

工地安全訓練 - 應用虛擬實景技術 VIRTUAL REALITY (VR) ON SITE SAFETY TRAINING

11 DEC 2020

1. Innovative Solutions For Accident Prevention

INNOVATIVE SOLUTIONS FOR ACCIDENT PREVENTION

2020 Accident

- As of October, there have been 12 fatal accidents.
- Accidents related to **Lifting Operation & Working at Height** accounted for the highest number.

How to prevent Accident?

Innovative Safety Solutions



INNOVATIVE SOLUTIONS FOR ACCIDENT PREVENTION

- Set up Construction safety fund (CSF) in April 2018 to support construction safety innovations



INNOVATIVE SOLUTIONS FOR ACCIDENT PREVENTION

Technology related:

1. Ultra-Wide band Wireless Positioning Safety System (超寬頻工人即時定位系統)
2. Safety Alert System for Temporary Lift Shaft Gate (臨時升降機閘門警報裝置)
3. Smart & Safe Working at Height Management System (高空工作安全智能管理系統)
4. Risk Assessment Conduct Everywhere Mobile App (RACE風險評估智能手機應用程式)
5. A. I. Unmanned Aircraft System for Overhead Line Inspection (人工智能航拍架空電纜偵測系統)
6. Intelligent Electrical System (智慧用電管理系統)
7. Smart Angel – Mobile Fall Protector (Smart Angel - 流動高空防墜裝置)
8. A.I. Lifting Safety System (A.I. 實時監控吊運安全系統)
9. Plant Operator & Driver Status Monitor (機械操作員及司機狀態監控系統)

Innovative Safety Training:

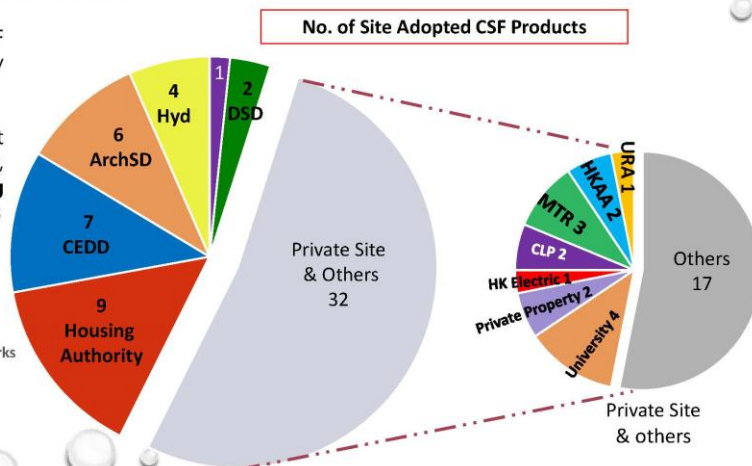
10. VR Immersive Training for Working at Height (虛擬實境高空工作訓練)
11. Electrical and Mechanical Workers Occupational Safety Enhancement Scheme (機電業工友職安提升計劃)
12. Construction Site Safety Champions (建造業安全先鋒計劃)
13. AR Safety Tool Box Talk Training Kit (安全工地座談培訓擴增實境訓練)

6

INNOVATIVE SOLUTIONS FOR ACCIDENT PREVENTION

CSF PRODUCTS ADOPTION STATUS

- Over **60 sites** adopted CSF Products for safety enhancement
- DevB & HA support innovative safety initiatives, about **30 gov & housing sites** adopted CSF products





