EXPOSITION DISPLAY INTEREST TRACKING SYSTEM

USING COMPUTER VISION

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MODULE: PROJECT ENGINEERING
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1 – Proposal:

What makes a successful expo display? This is an important question businesses must ask themselves when looking to use an expo as a means to promote their brand and showcase their product. My proposal is of a computer vision system that tracks the gaze of attendees at an expo, so that detailed data may be provided to a user of what component of their display most effectively caught peoples' eye. The result of this would be a more detailed understanding of how a display performs, so that its design may be altered to grab attention more effectively.

The proposed system will involve placing a small camera at a position near the display. The camera would record where about on the display attendees' gaze fell and for how long. The recorded gaze data could then be displayed as a heat map overlayed onto a picture of the display in question, giving the user a good idea of what was most effective (or ineffective) about their design. Users data would be stored on a database and accessible via a web application, thereby opening the possibility for collaboration between different users. For example, a new user may not yet have gathered sufficient data to be of help to themselves, instead they could view past effective display designs and pick elements from these for use in their own display.

2 – Technicalities:

Image capturing will involve using an 'ESP32 CAM', a low-cost microcontroller specifically designed for use as a vision system. It comes with an 'OV2640' 2MP camera module, is WIFI enabled and can be powered by a 5V supply, making it a good choice for wireless use. It will take frequent snapshots of the display area that will be analysed during image processing. The programming of the ESP32 involves the downloading of Espressif's 'IoT Development Framework' (ESP IDF). This is a command line tool and will necessitate the use of Visual Studio as an IDE.

A laptop will provide the computational resources required for image processing and will receive raw images wirelessly from the ESP32 CAM. Images will be processed using a Convolutional Neural Network (CNN) and trained with back propagation algorithms. The processed images will then be sent to a MySQL server hosted on Amazon Web Services. The CNN and Deep Learning algorithms will likely be written in Python and will involve the use of OpenCV libraries for the CNN, and TensorFlow for Deep Learning aspects. I believe these areas will be a particularly challenging part of this project, as both (Convolutional) Neural Networks and Deep Learning are new concepts to me and will require a depth of research.

A web application will be created for use as the projects user interface. The main purpose of the interface will be to allow users to view data about both theirs and other users displays. The web application frontend will most likely be developed using HTML/CSS & JavaScript. The backend will be hosted on an Amazon Web Services compute instance, using the AWS EC2 service and will need access to the aforementioned MySQL database.

I expect to carry out iterative testing on each component of the project (i.e. web application, image capturing, image processing and database service). This is due to the fact that the project is educational by nature and will involve much research and alterations throughout the development process. Once each component has been adequately tested, system integration testing will begin.

3 – Timeline:

Figure 1 is of the project timeline, which contains deadlines I hope to adhere to during the course of the project.

