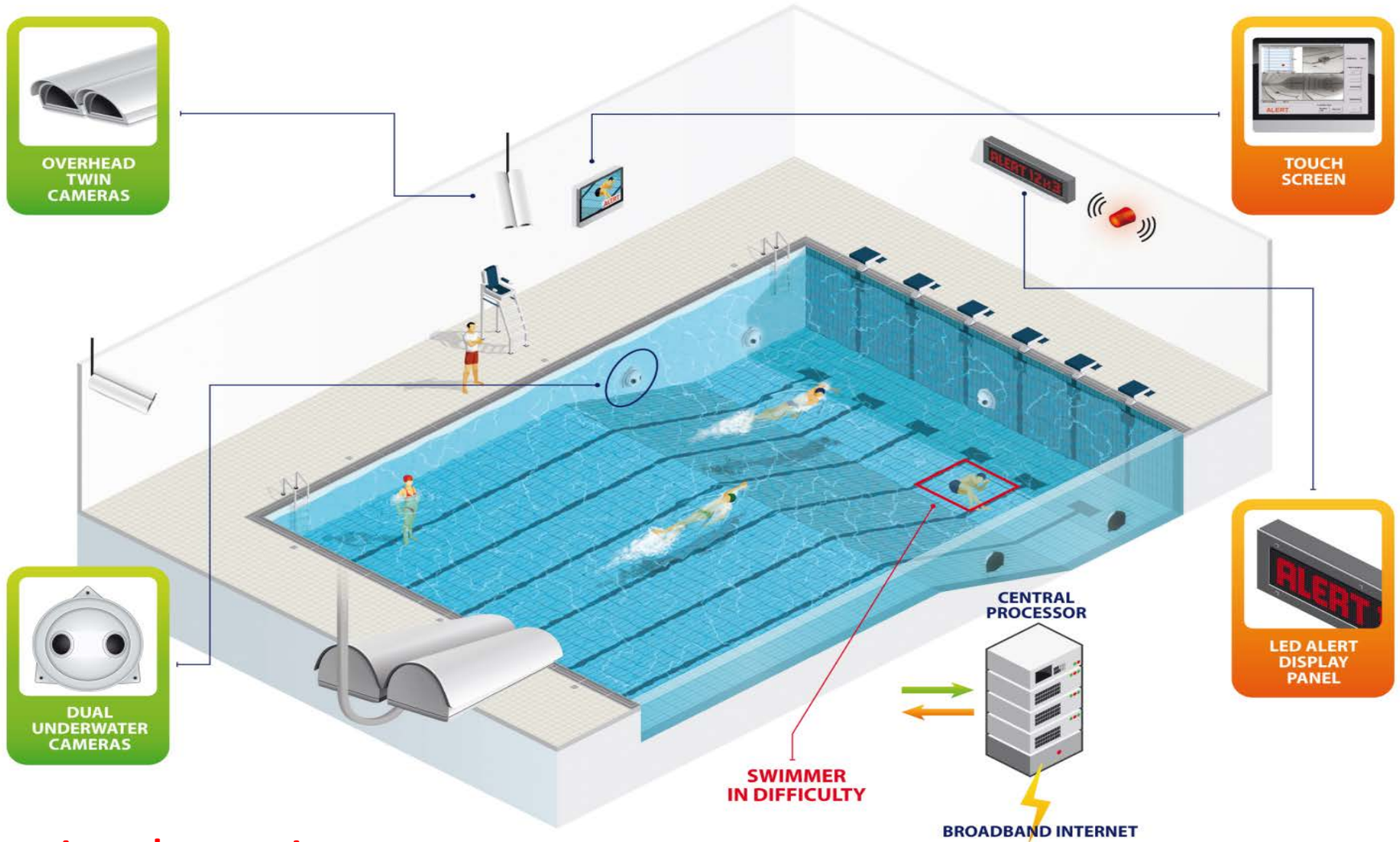
Global Leader in
Computer Vision
Drowning Detection

Maytronics Australia

Australian Leader in
Drowning Detection

How Drowning Detection works

Poséidon



www.drowningdetection.com.au

How Drowning Detection Works

Why the Need for drowning detection?

We still have drownings in public pools…

Poséidon

MONASH University
Injury Research Institute

Between 22 – 35% of <u>all pool immersions</u>

Queensland Injury Surveillance Unit

Are from

the children's hospital at Westmead

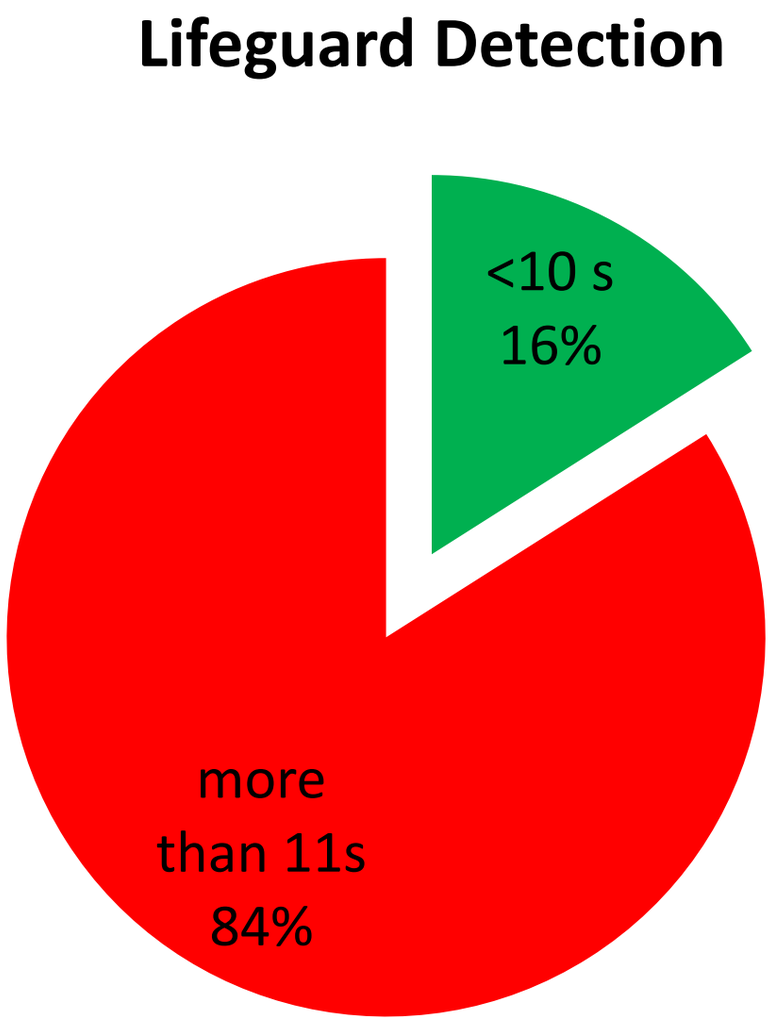
<u>Public Pools</u>

65% have no idea on immersion time?

Hard to be a lifeguard…

- **10:20 rule**

- **How well do lifeguarded pools perform?**
  - Lifeguard Vigilance Study, 682 mannequins
  - Average detection time >1 min

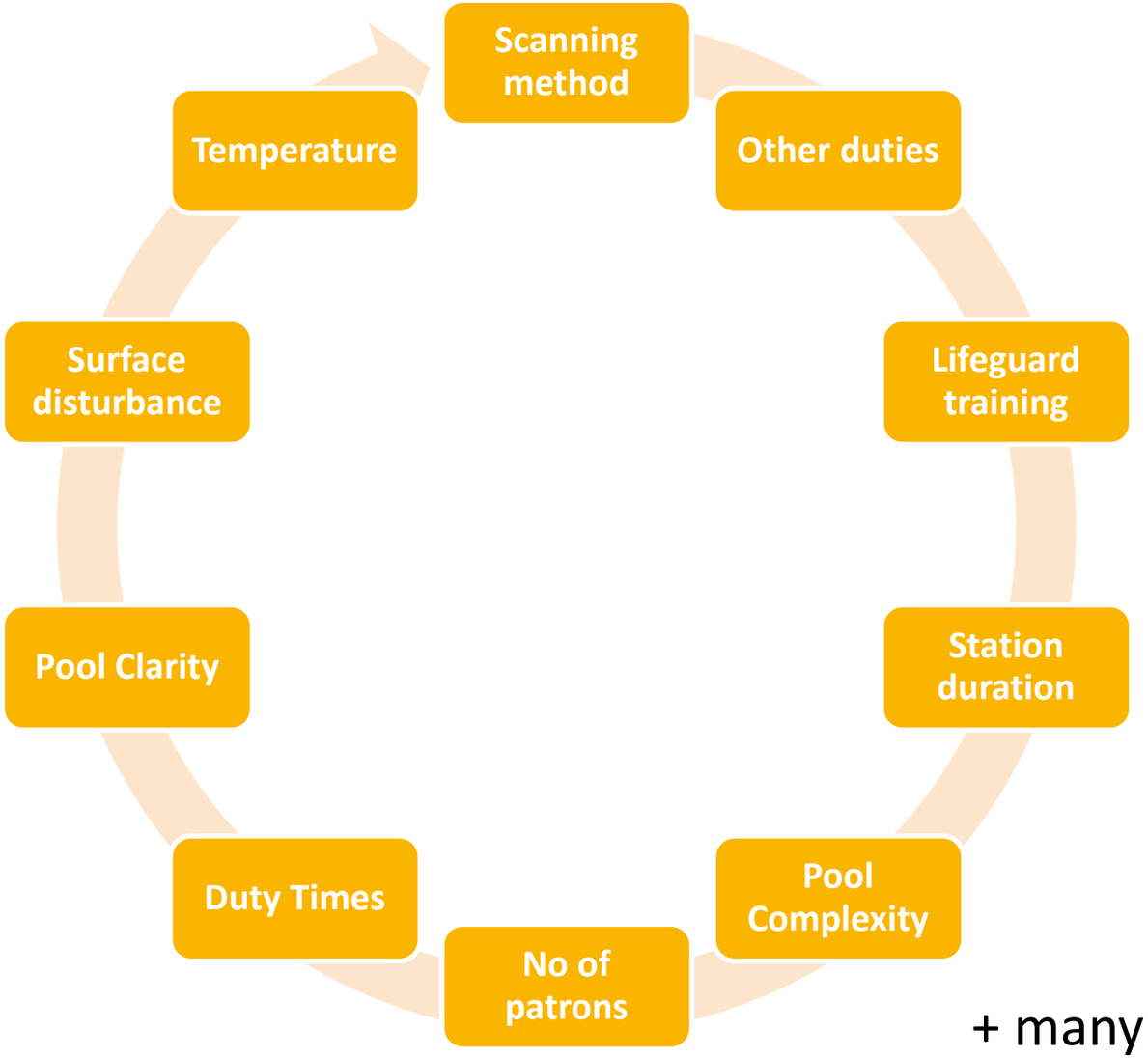


Works in more than 90% of U.S. waterparks

Investigated 800+ drownings in 15 years

Expert witness in over 600 cases

Things that affect lifeguarding performance….