2. VR Training for Working at Height

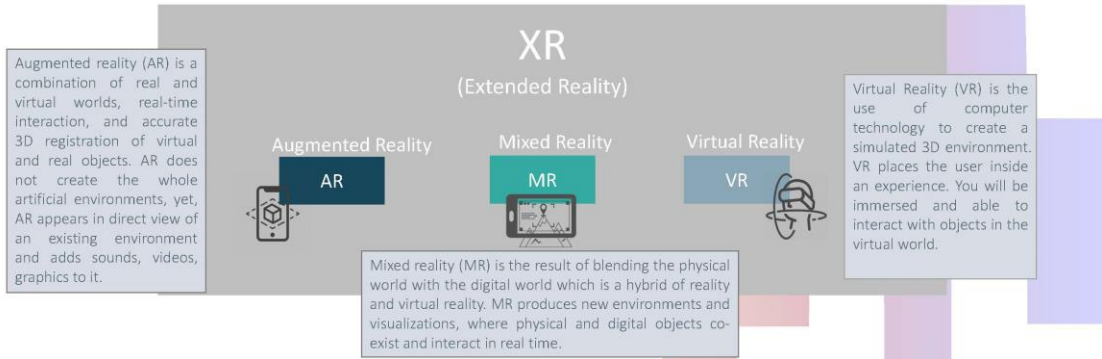


INTRODUCTION OF VR



XR – VR – AR - MR

Extended Reality (XR) refers to all real-and-virtual environments generated by computer graphics and wearables. XR covers all the various forms of computer-altered reality, including Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR).



Virtual reality(VR) training creates realistic workplace experience for interactive learning. Users can experience the consequences of the fall from height accident, which can deepen their understanding on the importance of working at height safety.

Training Contents

Safe & Correct use of:

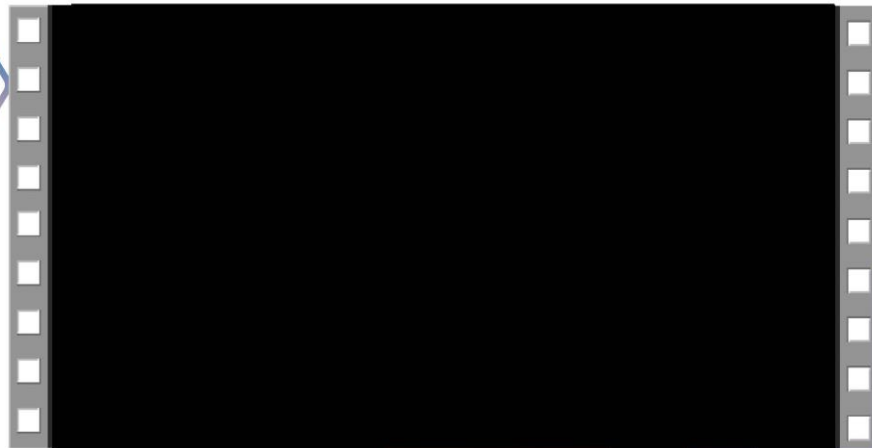
- ◆ Metal scaffolding
- ◆ Mobile working platform
- ◆ Fall protection equipment

VR Scenarios:

- ◆ Metal scaffold
- ◆ Formwork
- ◆ E & M works

Features

- ◆ Visualization training
- ◆ Immersive training experience
- ◆ Hazard identification training
- ◆ Accident simulation and analysis
- ◆ Trainees performance record

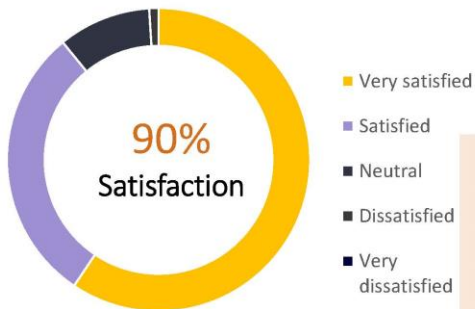


Over
30 sites
Visit / Trial

- 東涌填海項目
- 坪輦污水處理廠
- 古洞北發展項目
- 西貢公路工程
- 火炭房屋項目
- 青衣公屋項目
- 屯門公屋項目
- 黃竹坑上蓋項目
- 粉嶺皇后山項目



