FAMU/FSU College of Engineering

Department of Electrical and Computer Engineering

<u>Operation Manual</u>

Team 304: ATS Training Application
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Project Overview

       Florida Power and Light (FPL) has recently introduced a new device into their systems to help reduce the amount of power outages and is called the Automatic Transformer Switch (ATS). The ATS ensures that power is always flowing and achieves this by detecting faults and then automatically reclosing to restore power. Due to COVID-19, the desire for remote training has drastically increased. Our project, the ATS Training Application is an iPad application that aims to train FPL employees on ATS maintenance and troubleshooting procedures.

       Our design consists of four main methods that will train the employees. First, PDF documentation and videos were integrated to provide two different methods of initially learning the material. Second, a virtual model of the ATS was integrated into the application that allows for FPL employees to virtually practice the different operating procedures. Lastly, each module is concluded with a quiz to ensure that the knowledge was retained. The main tool that we are using for production is Unity, a game engine, with support from JetBrains Rider as our IDE and AutoDesk Maya for any 3D modeling needs.

Module Description

The four main components included within the application each consist of their own module. Below are the implementations of the models and reasoning for why a certain approach was taken.

ATS 3D Model

In the original project specifications, FPL desired that we include a model of the ATS within our application. However, there are no drawings available online and after contacting S&C, they were not willing to send a CAD file or the drawings due to intellectual property concerns. The model we included is simply just a mockup using what little information was available.

Product Literature

The application includes PDFs to various product literature for the ATS including the descriptive bulletin, information bulletin and many more. Research determined that rendering PDF files in Unity is rather difficult, unless willing to pay for premade designs. Thus, we used the links to the PDF files instead. The implementation is as follows:

Application.OpenURL(<InsertLinkHere>);

Assessment Module

There are three main components to the assessment module, namely the question, the answer choices, and the determination of which is the correct answer and whether it was picked or not. Additionally, hardcoding all of these components into actual C# scripts are extremely inefficient. The approach we took used JSON files to hold the data and then object pooling to support all the possible answers. The JSON files were of the following format:

```
"Question": {
        "questionText": "This is a sample question?",
        "questionAnswers":[{
                "answerText": "This is a right answer",
                "isCorrect": true
        }{
                "answerText": "This is a wrong answer",
                "isCorrect": false
        }]
}
```

Object pooling is a method to pre-instantiate all objects that will be needed at any given moment before they are needed. Instead of creating and destroying objects, the same ones are reused thus making a "pool" for the program to choose from.

Integration

This project was assembled through a level of building blocks. As each component was complete it added to the overall structure in order to complete the entire structure. The 3-D model, the application structure, the quiz questions and the training modules all represent the different blocks and components that went into making the app works as it does and each of those things needed to be worked on individually to combine.

Operation

The use of the application is very self explanatory. It does require having an iPad in order to download and run it, but after that the process is trivial. The various menus and scenes within the application all have labels and buttons that indicate what each functionality of the button is. The application begins at the main menu and then offers 4 choices. The documentation menu contains links to various product literature, the video menu contains various relevant videos, the playground allows for free interaction with the ATS model, and the tutorial goes throughout the modules to train the user. Each module consists of required reading of documentation, viewing of videos, and scoring above a threshold on the assessment in order to move on to the next module.

Troubleshooting
iOS Deployment

One issue that we had was deploying the application onto an iPad. It is necessary to have access to XCode (only available on Macs) to compile and build the project. Unity however offers a cloud build service that allows you to bypass this issue. The service is free for the first month, and then $9 a month for a team of three and it is integrated directly into the version control. The process is automated and also does not require any personal computational power to execute. It is most likely worth it just to not have to strain your personal computer attempting to build the application and ability to deploy iOS applications on any machine is an added bonus.

The following is a good link that outlines how to get this automated workflow set up:
https://www.techwrath.com.au/blog/publish-ipa-file-from-windows-for-ios-without-macunity/

Code Debugging
Unity is based on C# and offers the "Debug.Log" function which is very useful when debugging. The output will not be directed into the application but rather a separate console so using such statements throughout code production and monitoring the log will assist in catching bugs and then determining what the root cause is.

Appendix

a) The following link is to our GitHub repository which contains all of the code for the project. It is subdivided into three main components. There are two Unity projects, one focusing on animations and the other on the UI and application architecture. The last component is the website. https://github.com/maxurs/AR-Training-Application
b) S&C Website for the ATS:
https://www.sandc.com/en/products--services/products/vacufuse-self-resetting-interrupter/
c) Useful tutorial for the quiz module:
https://learn.unity.com/tutorial/live-session-quiz-game-1#