– Detection performance

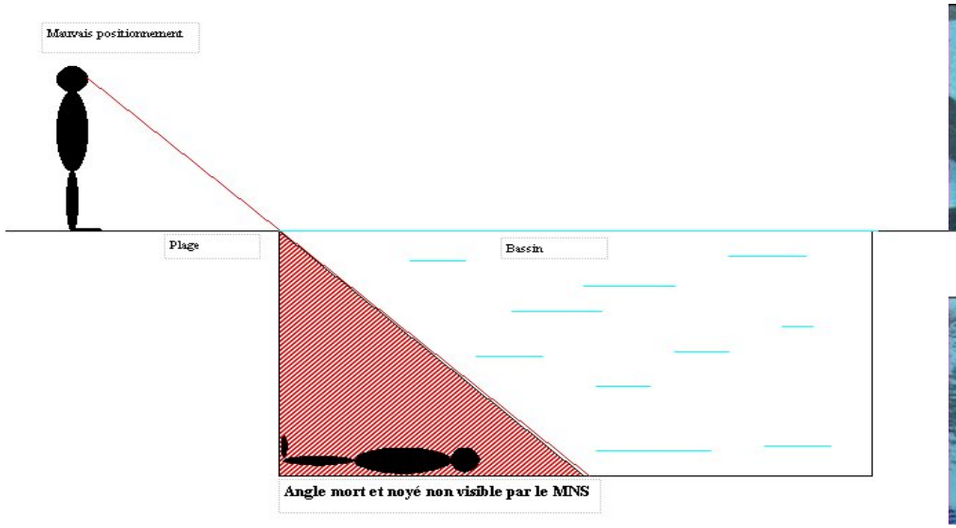
+ many more factors

Why is the rate so low?

Lifeguards are:

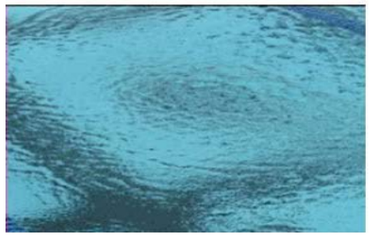
- Essential, amazing at rescuing,
- But, even in the best of circumstances, are not the most effective method of detection…WHY?

We cannot see, what cannot be seen!



1. Manikin visible

2. Going



3. Going…

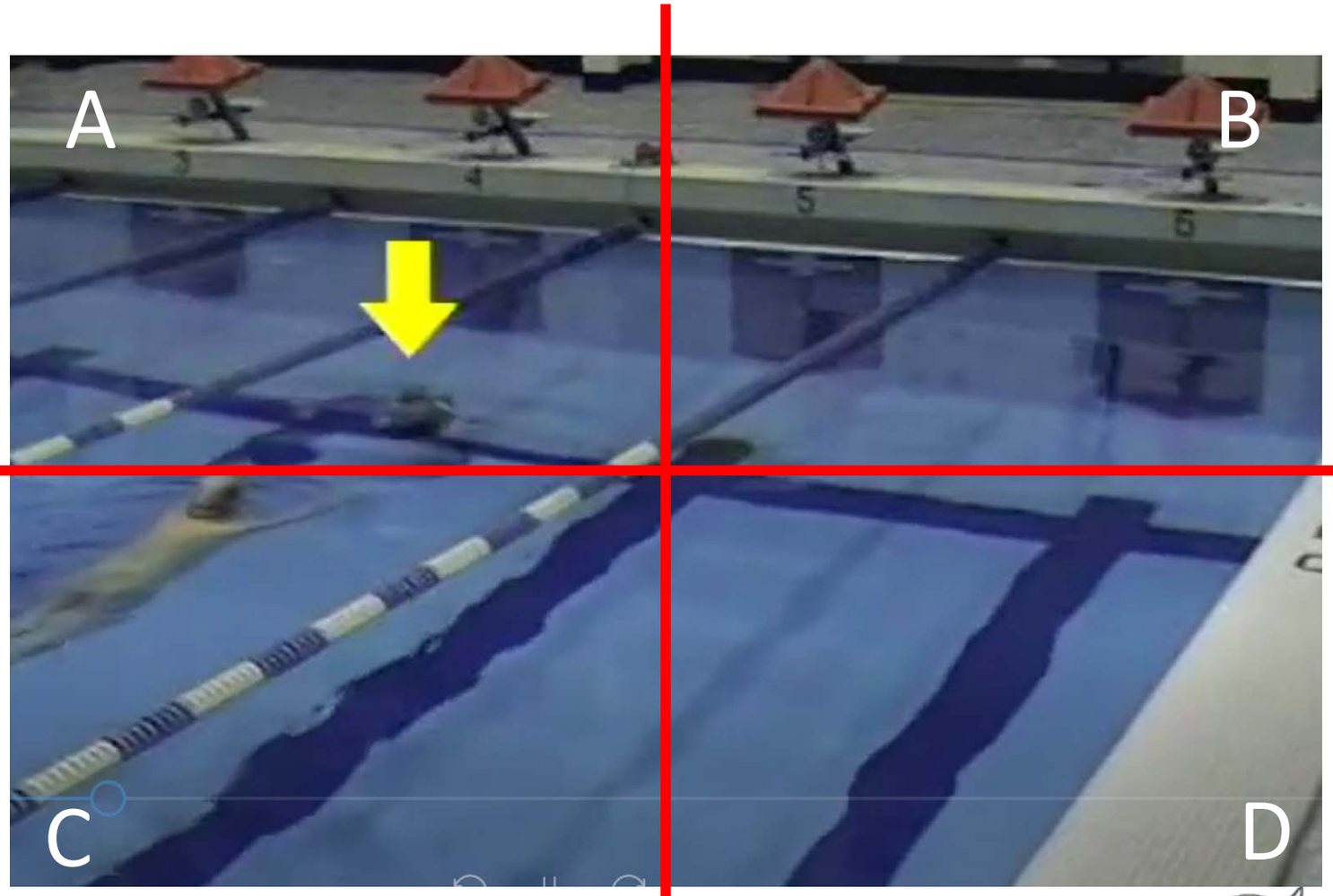
4. Gone…

We only have 2 eyes!

Test your skills…

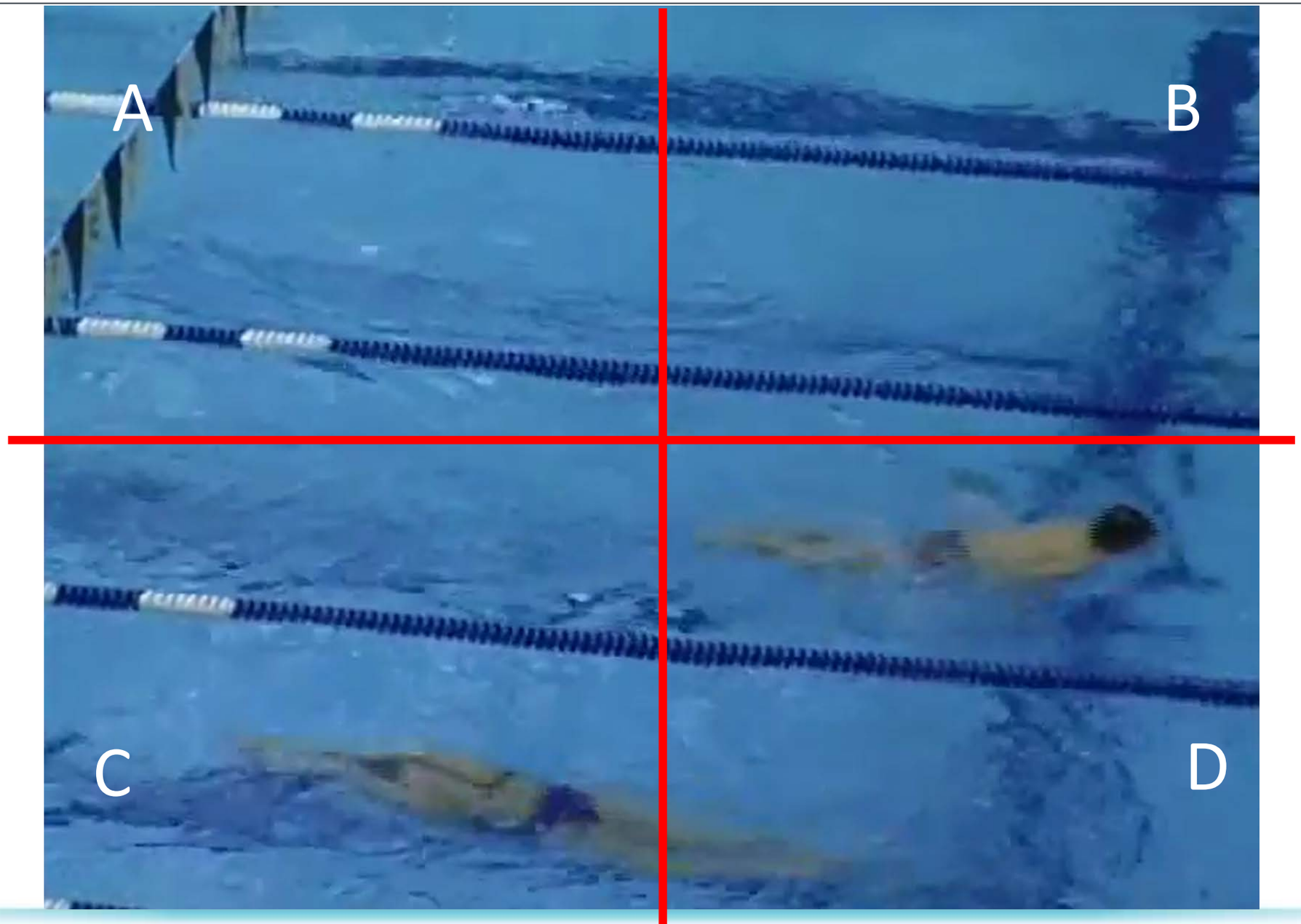
- 10 seconds per image for you to detect the person
- A, B, C, D = position in the pool
- E = no person drowning
- Example…