➤ 80 Questionnaires were delivered

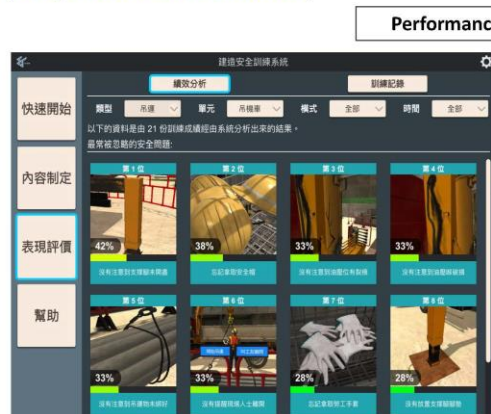


Adaptation and Benefits

- Quantitative data
- Performance tracking
- All-rounded safety report
- Find out the common mistakes among workers



Adaptation and Benefits



Performance Evaluation System

#	類型	單元	模式	安全分數	意外	日期	時間
10	電力工作	電線	站立	100%	0	2020-05-27	16:28
9	電力工作	電線	行走	95%	0	2020-05-27	16:26
8	電力工作	電線	行走	95%	0	2020-05-27	16:23
7	電力工作	電線	行走	94%	0	2020-05-27	16:19
6	電力工作	電線	行走	93%	0	2020-05-13	12:31
5	電力工作	電線	行走	93%	0	2020-05-13	12:27
4	電力工作	電線	行走	93%	0	2020-05-13	12:25
3	電力工作	電線	行走	28%	0	2020-05-13	12:22
2	電力工作	電線	行走	99%	0	2020-05-11	22:15
1	電力工作	電線	行走	100%	0	2020-05-11	22:13



3. What Next?



創新訓練
Innovative
Training

AR SAFETY TOOL BOX TALK TRAINING KIT

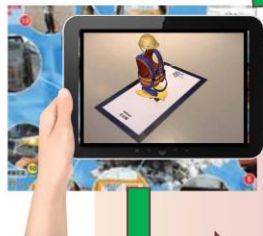
NEW PRODUCT

Augmented Reality Training allows an interactive and engaging learning process in effective approaches. Through downloading the AR App, workers can use their mobile devices to view the tool box training in 360 degree 3D perspective. Furthermore, workers' training performance data can be viewed in the recording system for trainer evaluation and analysis.

Features:

- ◆ Over 40 safety training topics
- ◆ Training content in 360 degree 3D perspective
- ◆ Quiz for each topic
- ◆ Trainees performance recording system

Developer:





Here is the footage from
Site Safety Seminar for Capital Works New Works Contracts
which was held on 11 December 2020
The speaker is Ms. Mary Li
Assistant Technical Secretary of Hong Kong Construction Association
and Mr.Terry Dao
Chief Executive Officer of VTM Digital Limited
Their presentation topic is Virtual Reality on Site Safety Training

First of all many thanks to the Housing Authority (HA)
for letting us do this sharing with you today
I am Mary from the Hong Kong Construction Association (HKCA)
Today I am going to talk about
how to apply Virtual Reality (VR) technology
for safety training on construction sites
Why does the HKCA have this set of VR training material?
Why did we develop it in the first place?
We really wanted to use innovative methods
to help the industry alleviate problems related to site safety
and also to prevent certain accidents
Looking at some figures in 2020
up to October we already have 12 fatal accidents
And looking more closely at the data

the highest risks lie in lifting operations and working at height
In fact our industry has been working hard to improve safety
so why are there still so many accidents?

How can we prevent them?

That was why the HKCA wanted to introduce
more innovative safety technology for the industry
to see if they could help enhancing our safety performance
and help preventing accidents

We cannot solve these problems alone
and would like to draw more ideas

We contacted different contractors and
a few innovation and technology companies
hoping to devise innovative safety measures
meeting our industry's needs

At the same time we communicated with different stakeholders
including government departments developers and owners
the Construction Industry Council (CIC) the OSHC
colleges and universities

as well as some workers' unions and associations
wishing to gather insights from everyone for improving safety

Also we established a safety fund of \$10 million
to support and sponsor companies

who would be developing innovative safety measures

Creating more solutions for the industry to
establish intelligent construction sites for cutting accident number

At this moment we are already sponsoring 13 researches

VR working at height training to be briefed today is one of them

All of these projects will be rolled out and promoted to the contractors

Right now there are already 60 construction sites

that have used the systems developed by our sponsored projects

Over half of them are government or HA projects

30 of them have used the VR working at height training

which we will be learning more about today

Terry will talk more about this collaborative VR training

Thank you Mary

Thanks for HA's organising and inviting us to this seminar today

Just now Mary mentioned our development of VR technology
and felt that there is an absolute need for applying it on site

Indeed one could even say there is an urgent need for it

Why do I say this?

