

IATL Academic Fellowship

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Due to increasing economic pressures, most employers are keen to explore alternative modes of embedding knowledge that enable employees to access Higher Education learning opportunities, but with a diminished emphasis on class-based delivery. IATL funding was secured to develop a virtual tour of a Jaguar lab car. This report outlines the design and development of the learning object that enables learners to explore the lab car without having to attend a campus-based learning event.

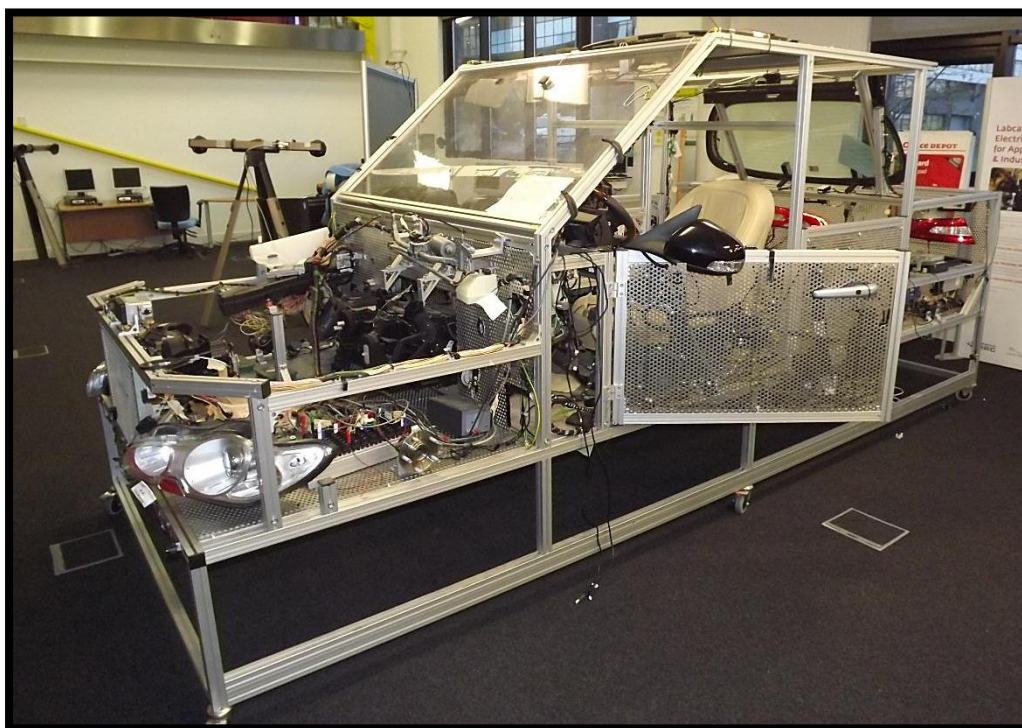
Virtual Tour of a Jaguar Lab Car

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Introduction

Currently, the practical aspects of teaching automotive electrical systems, networks, and diagnostics on a vehicle are facilitated with the use of a lab-car, (shown below) that is located the International Digital Laboratory, WMG. A lab-car is a physical structure that contains all of the vehicle's electrical and electronic systems as they would appear in a real production vehicle.



Delegates who have attended the one-day workshops, (a precursor for the MSc Diagnostics module), can only engage in this aspect of the learning by physically attending lab-based sessions at the University. Delegates have frequently reported back that they would value greater exposure to the lab-car. However, due to increasing economic pressures, most employers are keen to explore alternative modes of embedding knowledge that enable employees to gain the same learning, but with a diminished emphasis on class-based delivery and less time away from their place of work.

Feedback from delegates has highlighted that learners consistently place a high value on these practical sessions; both from a learning perspective and from a practical aspect. The interactive nature of the workshops enables delegates to develop a feel for the technology, i.e., 'learning by doing'.

Aims & Learning Outcomes

Aims

The original aims of the project were to:

- Scope out the options available for WMG to develop an online multimedia, video-based, blended-learning teaching and learning tool that would enable tutors to simulate a range of faults on a 'virtual' test car.
- Produce a detailed specification for the simulation/testing tool.
- Capture a series of short video clips that will be used as the basis for creating the final teaching and learning tool
- Produce the final teaching and learning tool that will pose the learner with a series of fault scenarios on the virtual test car. Depending on the response, the learner will be presented with a series of short video clip showing the actions performed and the resulting consequences.