A

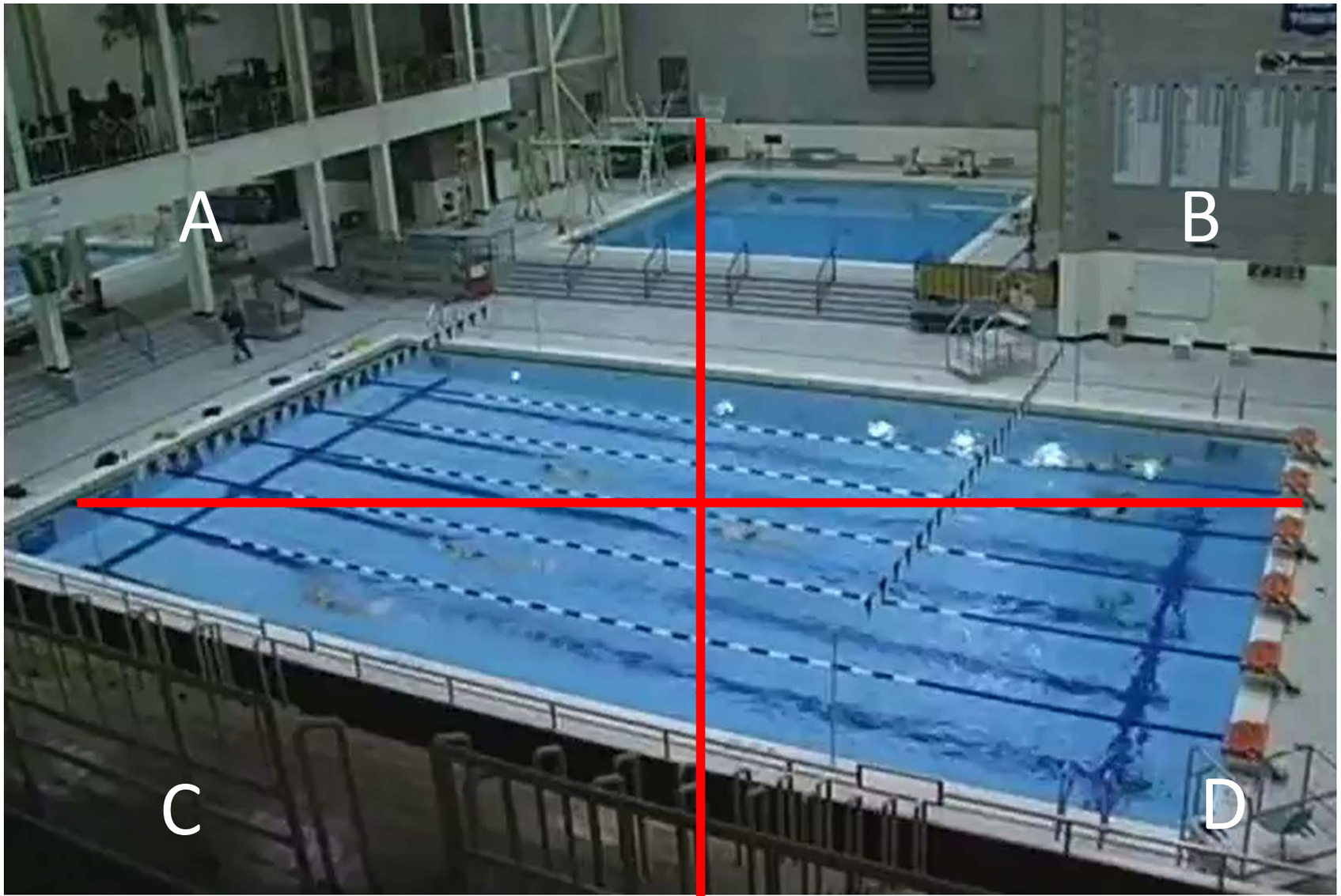


Ready to start….

Test your skills…A, B, C, D, E



Test your skills…A, B, C, D, E



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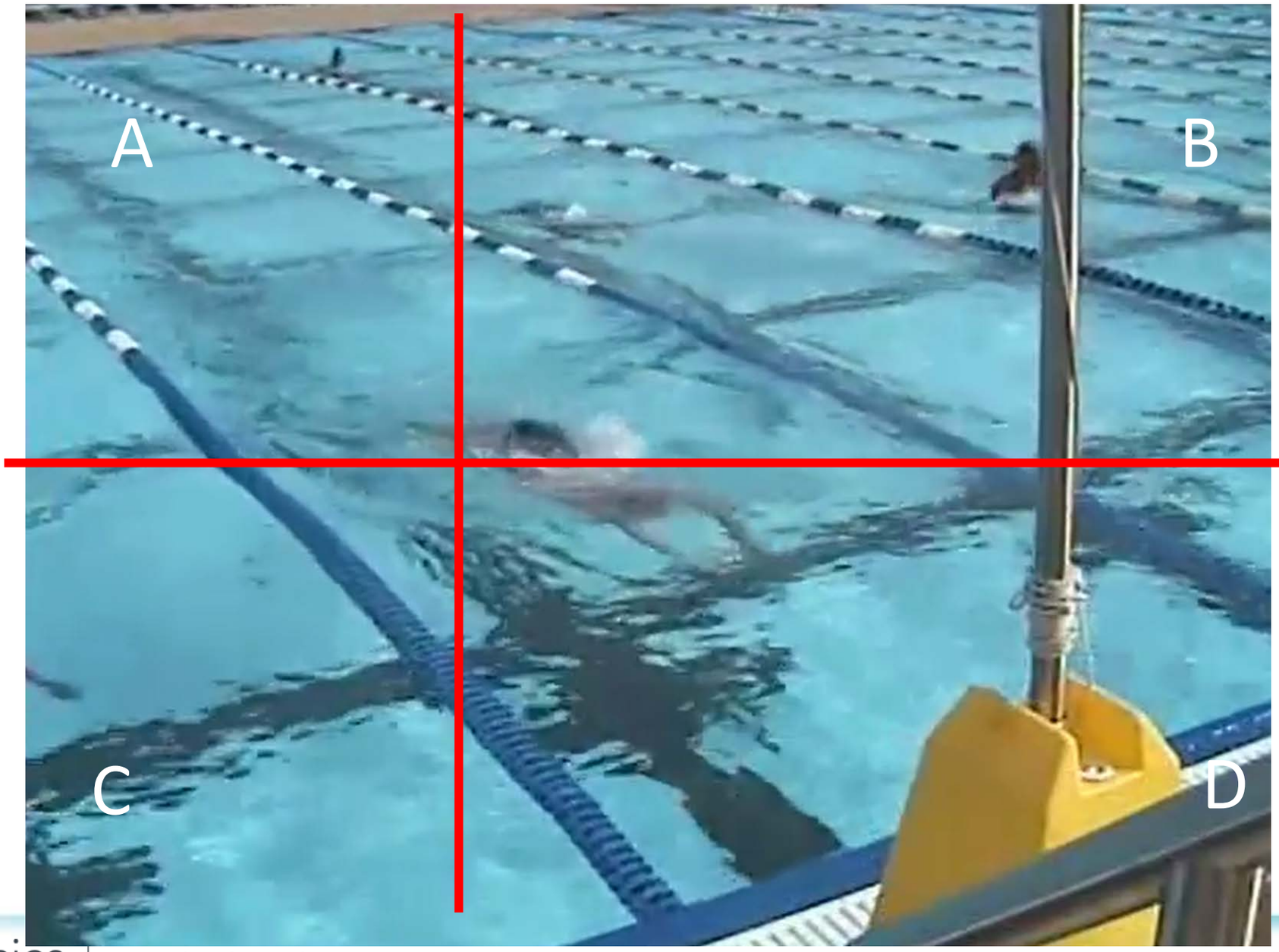
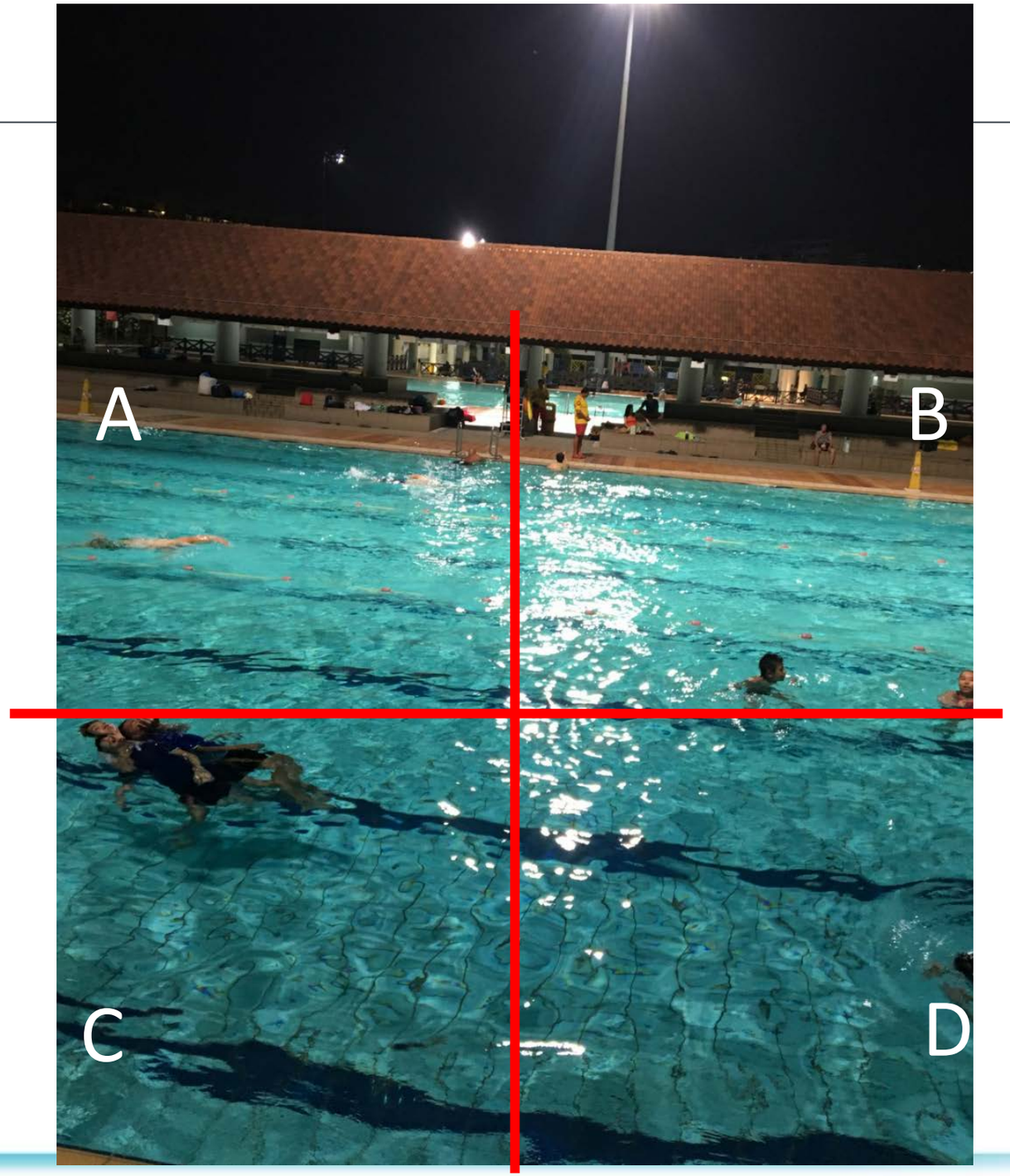


