Project Details

Location
London

Contact Reference

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Contract Date

Start Date	End Date
February 2019	February 2021

Contract Value
£250,000 (overall, £25k to PAULEY)



Figure 1: The section of the augmented reality environment created by PAULEY

TunnelSkills is the national specialist training forum for the UK tunnelling industry. Supported by CITB, the British Tunnelling Society and the Tunnelling and Underground Construction Academy - TUCA, members benefit from continuing development of specific tunnelling qualifications. The aim is to benchmark safety and competence for all in the underground environment, and to promote competence via on-site training and assessment leading to national qualifications.

The project was aimed at elevating the quality of the content, promotion and delivery of tunnelling training using a range of immersive technologies. Modules relevant to tunnelling, including some pertinent to the general construction sector were developed giving stakeholders a realistic, consistent and safe environment in which to train and experience the environment shared across disciplines. Tools and 3D content were created to improve promotion, distribution and knowledge retention; including AR and VR.

Scope	Part of TunnelSkills Project	PAULEY Expert in field
Virtual Reality (Oculus Rift)		✓
Augmented Reality (Microsoft HoloLens)	✓	✓
Blended Learning	✓	✓
MultiLens		✓
Multi-Stakeholder Collaboration	✓	✓
Live stream Data Feeds		✓

Project Overview

The project entails elevating tunnelling and underground construction skills through immersive technologies

The project wider project will address challenges of simulating/recreating tunnelling environments for workers to develop the behaviours and competencies required for their roles.

This collaborative project will use a wide range of immersive products and a content library, that will tackle a number of tunnelling specific and generic construction topics for use as training aids in existing accredited and employer specific short courses and apprenticeships.

This project covers a number of areas and includes a VR promotional tool that will attract new entrants into the sector.

The immersive content delivered as part of this project aims to build awareness of the risks and hazards amongst employees at all levels helping to affect culture change through the industry. The immersive content will bring the environment into the classroom or training arena without the need to access high risk areas underground or affect production.

The range of products to be delivered will include:

- VR Classroom content and scenarios
- VR Promotional Game
- VR Cube Scenario
- AR HoloLens application (delivered by PAULEY)
- Library of 3D content and assets for the TUCA VR Platform (delivered by PAULEY)

As part of the delivery, PAULEY will provide a Hololens application that can be used for demonstration and promotion of a number of training scenarios. PAULEY will also provide access to their online 3D asset portal.

In total 8 scenarios will be built in an immersive environment with PAULEY undertaking two of these scenarios in augmented reality:

- Scenario 1 – Access into Shafts and Tunnels under Construction
- Scenario 8 – Emergencies, Planning and Response

Project Delivery

This is a 24-month project however PAULEY's scenario creation was one of the first sections to be completed. Whilst the project is currently still ongoing, we have already completed our sections of this innovative project on time and to budget.

Training for tunnelling requires people to carry out highly skilled tasked in a dangerous environment. This is currently delivered via traditional face to face classroom-based learning where it's difficult to replicate the type of environment the trainees will be working in.

Safety is critical to working underground and without physically being in a tunnel which is expensive and a restricted environment in which to learn, it's difficult for trainees to gain an understanding of what the environment is truly like when working in a tunnel.

Drawing on CITB funding, PAULEY have been working with TunnelSkills and BAM, and alongside Tideway, in order to create various Augmented Reality environments. These AR environments will be

used to support the induction, training and outreach of workers and visitors alike in order to give them an immersive sense of what it's like to work safely in different tunnel environments.

PAULEY used their HoloSkills Platform to address these challenges. The use of Microsoft HoloLens (AR headsets) and 3D computer modelling has been effectively aligned with the key learning objectives thanks to a clear vision and careful evaluation of which courses would be best suited to digital immersive learning.

PAULEY have developed two scenarios as part of this project:

Scenario 1: Access into shafts and tunnels under construction

This immersive experience is built to ensure that staff and visitors are equipped with the skills they need to:

- safely enter and exit the tunnel
- use the correct equipment including the correct PPE
- understand the importance of (and consequences of not) using the personnel tally systems (in and out)
- use of a passenger lift to descent into the shaft

Scenario 8: Emergencies / Planning / Response

This second scenario has been designed to ensure that staff and visitors are equipped to deal with an emergency should one arise and covers:

- Sounding of alarms
- Use of a self-rescue kit
- Self-rescue or escape to refuge chambers
- Gas detection and gas alarms
- Fire in the tunnel – raising the alarm
- Fire prevention and fire suppression



Figure 2: Screen shot from scenario 8

The augmented reality scenarios gave the learners an awareness of tunnelling and its environment, it placed emphasis on safety and understanding the hazards of working in underground. It stepped them through the process in a highly visual and engaging way so they could prepare for when they enter a tunnel for the first time.

Benefits Potential

There is currently a large gap in tunnelling training capability that immersive technologies is helping to fill. The main benefit this project will bring to industry is high quality training scenarios that do not currently exist, along with the power and flexibility for trainers to create their own scenarios from the available assets.

Training in an immersive environment ensures that safety is of paramount importance and allows trainees to be placed in a dangerous (augmented) scenario and can repeat the training where required until they are fully competent and safe to enter the environment in the real world.