It was envisaged that the first two actions would be performed by a MSc student as part of their final project dissertation. However, this proved to be difficult due to a lack of interest by the WMG student community and the project was completed entirely by Anmoal Thethi

Learning outcomes for the learning object

In helping to ascertain the scope of the learning object the following outcomes were framed.

By using this learning object participants will be able to:

- Identify the components on the lab car - physical appearance & location
- Be able to effectively relate a component to its position within the electrical architecture of the vehicle – including data network type(s), dependencies & interactions with other related ECUs
- Be able to use different instrumentation to interrogate electrical components within the test car – including an Oscilloscope, CANalyser (CAN network analysis tool), IDS (Service diagnostic tool)

Progress against Original Plan

Milestone	Planned Action	Actual Action	Changes against Plan
Scope out the options available for WMG to develop an online multimedia, video-based, blended-learning teaching and learning tool	MSc student with direct supervision from A. Thethi	A. Thethi	Milestones completed but we failed to recruit the assistance of a post-graduate student
Produce a detailed specification for the simulation/testing tool	MSc student with direct supervision from M. Amor-Segan and A. Thethi	A Thethi in consultation with M.Amor-Segan	
Consult a representative sample group composed of key stakeholders	MSc student with direct supervision from M. Amor-Segan and A. Thethi	A Thethi in consultation with M.Amor-Segan	
Compile a detailed Project Initiation Document and Business Case.	MSc student with direct supervision from M. Amor-Segan and A. Thethi	Milestone modified	Not completed as this was a feature to attract interest from MSc students
Produce planning documentation for the E-Learning Technologist and video capture personnel	MSc student with direct supervision from M. Amor-Segan and A. Thethi	A Thethi in consultation with M.Amor-Segan	Milestones completed but we failed to recruit the assistance of a post-graduate student
Capture video footage	R O'Toole (IATL)	Milestone modified	Due to monetary / time constraints and because the inclusion of video footage would not add significant value to the final learning experience for the user, the project was modified to include digital still panoramic images instead of video.
Edit video clips	A Thethi	Milestone modified	
Produce a simplified prototype for three fault scenarios	A. Thethi in consultation with A. Amor-Segan	Milestone modified	The project scope was modified. The aim of the resulting object would be

			to produce a 'proof of concept' and instead of three scenarios, the resulting object focuses on providing a virtual tour of the engine bay only.
Test the tool with a representative sample group composed of key stakeholders	A. Thethi in consultation with A. Amor-Segan	Not actioned	Due to time constraints this action has not yet been completed. However, it is envisaged that it will be finished before presenting the final proof-of-concept to decision makers within WMG
Compile feedback from user testing into a final version of the tool with a more varied range of fault scenarios	A. Thethi in consultation with A. Amor-Segan	Not actioned	
Disseminate results to key stakeholders	M. Amor-Segan, MSc student and A. Thethi	Partially completed	Final project report for IATL Board completed. As part of presenting the final proof-of-concept, a dissemination event where the learning object will be demonstrated. A working version of the learning object is available for demo now if required.

The final spend on the project was £7382.36. This was used to pay for Anmoal's time as described in the table above.

Creating the Virtual Tour

A virtual tour is a simulation of an existing location, usually composed of a sequence of video images. They also may use other multimedia elements such as sound effects, music, narration, and text. The phrase "virtual tour" is often used to describe a variety of video and photographic-based media.

Panorama indicates an unbroken view, since a panorama can be either a series of photographs or panning video footage. However, the phrases "panoramic tour" and "virtual tour" have mostly been associated with virtual tours created using still cameras. Such virtual tours are made up of a number of shots taken from a single vantage point. The camera and lens are rotated around what is referred to as a no parallax point (the exact point at the back of the lens where the light converges).

A video tour is a full motion video of a location. Unlike the virtual tour's static wrap-around feel, a video tour is as if you were walking through a location. Using a video camera, the location is filmed while moving from place to place. Video tours are continuous movement taken at a walking pace. The original plan for this project was due to produce a video tour. However, during the project scoping phase the brief was changed to use panoramic images; the use of video would result in added expense, more time and would not yield significant benefits to justify the use of.