Test your skills…

A, B, C, D, E



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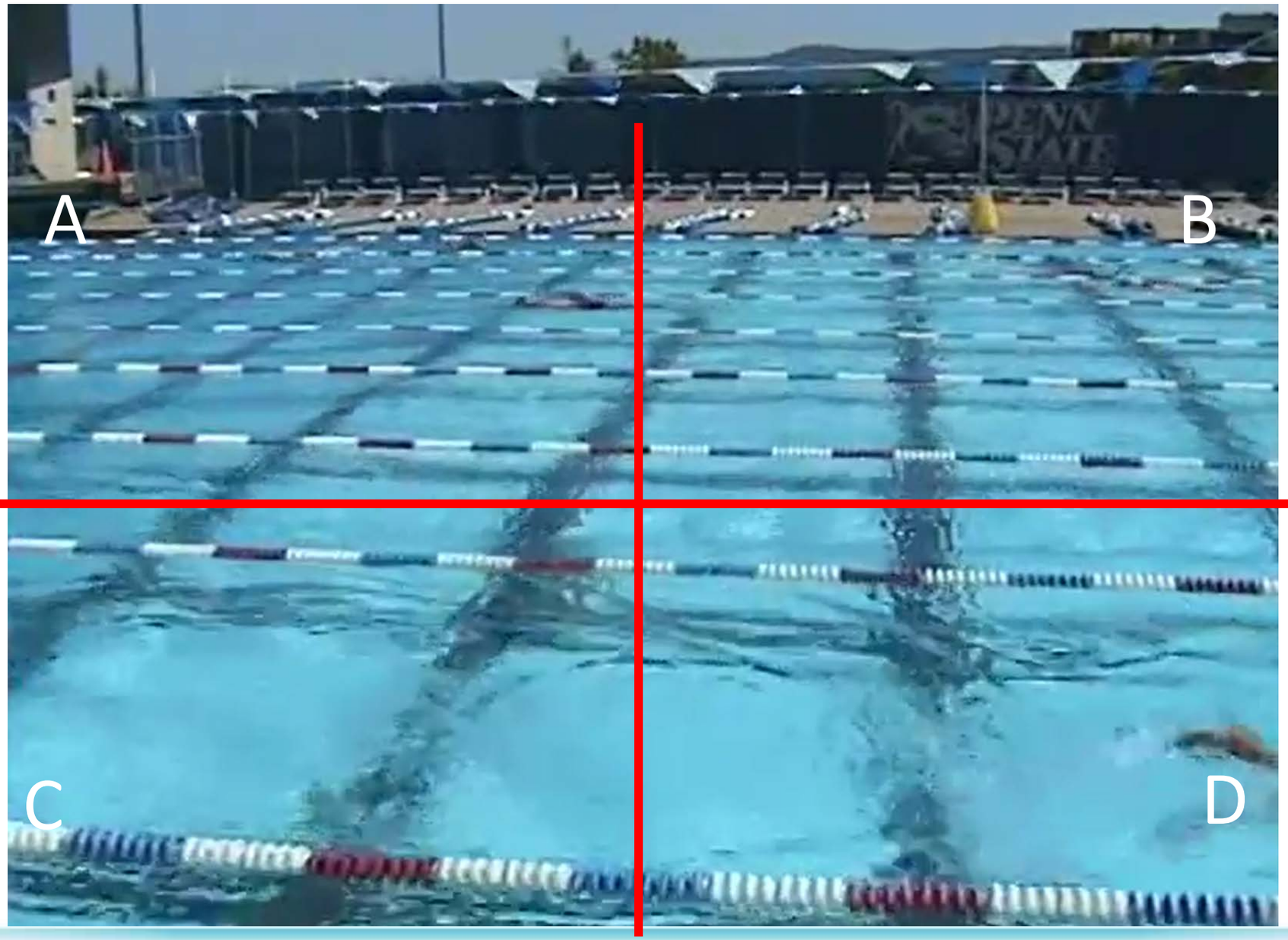
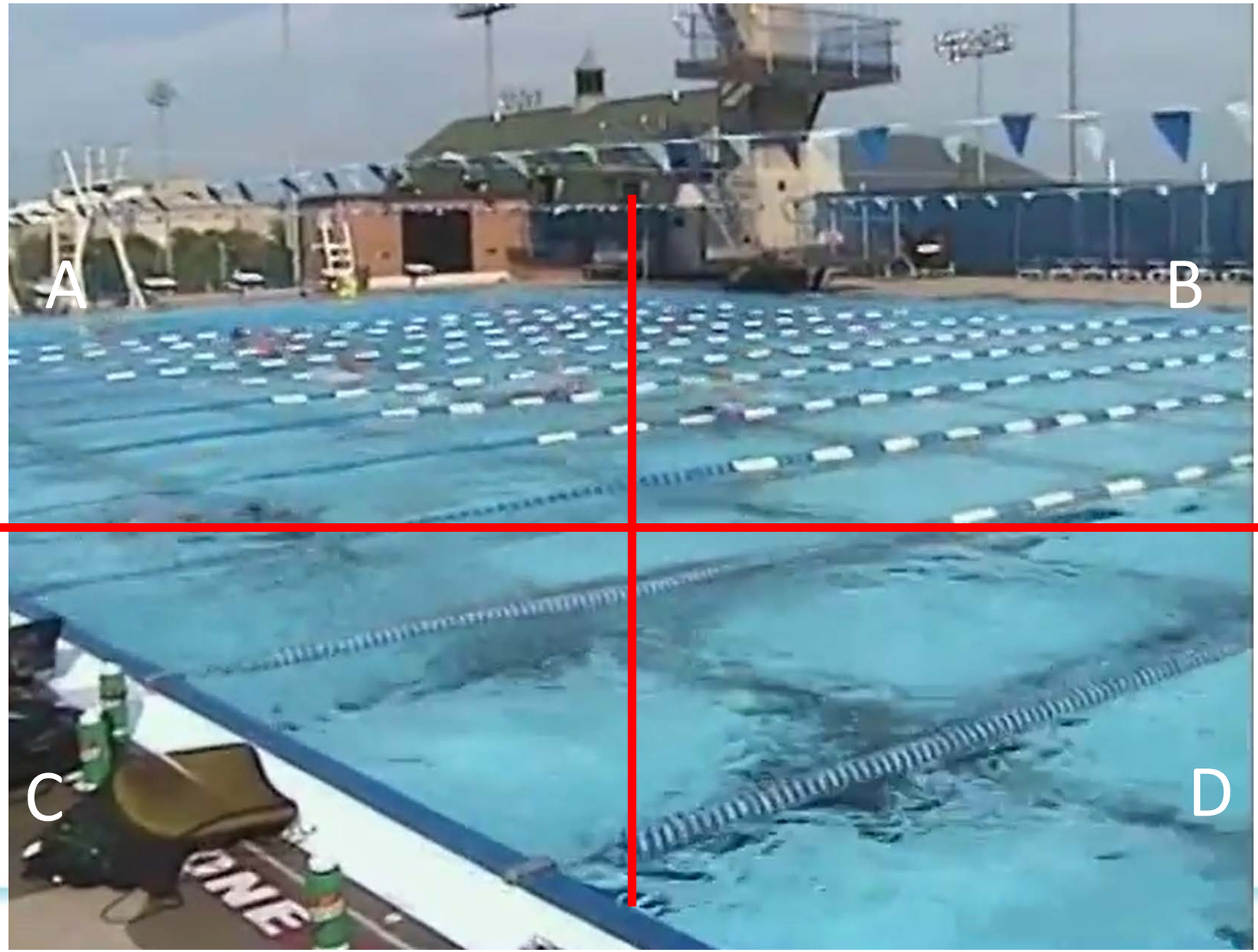