First let us go through some basic information

Apart from VR XR is also commonly used

This is an universal name with the full English term 'Extended Reality'

under it are some more detailed classifications

Since most of us would have heard of VR a bit more

maybe we will focus more on it today

VR stands for 'Virtual Reality'

What is special about it is that it uses a virtual scenario

and through a helmet called 'HMT'

we see images that are all generated by Computer Graphics (CG)

VR is an interaction between humans and this CG environment

Apart from VR we should not ignore AR or MR either

I believe that both of these will gradually be introduced

and applied to industrial safety in the near future

AR stands for Augmented Reality

and MR is Mixed Reality

For now we can see these two things as the same thing

Both emphasise engagement with digital objects

no matter whether it is text or images

When you put on the equipment you start interacting with this information

so it is crucial that AR and MR are designed

to coordinate with the physical environment

rather than simply a virtual experience

It is an interaction that happens in a real physical environment

So my prediction is that in the near future

in terms of safety or even some operational training

will further make use of AR and MR

At the beginning of this session

Ms Li said that HKCA was fortunate to have found us

and we too feel very honoured that we are invited to

develop three safety training kits in working at height

They are Metal Scaffolding

another one is Formwork

Lifting Operation and Application

in Electrical and Mechanical Engineering

All three are concerned with working at height

As just mentioned working at height
is a work process where accidents frequently occur
This is a great starting point for us to develop the VR training
We can show you a video
This video gives you a feel for
what you will see when you enter a VR environment
What you see are three different situations that involve working at height
And finally it will let you feel and experience what it is like
if you are unfortunate enough to fall from a great height
feeling a little bit of that centrifugal force
At the same time there is information that tells you
to always follow safety measures before working at height
The special thing about using VR is that it can help us simulate
environments that are difficult to replicate in real-life training
For example the metal scaffolding you saw just now
it was at a great height
Usually you would never do training at such a place right?
But VR has made it possible
And as I mentioned you can even use VR
to simulate the accident itself during training
so you can create a deeper impression in the trainee's mind
and thus make the training more effective
Just now Ms Li also said that
to date over 30 sites are using this system
and around 80 have tried this VR training unit before
The results were very positive with satisfaction rate over 90%
including people who found it 'satisfactory' or 'very satisfactory'
Note that most of the survey respondents were our trainees
i.e. ordinary workers or even colleagues in safety-related roles
Also one point about VR that Mr Leung said at the beginning
as the technology getting more advanced
one can say that
while the hardware is getting affordable in terms of price
More importantly the technology would be applied
widely without much limitation
You can be just sitting down or standing up
and you can go through a training session like this
Or if you have enough space maybe 2 metres by 4 metres

Our design was intended to be the interior of a 20-foot-long container
You could also try a 'walking-style' training
where its training efficacy would be even higher
At the same time apart from raising safety awareness
our training system allows us to save the relevant data
How long would be required to train one trainee? How well did they do?
Did they grasp certain knowledge in the course of the training?
Could they apply it at a later date?
All these kinds of information would be recorded
Later at each construction site
we can retrieve such data and from there
we can work out which areas need focus training
What you see here are called 'user interfaces' (UI)
We can use UI to control some of the training that is going on
for example monitoring for certain situations
We do not want each training session to be identical every time
so we can select and choose the next step
As I said at the beginning of my presentation VR is a trend
also AR application will slowly but surely become popular too
We will continue to work closely with the HKCA
to develop another application of AR or augmented reality
If we succeed we believe it can be even more widely applied
The concept is to conduct some trainings via phones or tablets
and there would be some 3D images that pop out
This would allow us to absorb safety information more easily and quickly
This will be ready next year so please look forward to it
That is all for my sharing today
Thank you