Method of creation

Stitching photographs

There are a range of methods that can be used to stitch images. Rectilinear Stitching was identified as the preferred method for this project. This involves the rotation of a digital camera, typically in the portrait (up and down) position and centered directly over the tripod. As the operator manually rotates the camera clockwise, the camera stops or clicks into a detent such as every 30°. The rotator can be adjusted by changing the position of "detent ring or bolt," into another slot like; 40°, 60°, 90° etc.

The combination of a precision rotator and a digital camera allowed the photographer to take rectangular "slices" of the engine bay. Through a process of trial and error the photographer took 8, 10, 12 or 14 slices of a scene.

Using specialised "photo stitching" software such as Autopano operator the "slices" were assembled into a rectangular one—typically 4,500 pixels to 6,000 pixels wide. This type of stitched panoramic view is also called "cylindrical"; as the resulting stitched panorama allows panning in a complete 360° but offers a limited look up or down of about 50° degrees above or below the horizon line.

Equipment Used

1. Fuji Finepix S3400 Camera
2. Manfrotto Tripod
3. Manfrotto Midi Ball Head

1



2



3



Shooting Panoramas Using S3400

PANORAMA **MOTION PANORAMA**

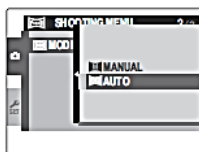
In this mode, you can take up to three pictures and join them together to form a panorama. Use of a tripod is recommended to assist in composing overlapping shots.

- 1 Rotate the mode dial to **PANORAMA**.



- 2 Press **MENU/OK** to display the shooting menu.

- 3 Select **AUTO** from **MODE** in the shooting menu (pg. 78).



- 4 Press the selector up to select a frame. Press the selector left or right to highlight a pan direction and press **MENU/OK**.

- 5 Take a photograph. Exposure and white balance for the panorama are set with the first shot.

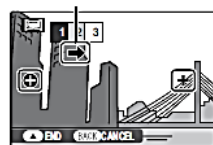


← Note

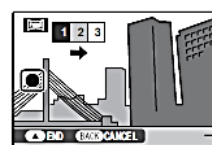
The camera zooms all the way out and zoom remains fixed at the widest angle until shooting is complete.

- 6 Frame the next shot to overlap with the previous picture by superimposing **+** on **+** so that they form a solid circle (●). The camera will release the shutter automatically.

Pan direction



Display after 1st shot



Shutter released

- 7 Take the last shot as described in Step 6.

← Note

To end shooting and create a panorama after the first or second shot, press the multi selector up after completing Step 5 or Step 6 and proceed to Step 8.

- 8 Press **MENU/OK** to save the picture.

Cautions

- Panoramas are created from multiple frames. The camera may in some cases be unable to stitch the frames together perfectly.
- The desired results may not be achieved with moving subjects, subjects close to the camera, unvarying subjects such as the sky or a field of grass, subjects that are in constant motion, such as waves and waterfalls, or subjects that undergo marked changes in brightness. Panoramas may be blurred if the subject is poorly lit.

●● For Best Results

For best results, be careful not to tilt the camera backward or forward or to either side and try not to move the camera while **+** and **+** are aligned to form a solid circle.

●● Printing Panoramas

Depending on the page size and the size of the panorama, panoramas may print with their edges cropped out or with wide margins at the top and bottom or at both sides.

●● Framing Panoramas Manually

Follow the steps below if the desired results are not achieved with **AUTO** selected for **MODE**:

- 1 Select **MANUAL** for **MODE** in the shooting menu.
- 2 Select a frame and take the first shot.
- 3 Press **MENU/OK** to display a guide showing an edge of the picture you have just taken. Take the next shot, framing it to overlap with the previous picture.