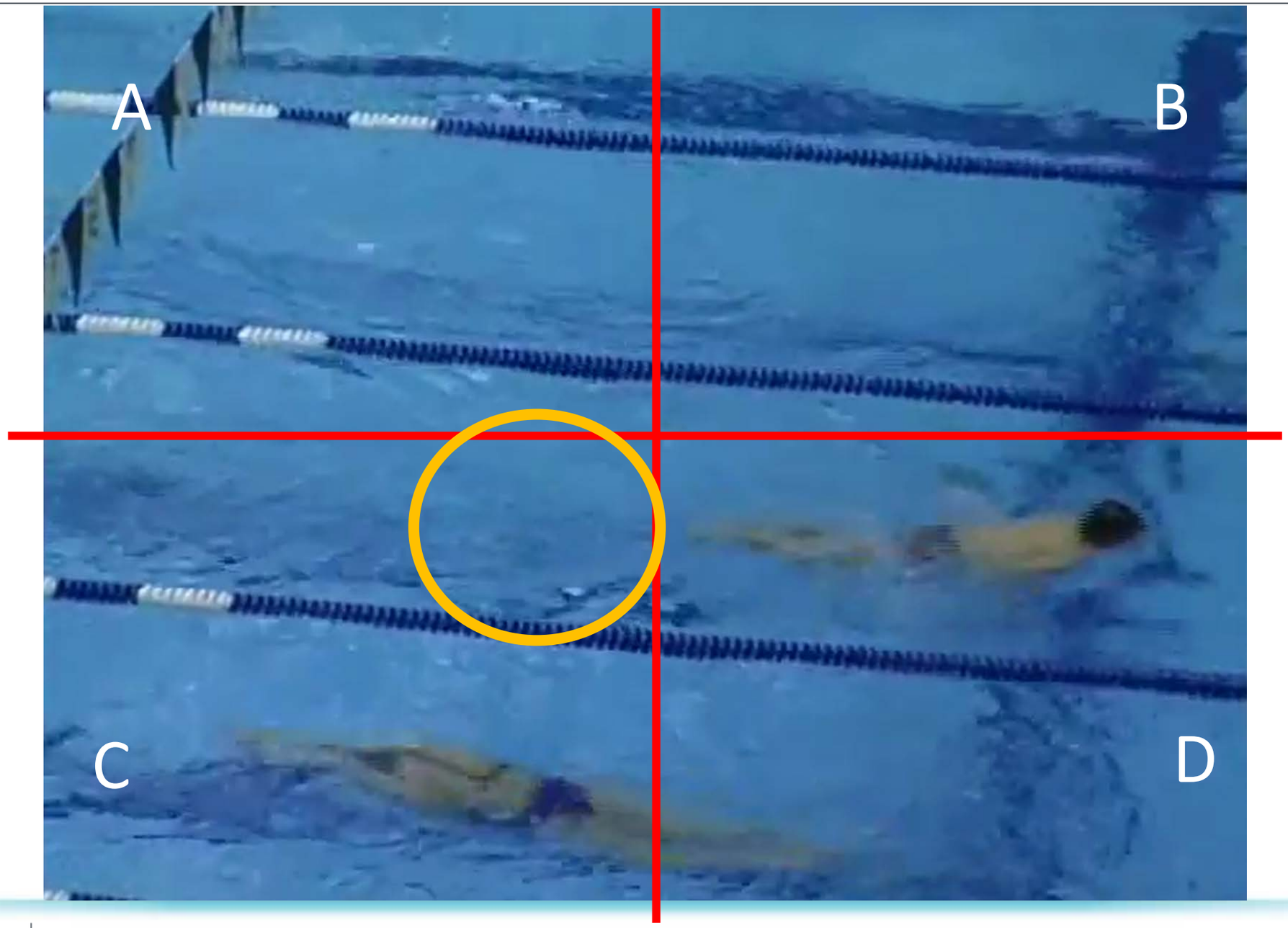
Test your skills…A, B, C, D, E



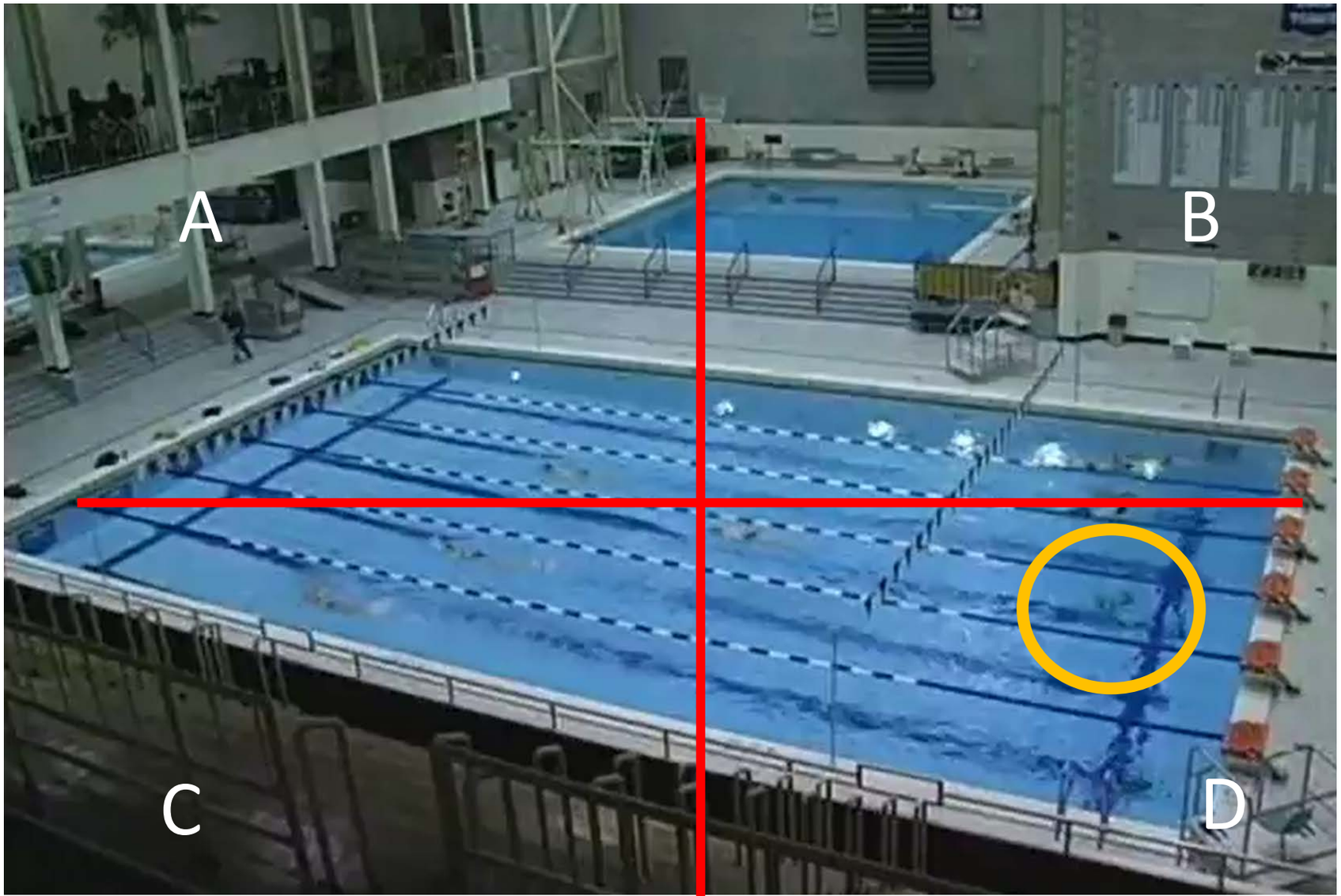
Test your skills…A, B, C, D, E

Who thinks they got 100%?

Test your skills…A, B, C, D, E



Test your skills…A, B, C, D, E



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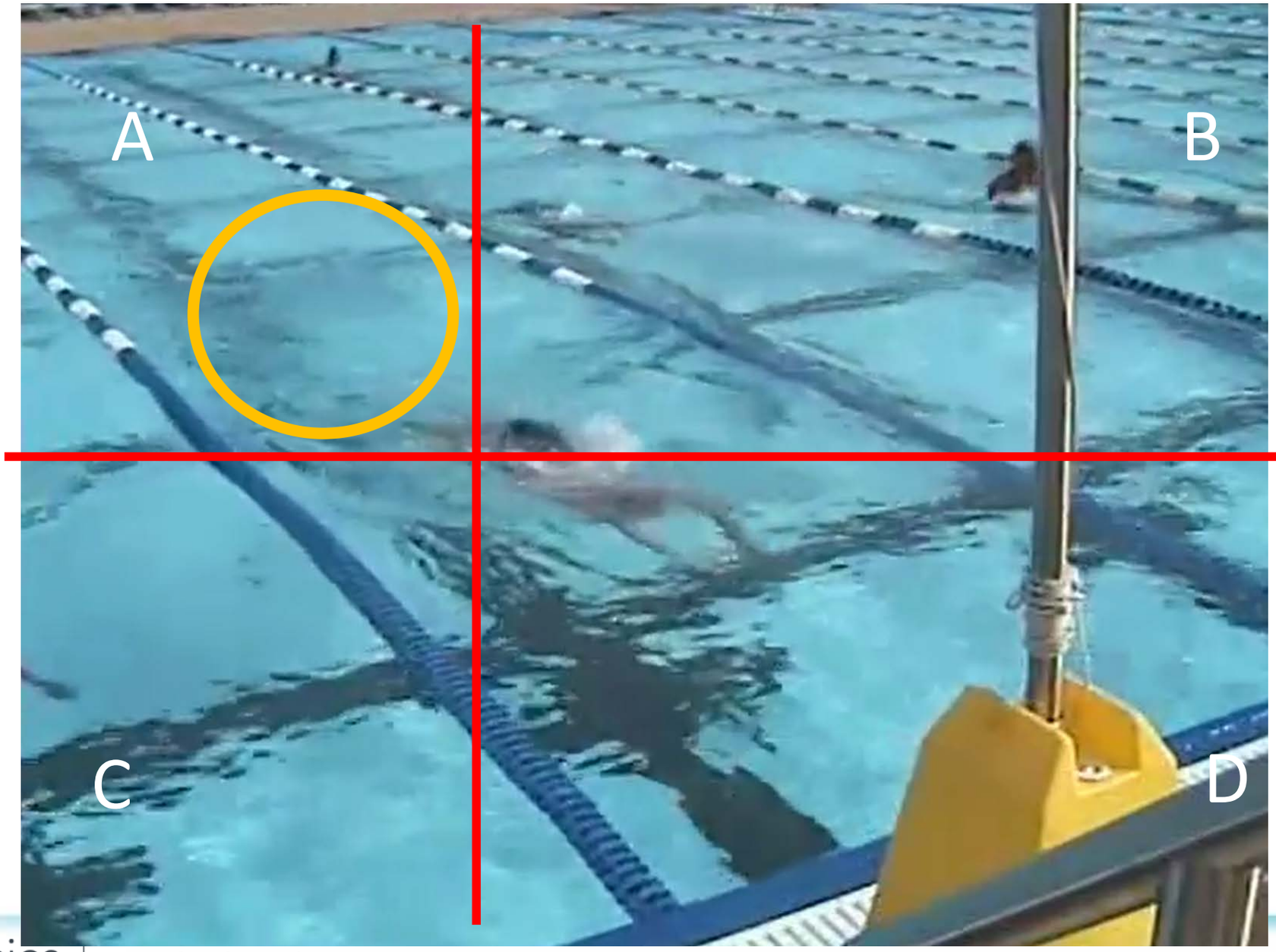
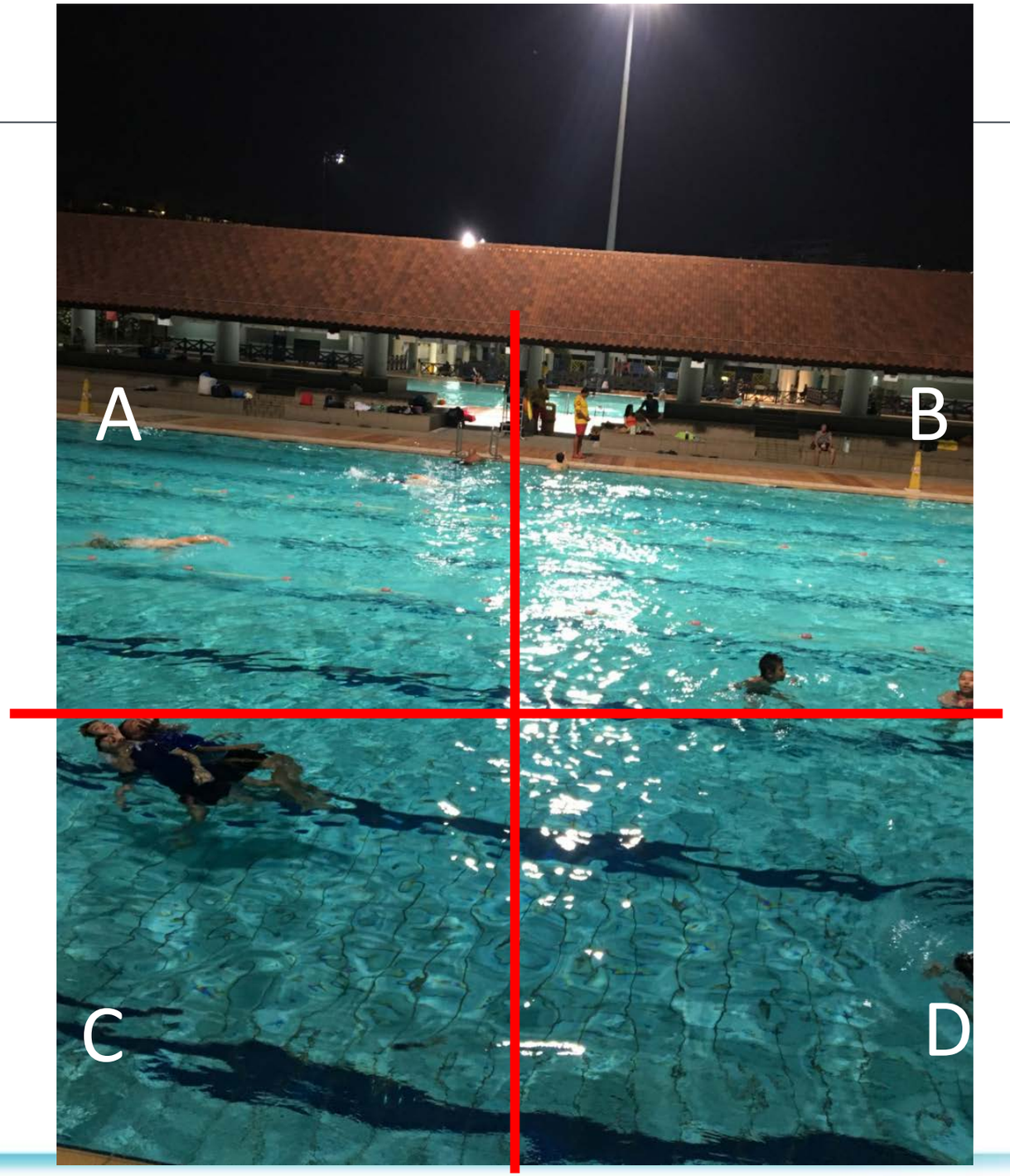