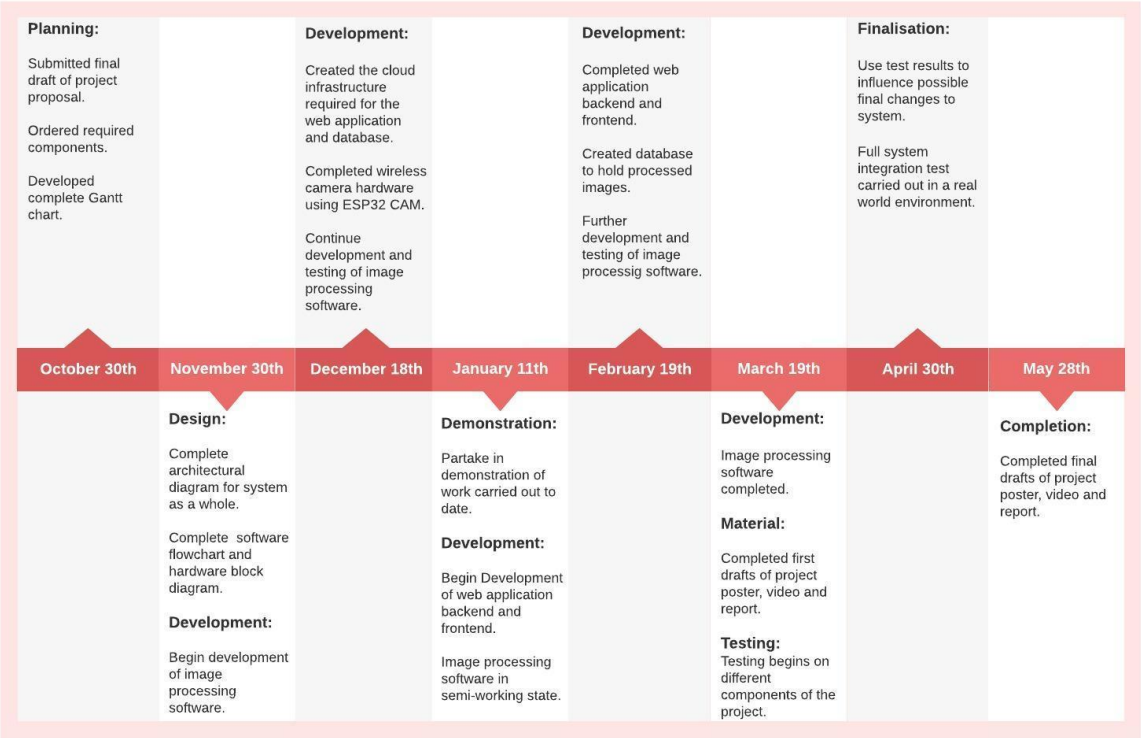

Figure 1 – Project Timeline

4 – Architectural Diagram:

Figure 2 contains a high-level architectural diagram of the components I expect will make up the project, and how these components may interact.

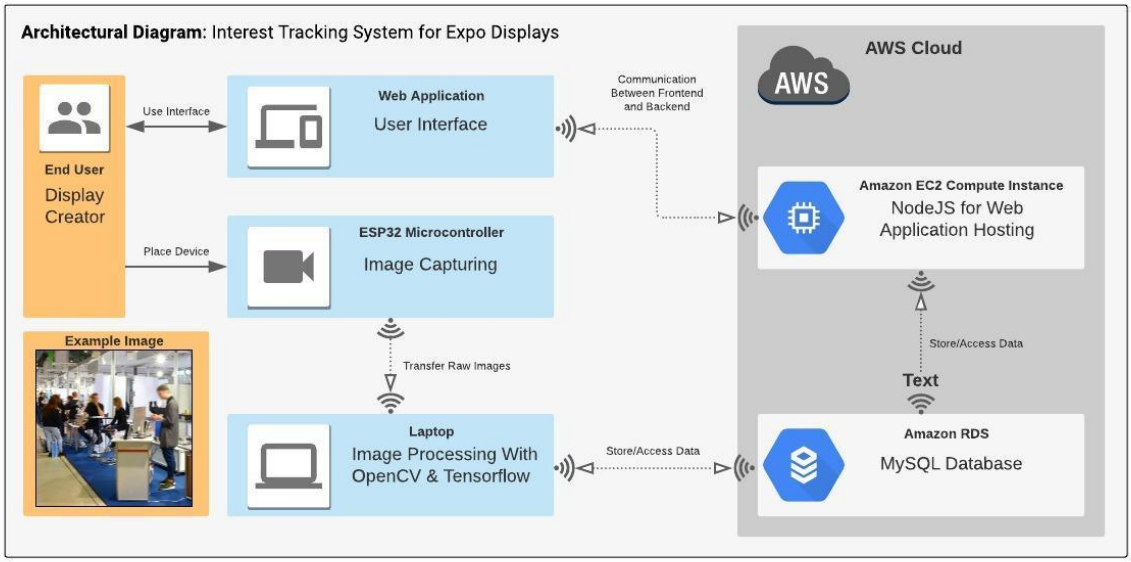

Figure 2 - Architectural Diagram