Guide



Display after 1st shot



Frame next shot

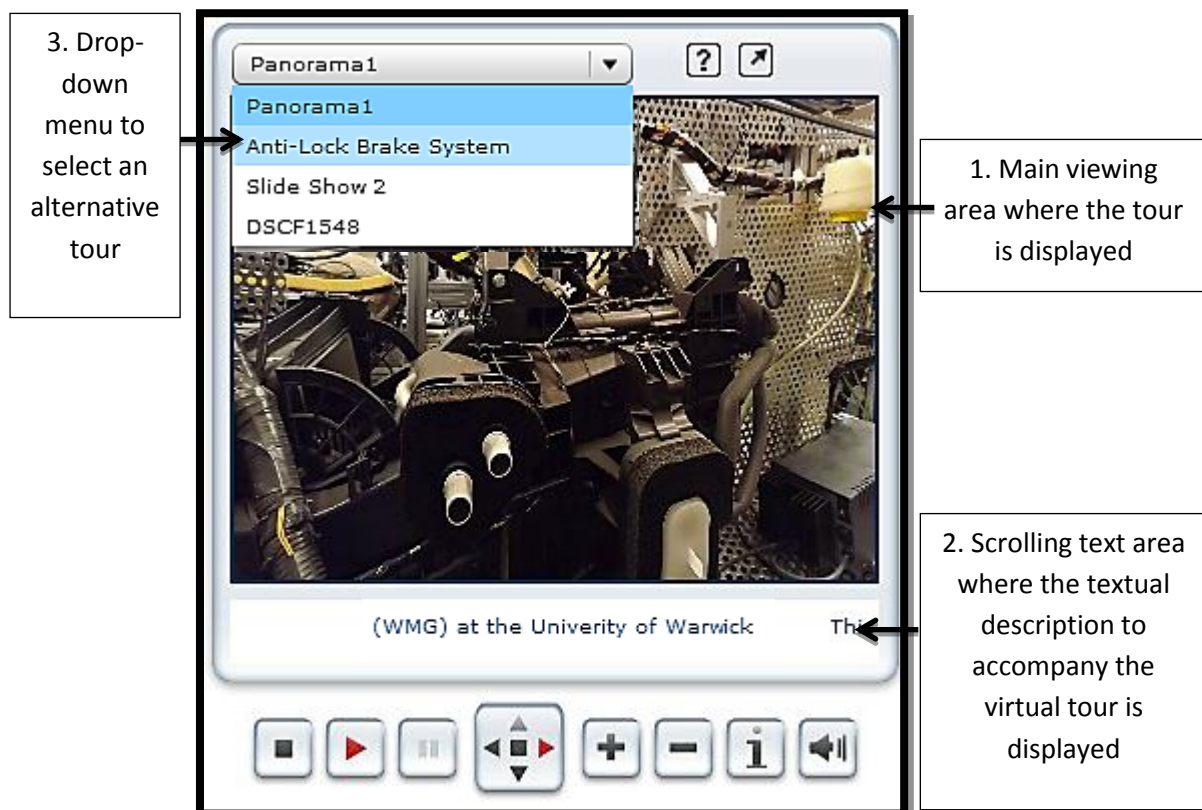
- 4 Repeat Step 3 to take the third shot and then press **MENU/OK** to display the completed panorama.
- 5 Press **MENU/OK** to save the picture.

The User Interface

The User Interface consists of three key areas (shown below):

1. The main viewing area. This is where the virtual tour is displayed. The viewer is presented with a moving image where the camera is in a fixed-spot and slowly rotating.
2. In addition, scrolling text-based information is presented below the main viewing area
3. Users can load an alternative panorama tour or slide show via the drop-down menu shown or by clicking on a hot-spot symbol within the current panorama.

The user is presented with a variety of buttons located primarily at the bottom of the interface which are outlined on the next page