Test your skills…

A, B, C, D, E



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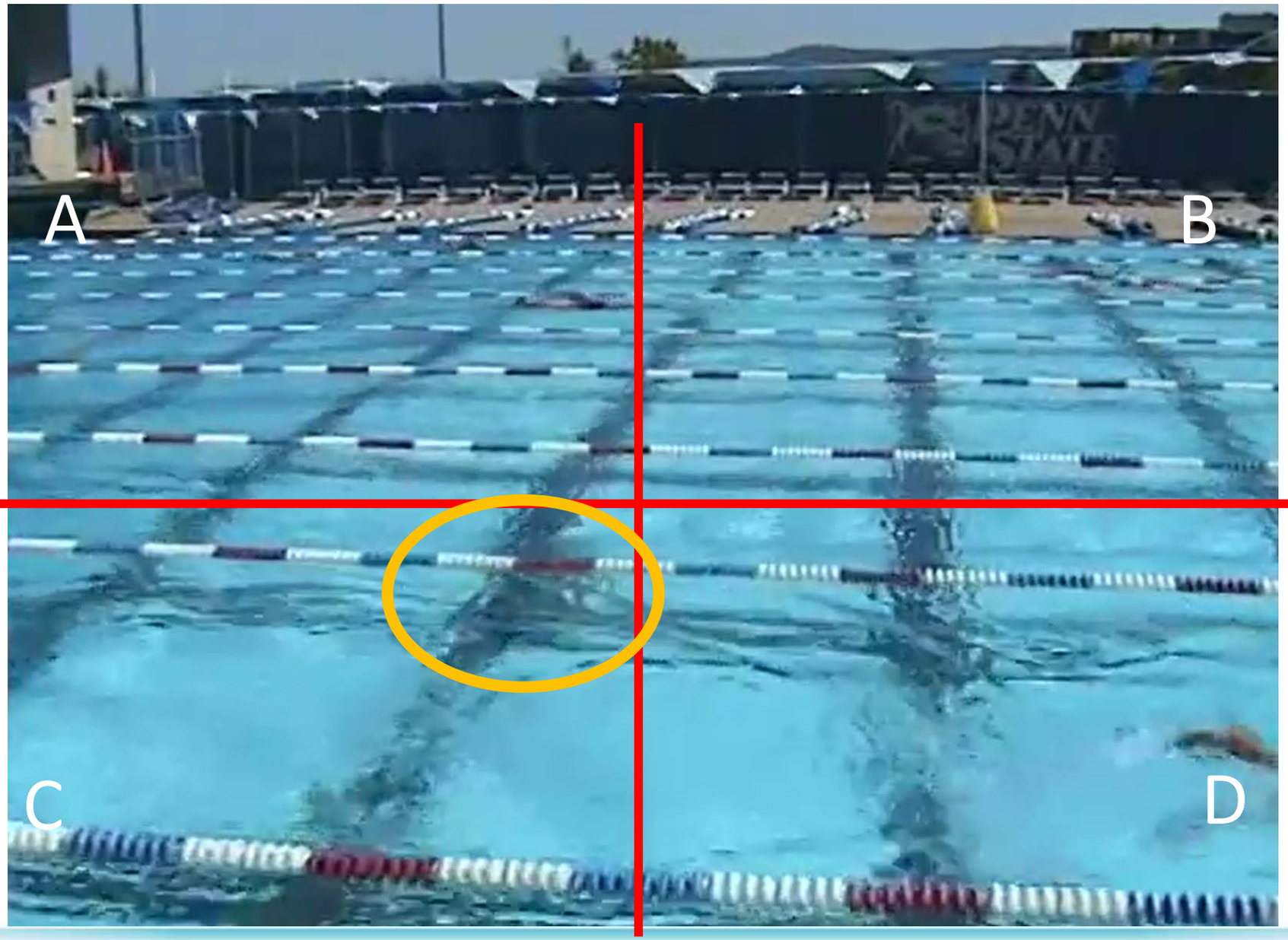

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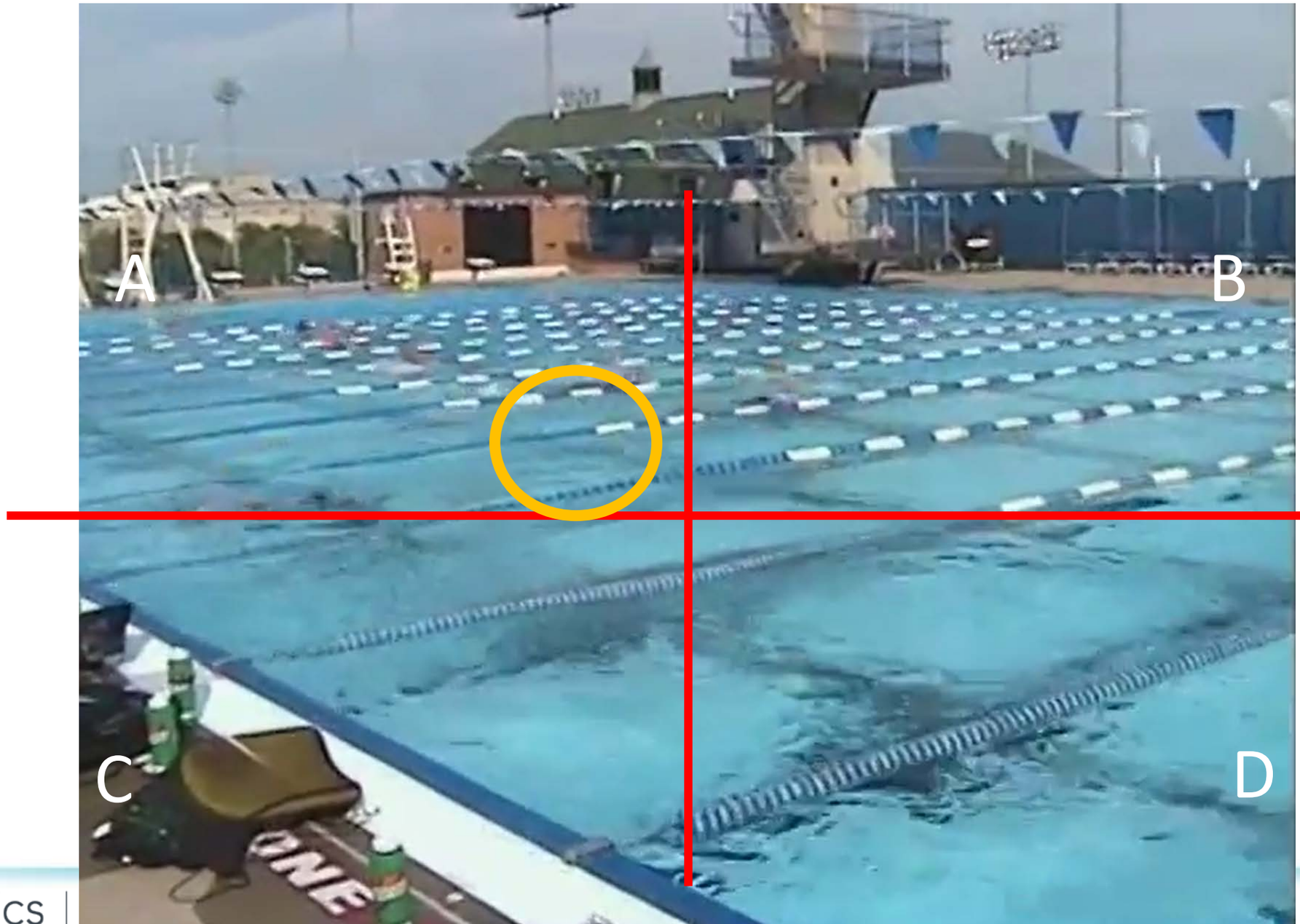
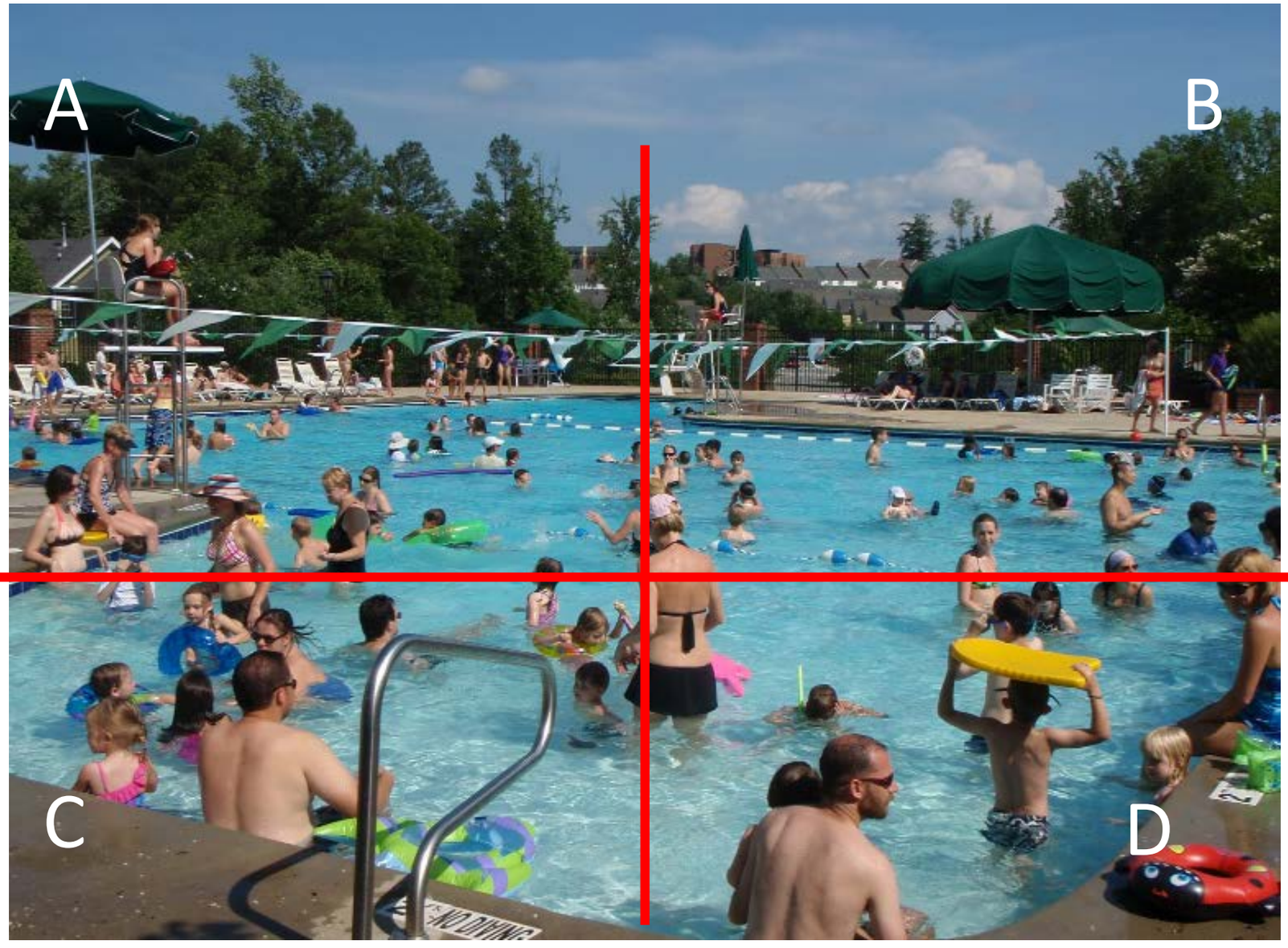


Test your skills…A, B, C, D, E



C, D, A, E, C, A, E - How many got 100%?