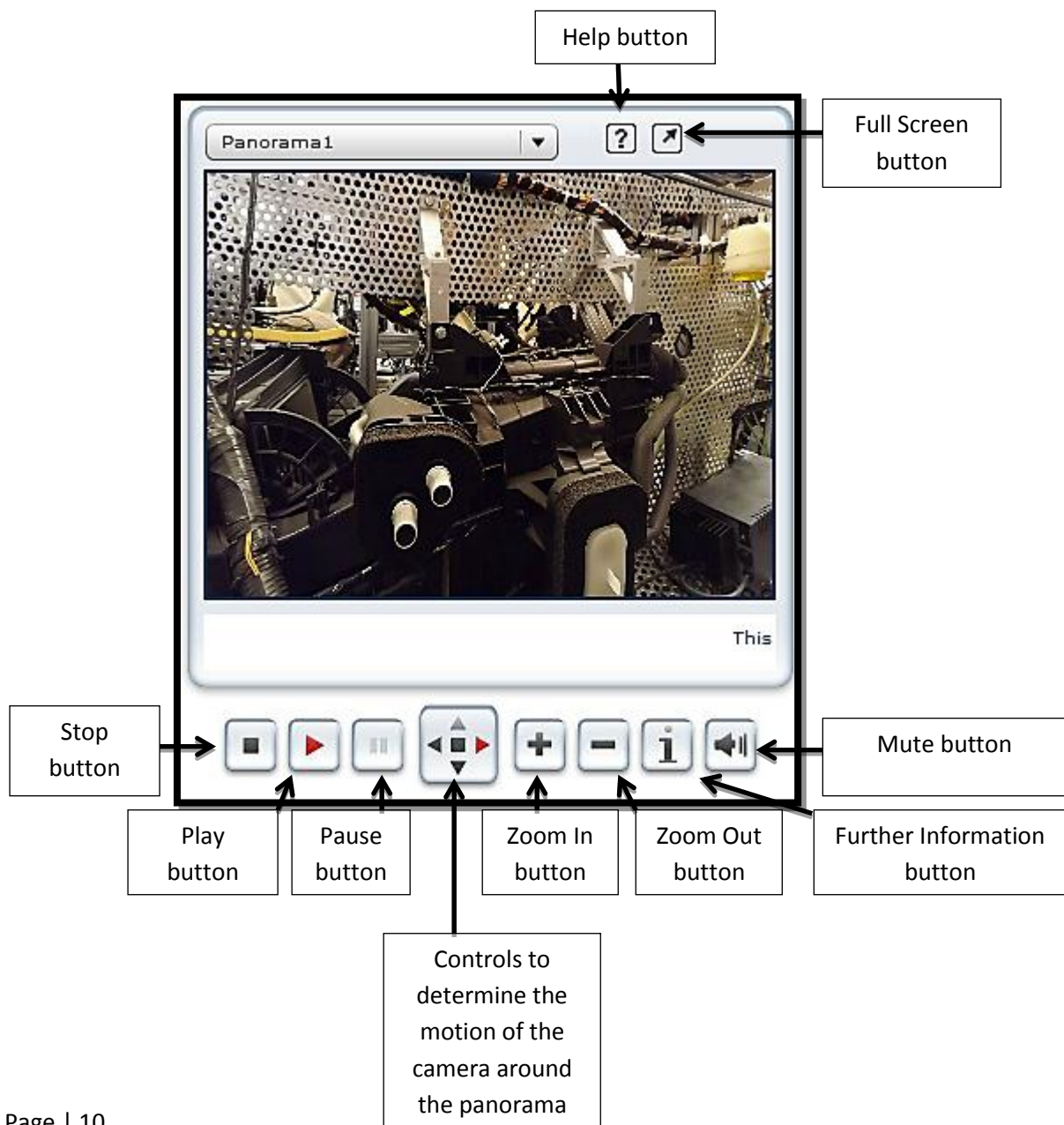
Navigation (*Minimise Mode*)

The virtual tour starts in a minimised Window, (shown below).

The Window can be maximised by clicking the 'Full Screen' button. The user interface and the resulting controls change as a result are shown and explained on the following pages.

The interface presents the user with a range of buttons that enable the user to stop, play and pause the movie. The user can also zoom in/out to view an item in greater detail. And when required the user can take control of the camera to explore the engine bay as they wish.

A Help and Further Information feature is provided for the user to enhance the usability of the learning object. The help information provided is shown on the next page. To avoid confusion, the buttons are designed to explain their purpose by using familiar visual clues.



Help Instructions

The following text is accessible via the Help button to assist the user in navigating around the virtual tour

Playing Media

- The Show should start playing automatically. If not, click on one of the elements in the media list and press the "play" button.
- You can change media at anytime by clicking on the media list, drop-down menu or "forward" and "back" buttons.

Navigating around the panorama

- Click and drag the panorama to control its movement, or use the "left", "right", "up", "down" and "stop panorama" buttons.
- Use the "zoom" buttons to zoom in/out of Immersive panoramas.

Hotspots

- Hotspots are coloured targets or rectangles inside the panoramas. Hotspots may be visible or hidden.
- Click on a hotspot to: move to another scene, play a different media, play an audio or to open a web page.
- Use the "hotspots" button to reveal or hide the hotspots.

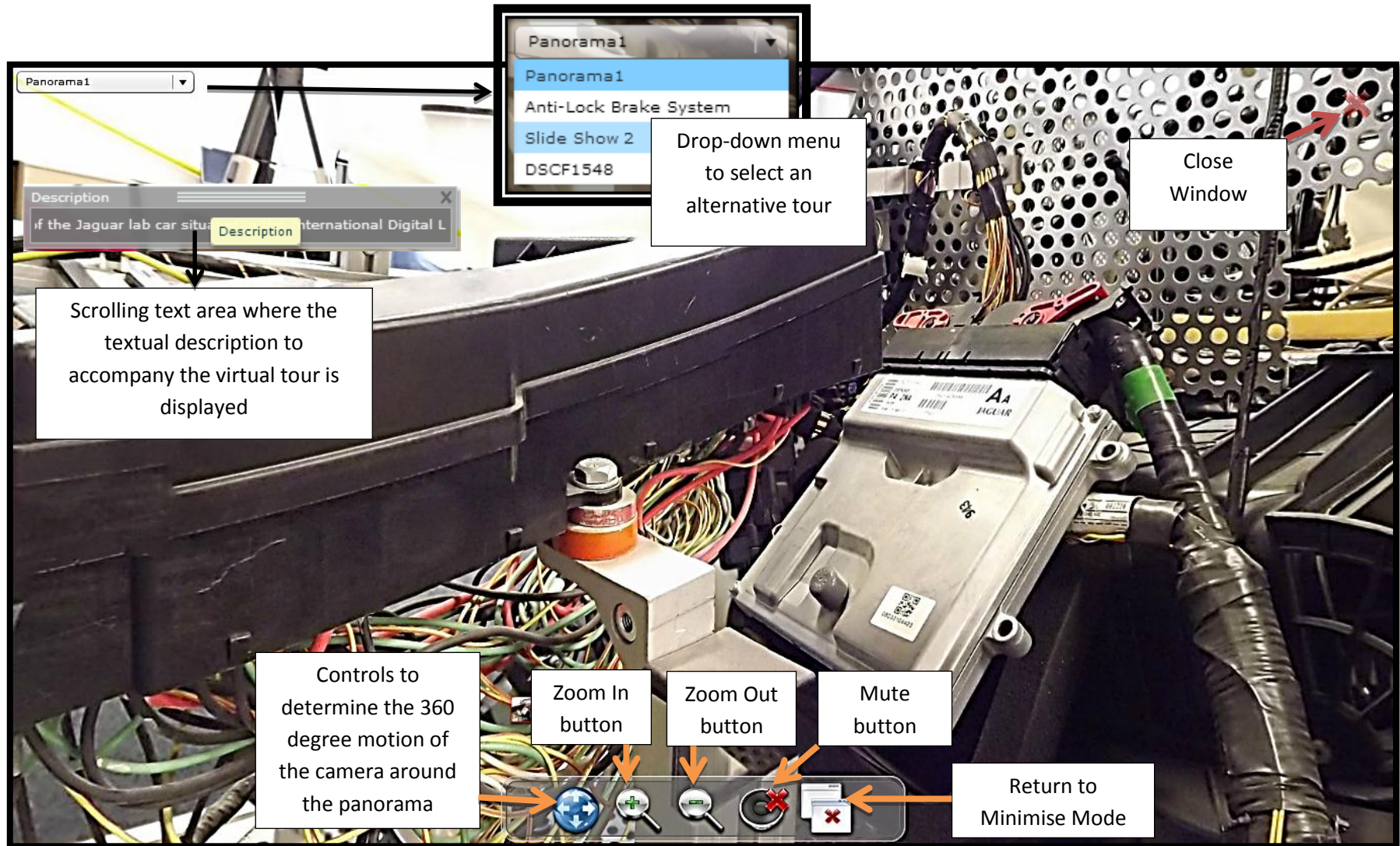
Slide-Shows

- The slide-show should play automatically. To view a slide, you can click on one of the thumbnail images (if present).
- Some slides can be enlarged by clicking on the "zoom" button