I’m sorry but:

- half of you were doing other jobs

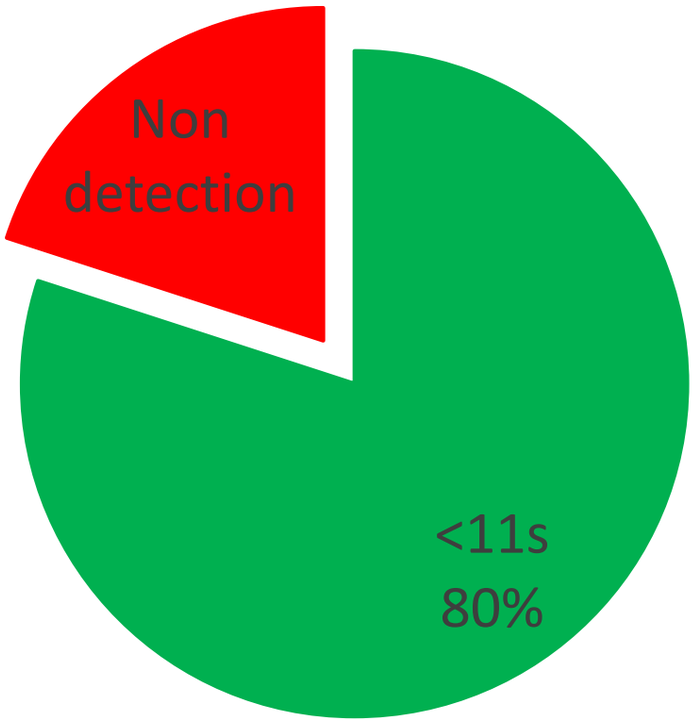
- another 45% would miss them due to working a hot day

- another 20% miss due to duty time

Computer Vision = Risk Reduction =
TOOL FOR LIFEGUARDS

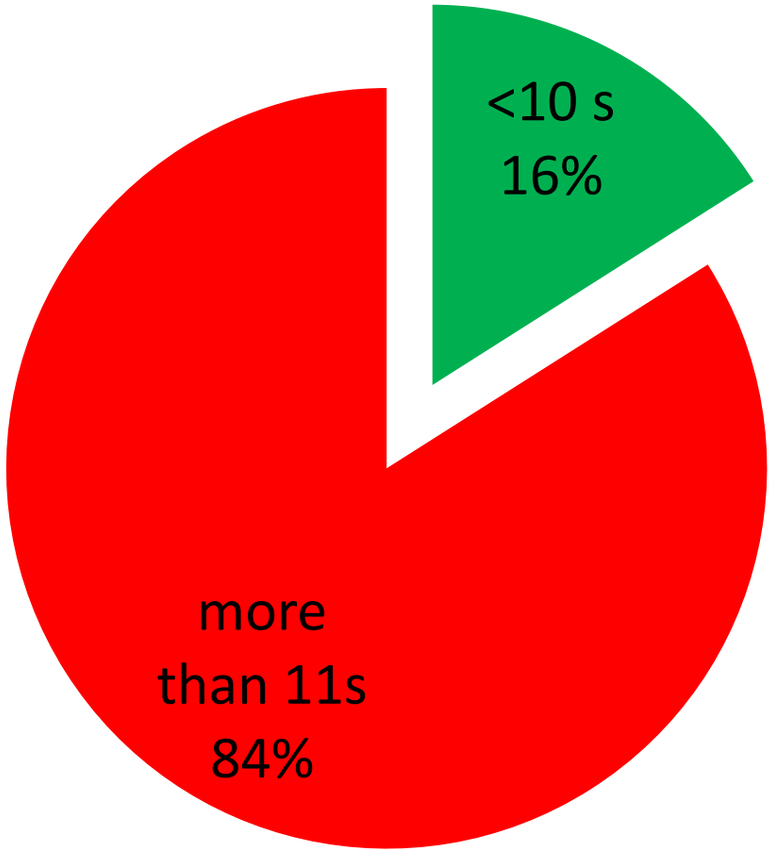
Poséidon

Computer Detection & Lifeguard Pool



4x better at detection

Lifeguard Detection



So Computer Vision fits here…

Prevent Dangerous Behaviour
- 1:1 Supervision
- Lifeguard

Detect Drowning
- 1:1 Supervision
- Computer Vision
- Lifeguard

Perform Rescue
- 1:1 Supervisor
- Lifeguard

		Likelihood				
		Very Likely	Likely	Possible	Unlikely	Highly Unlikely
Consequence	Fatality	Extreme	High	High	High	Medium
	Major Injury	High	High	High	Medium	Medium
	Minor Injury	High	Medium	Medium	Medium	Medium
	First Aid	Medium	Medium	Medium	Low	Low
	Negligible	Medium	Medium	Low	Low	Low

How the Standards work

Representation on Standards

Other Au organisations

alfa QUEENSLAND Australian Leisure Facilities Association

alfa Australian Leisure Facilities Association

Nominating Organisation

STANDARDS Australia

Pool Committees
- Eg pool fencing

Standards Australia (P) Member = participating member

Nominating Organisations

ISO

ISO Working Group

French Standard Background

Competition Arrives

- Same marketing claims
- Detection + low false alarms

Reality

- Hard technology
- Detection + high false alarms

OR

- Low detection + low false alarms
- **RISK for purchaser**

French Standard created

- Performance standard for computer vision
- For Pool Operators to know how to test system effectiveness
- For suppliers to make sure they supply a product that works

ISO -> AU standard development

French Standard

- NF-52-10
- Published
- Only existing standard in the world

International Standard

- ISO-TC-83-WG4
- In development since 2014/15
- AU / ISO mirror committee represented by CS05
- Prof. Eager (UTS) & Dan
- Published Nov 2017

Australia Standard

- Mirror Committee
- May also create AS if required (unlikely at this stage)
- CS34 committee

ISO TC 83 – WG4 - status

Stages in development process of an ISO Standard

Stage code	Stage	Associated document name	Abbreviations	Description
00	**Preliminary stage**	Preliminary work item	PWI	
10	**Proposal stage**	New work item proposal	NP or NWIP, NP Amd/TR/TS/IWA	
20	**Preparatory stage**	Working draft(s)	AWI, AWI Amd/TR/TS, WD, WD Amd/TR/TS	
30	**Committee stage**	Committee draft(s)	CD, CD Amd/Cor/TR/TS, PDAmd (PDAM), PDTR, PDTS	
40	**Enquiry stage**	Enquiry draft	DIS, FCD, FPDAmd, DAmd (DAM), FPDISP, DTR, DTS	(CDV in IEC)
50	**Approval stage**	Final draft International Standard	FDIS, FDAmd (FDAM), PRF, PRF Amd/TTA/TR/TS/Suppl, FDTR	
60	**Publication stage**	International Standard	ISO TR, TS, IWA, Amd, Cor	
90	**Review stage**		ISO TR, TS, IWA, Amd, Cor	
95	**Withdrawal stage**			

Start 2014

Nov 2017

Representation on Standards

Public swimming pools — Computer vision systems for the detection of drowning accidents in swimming pools — Safety requirements and test methods

Result of voting

P-Members voting: 15 in favour out of 19 = 79 % (requirement >= 66.66%)

(P-Members having abstained are not counted in this vote.)

Member bodies voting: 5 negative votes out of 22 = 23 % (requirement <= 25%)

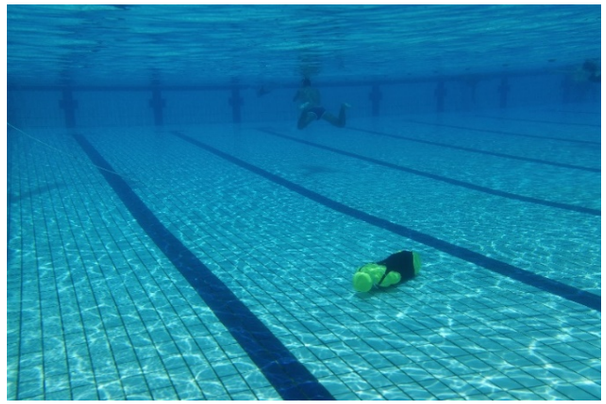
Approved

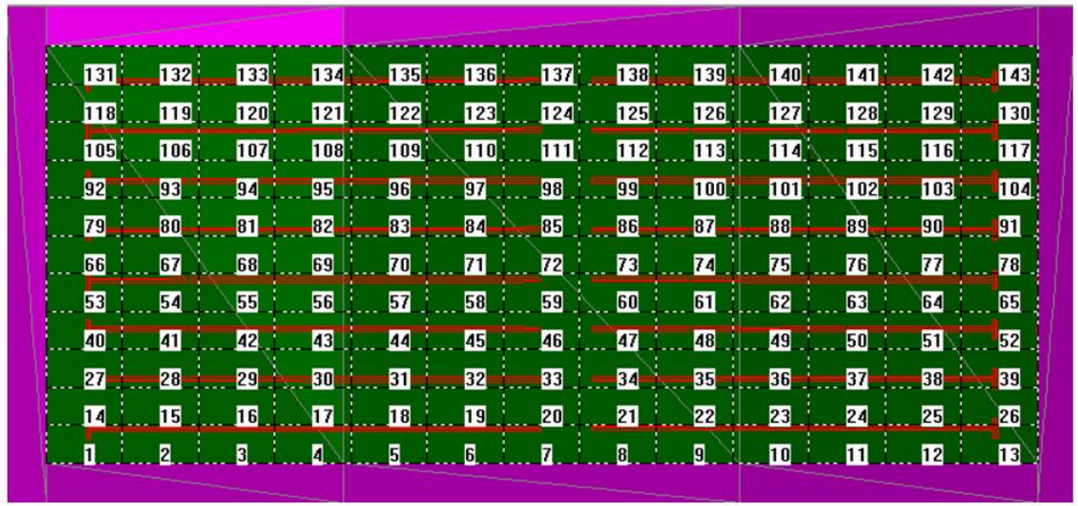
Standards Content

ISO STRUCTURED TEST METHODOLOGY

1. DETECTION TEST

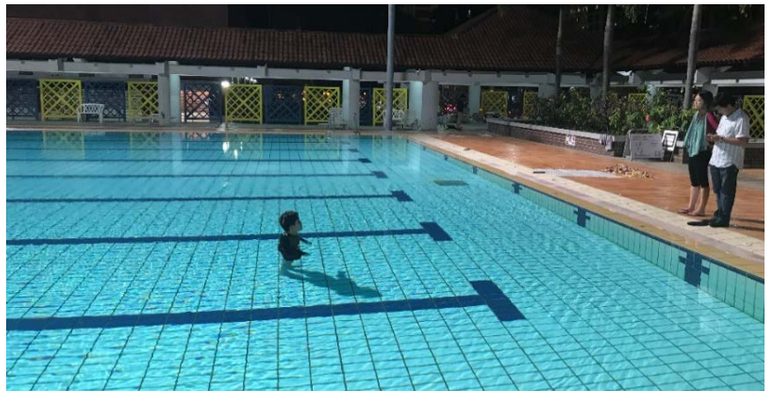
- Mannequin positioned in 143 unique positions
- Determine number of successful Detections
- **Measure of % Detection Rate**

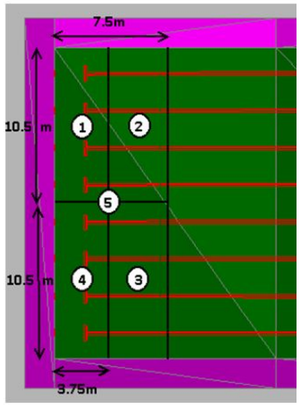




2. NON DETECTION TEST

- 5 specific positions
- In area of pool shallower than 1.5m
- Max 2 false alarms
- **Measure of False Alarm Level**





3. FALSE ALARMS

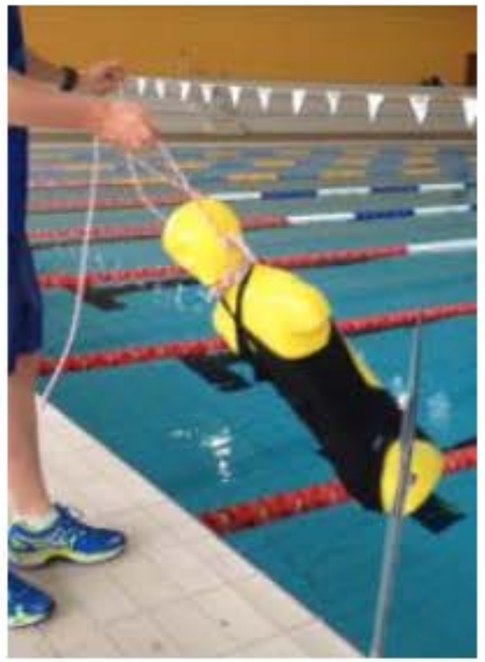
- Have less than 6 false alarms per day on average per month during pool operation