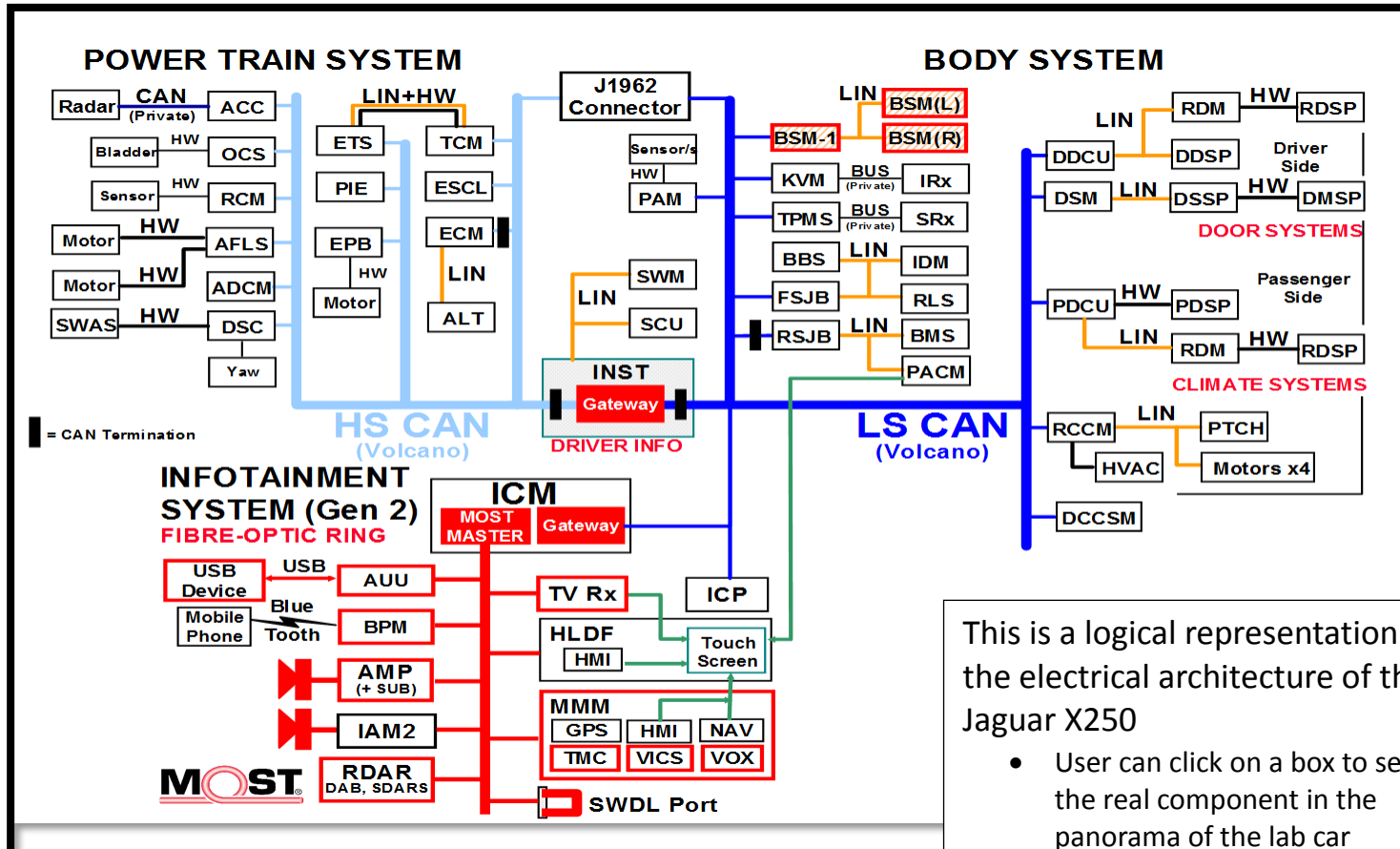
Navigating around the plan

- Move you mouse over the Floorplan/Map area to reveal any hidden links.
- Click on a link to: change the media being played, open a web page, play an audio or to open a drop-down menu.

Navigation (*Full Screen Mode*)



Virtual Tour Map



This is a logical representation of the electrical architecture of the Jaguar X250

- User can click on a box to see the real component in the panorama of the lab car
- User can click on the map to access a list of acronyms

Further Work

The aim of this IATL-funded project was to produce a proof-of-concept prototype of a virtual tour around a lab car. The following table outlines the current status of the learning object and planned further developmental activities

Feature	Current Status	Further Work
Textual content	Functional text that briefly describes components	Working in consultation with the subject expert author detailed, supportive text that provides additional audio information for the user.
Vehicle scope	Car engine bay	To extend the scope of the learning object by considering the passenger cabin and the rear compartment of the vehicle
Narration	No supporting narration, just some background audio	Working in consultation with the subject expert author supportive text that provides additional audio information for the user. Record and incorporate the information.
User testing	User-testing with a small group, consisting of the subject expert and programme manager	Test the tool with a representative sample group composed of key stakeholders

Once the current version of the learning object consists of narration and more descriptive text, it is envisaged that a business case will be presented to WMG decision makers to resource the further work outlined above.