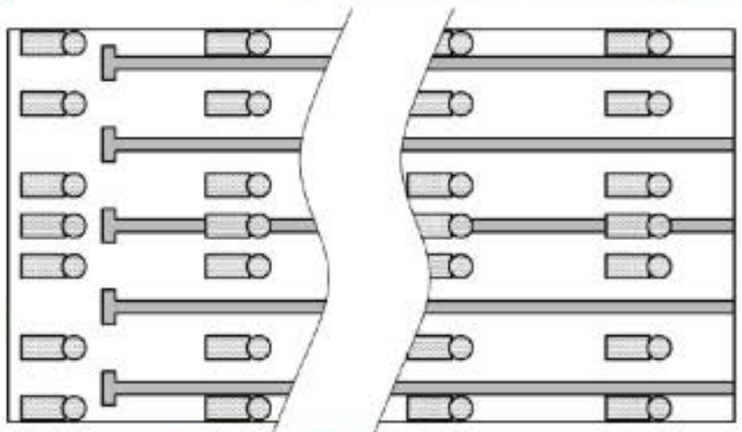
4. Design Requirements

- System Robustness

1. Detection Test

- Detection time & Detection rate measurement: Dummy drag…
  - Use a sinking mannequin
  - Position systematically around pool
  - Measure:
    - Time to alarm
    - Whether alarm occurs
  - Determine coverage pattern
  - Repeat periodically at pool





- Must have >= 80% “Y” score

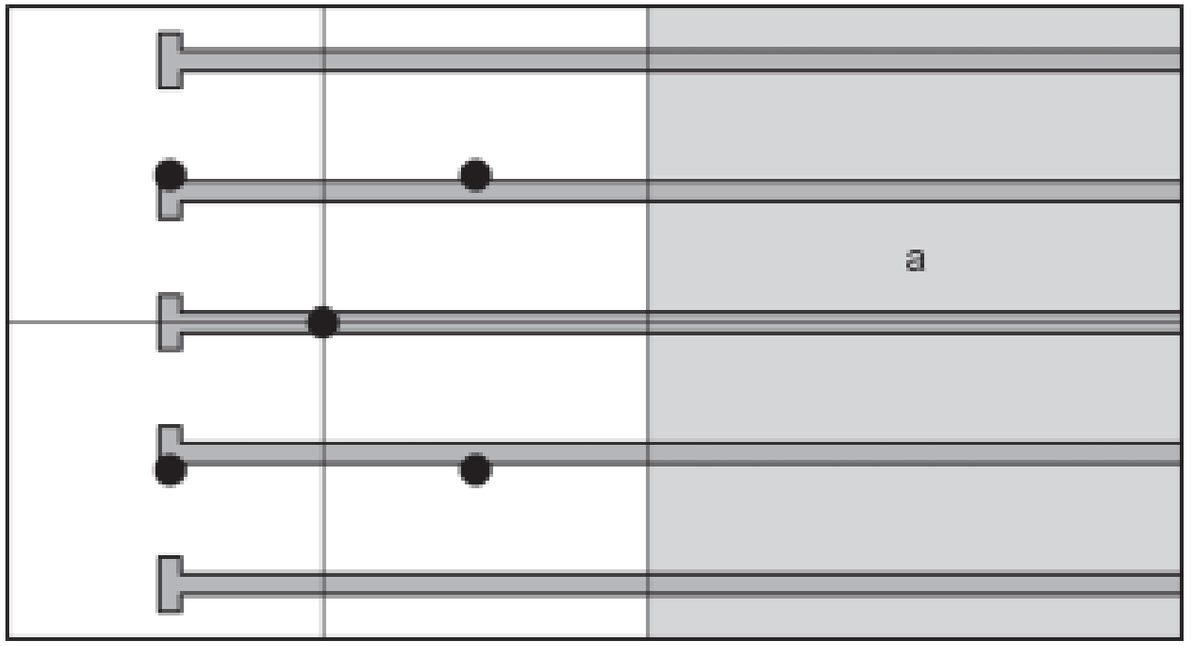
2. Non Detection Test

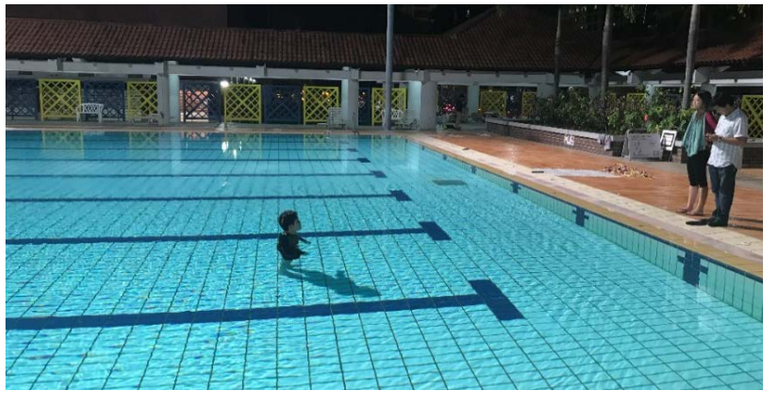
NORMAL OPERATION

- **Avg of 5 or less false alarms**

TEST METHOD

- **Person stands in 5 positions**
- **Duration of 40 seconds**
- **If alarm sounds = false alarm**
- **Max 2 false alarms**





3. Test Frequency

Daily Test

- 1 x Random Position
- False alarm levels

6 monthly

- Full test
- Detection
- Non-Detection

4. Other Design Requirements

General aspects

- Technical study to identify coverage area
- Trained staff - Strict control on detection area overrides
- 2 alarm methods minimum
  - 1 must be hard wired
  - 1 must be audible
- Wireless alarm – coverage area
- 30 days of data kept
- Maintenance essential

Summary

Summary

- Computer Vision is becoming more prevalent in Public Pools

- Computer Vision is superior to lifeguards for detection

- Performance Standard now published

- In discussion for GSPO standards should be modified to:
  - Reflect the reduced risk of pools with Computer Vision
  - Include reference to ISO and AU standards for centres to reference in tenders & ensure they work

More…

GSPO current reference…

5.7 Drowning Detection Systems

a) Computer aided drowning detection systems use various systems of computer hardware and software to monitor the patrons in a swimming pool. When they detect patron behaviour that is out of the norm, such as being motionless underwater for 10 seconds, they activate their alarm system, notifying the lifeguards of the incident and their location. These systems have had considerable and demonstrable success in preventing drowning, particularly overseas and aquatic facilities should consider installing a drowning detection system.

EVERYONE CAN BE A LIFESAVER

Royal Life Saving

ROYAL LIFE SAVING SOCIETY - AUSTRALIA

SUPERVISION SU27, Page 2 of 3

GSPO* – SU27

Why Poseidon: Lifeguard Rationalisation

Why Poseidon - Lifeguard rationalisation

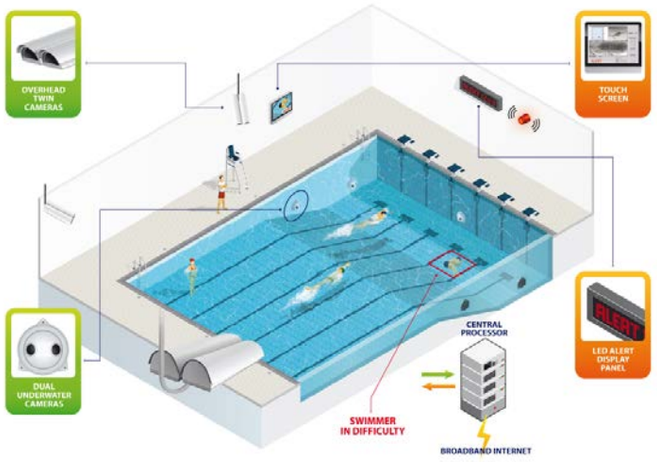
A video from the Redwoods insurance company (USA) shows a CCTV recording from the tragic Eric SMITH drowning accident:

- Despite the presence of 5 lifeguards,
- Even if the pool surface is limited,
- Even if the pool depth is limited,
- Even if they are only 15 guests into the water,
- **Eric was submerged more than 2 minutes, until a swimmer was alerting the lifeguards,**
- **Eric never recovered, he sustains permanent brain dammages.**

(screenshots from the Redwoods video)

Why Poseidon - Lifeguard rationalisation

A modern approach in order to minimize the risk:



Improved Automatic Detection Systems

Well Trained Lifeguards

Clear Procedures

		Likelihood				
		Very Likely	Likely	Possible	Unlikely	Highly Unlikely
Consequence	Fatality	Extreme	High	High	High	Medium
	Major Injury	High	High	High	Medium	Medium
	Minor Injury	High	Medium	Medium	Medium	Medium
	First Aid	Medium	Medium	Medium	Low	Low
	Negligible	Medium	Medium	Low	Low	Low

Risk Assessment

Management Supervision

Optimal survival Chain

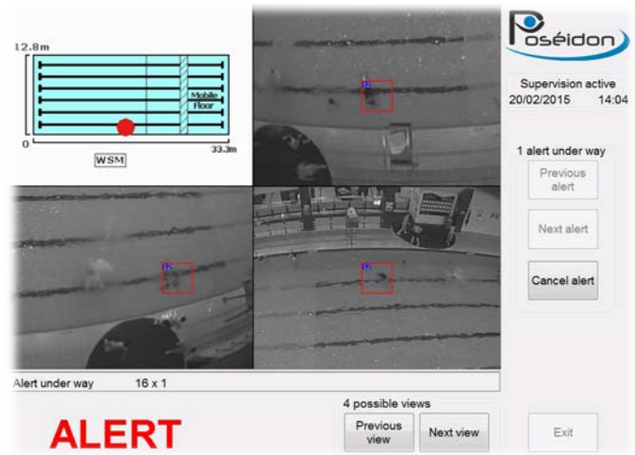
Automation Efficiency Improvements have been used across many applications to improve life & work environments

Why Poseidon - Lifeguard rationalisation

The Peter MILLS, Quality Leisure Management, United-Kingdom, risk assessment approach:

- **In 2005, MILLS says: "Using [Poseidon] technology at Blackshot Leisure Centre enables a sensible reduction of lifeguard numbers and, most importantly, the centre will have a higher standard of safety"**

- **In February 2015, Poseidon was detecting a real drowning accident in this pool.**



ORIGINAL LIFEGUARD-TO-BATHER RATIOS

0-100 bathers = 2 lifeguards
101-120 bathers = 3 lifeguards
121-143 bather = 4 lifeguards
Inflatable = 5 lifeguards including deep end cover
Lane swim = 1 lifeguard up to 15 bathers
Aerobics and club swim = 1 lifeguard

PROPOSED LIFEGUARD TO BATHER RATIOS

0-50 bathers = 1 lifeguard
51- 120 bathers = 2 lifeguards
121-160 bathers = 3 lifeguards
Inflatable =unchanged as cameras mainly overhead

Why Poseidon - Lifeguard rationalisation

Subject to local site risk assessment:

- It may be possible to use Poseidon to reduce lifeguard numbers – and reduce risk,
- This approach has been used by other pools,
- Best Practice = onsite risk assessment + adequate safety procedures to apply + Poseidon automatic detection system + adequate well trained lifeguards number + Management supervision,
- This modern approach helps also to answer to the growing problem of lifeguards shortage,
- There can be significant savings if this concept is implemented correctly.

WARNING:

The Poseidon system is intended to help lifeguards to detect and rescue people more quickly.

Poseidon can be used only by professional lifeguards that received an adequate training in order to work with the system.

As Advanced as the Poseidon system is, it does not save physically people from drowning-only lifeguard can save physically.

A risk assessment shall be done by a qualified professional in order to properly integrate the Poseidon system in the supervision and rescue procedures.

Poseidon is a technological company that can explain what are the system performances and limits but Poseidon is not qualified to do risk assessment in swimming pools.