Video Script

For Final Year Project Video

Slide 1: Self Introduction and What this video is About

My name is Dillon Lakshman, I am a final year undergraduate reading for my Bsc (Hons) Computer Science degree at the Informatics Institute of Technology, affiliated with the University of Westminster, UK. And this a video presenting my research and then demonstrating the prototype that I have developed through my findings.

Slide 2: Agenda

As we can see the agenda of this presentation goes through as follows

Introduction: Which explains what this presentation is about

Introduction to Project: That provides an overview of the domain and the nature of the research carried out during this module.

We will start off here and continue through the other items in the agenda such as Research gap, methodologies used, SLEP aspects which mean social logical, ethical and professional aspects considered in this research and etc as we go.

Slide 3: Introduction

Okay, first we will look at what this presentation is about, I mentioned before that this presentation is done in order to showcase the research and demo the prototype that I have done. This is part of my Final year project that I have to complete in order to finish my degree which is Bsc honors in computer science, at the Informatics Institute of technology. The following areas of my research will be touched upon during this presentation. Those are

- Problem domain and aim of the research
- The Research gap
- Solution proposed, its features and how it is designed
- Evaluation of the research

Moving on.

Slide 4: Introduction to project

We will look at the introduction to the project and my research.

I am personally a graphic designer, and I have while working on my projects realized that raster to vector conversion using the current solutions available for use do not produce satisfactory results all the time and are inconsistent in their ability to convert images from raster to vector accurately. Motivated by this I have conducted my research on the Raster to vector conversion technology,

As for the research question that I have undertaken to find a solution for during this research can be stated as….

How can the Raster to vector conversion process be improved to obtain better quality outputs by changing parameters that affect the conversion process?

Slide 5: contd.

The aim of this project therefore becomes to implement a Raster to Vector conversion platform that selects the best method of conversion using image processing techniques.

What is Raster to vector conversion?

The functionality of a raster to vector conversion tool can be described as

A tool, that converts Raster images to this polygon based vector image format by using various algorithms such as Line Thinning, Gap Removal etc. It traces the paths identified using these algorithms; that process the pixels of images to convert the final output into a composition of polygons.

Raster to vector conversion is used in many applications, but for this research I have looked into raster to vector conversion of GIS imagery. GIS stands for Geographical Information systems, these are frameworks for gathering, managing, and analyzing data geography related data.

And as R2V raster to vector conversion is used a lot in GIS as shown and justified in my research. I will be using it as the domain that I use to scope down my research into.

Slide 6: LR

During the literature Review chapter of my research I read many research documents regarding, GIS and usage of imagery in them. Raster images and their composition, Vector images and how they are computed by systems. And also about similar raster to vector conversion tools that are currently available for use.

When studying about the current raster to vector conversion tools available in the market and researches carried out on them. It was clear to me that not all of these were suitable for a GIS use cases and also that some solutions did not provide satisfactory results at all times. When further studying

about this inconsistency, I saw that the conversion parameters used by each stage of this algorithm were kept at a default constant and that it affected the conversion output.

Slide 7: Gap

Therefore, I identified the research gap as determining the best conversion parameters for a particular image based on similar images, which can be classified using image classifiers and other image processing techniques.

Slide 8 and 9: Methodologies used.

These are the methodologies I used for research, design, development and management.

As I established a hypothesis at the begging and carried out the research to prove this fact the research methodology has been selected as a deductive approach and the research paradigm has been selected to a positivism approach.

OO analysis and design has been selected as the design methodology, the software development methodology has been selected to agile… This is because agile focuses on delivering working prototypes with incremental feature upgrades and it was suitable to handle requirements that might suddenly during the research.

Prince 2 is a widely used project management methodology in the industry and I have used it as my project management methodology for this project.

Slide 10: Solution Overview

Next we will look at the overview of the solution that I proposed to solve the research question I identified and mentioned earlier.

The solution comprises of three components which are

- An image classifier, that is used to identify the classification of the image.
- A parameter trainer that has been trained for each classification by generating vector images using iteration by changing parameters.
- The final system, that uses these two trained models and data to analyses an image real time and find the best parameters for conversion. And also converts the image using those parameters

The final system uses the model files and parameter data for that specific images classification and converts the raster to vector and saves it into the local file system. This is proposed to be implemented as a desktop application but the back end functionality of it is developed as a flask API therefore it can run locally and also be deployed remotely on a server and the front end can use this to convert images from raster to vector.

Slide 11: SLEP

Moving on… we will look into the Social, Legal, Ethical and professional aspects considered by this project.

When considering the social aspect.

The standard end user license agreement will be used as the software license for this project.

Any individual who would like to improve the system will also be given the ability to do so, through the author

When considering the ethical aspects.

Creating highly inaccurate images might lead to issues in places where the converted image is to be used, so it always tries to maintain accuracy in the end conversion so it can be used reliably.

For example, when being used in GI systems

Legal,

This project does not violate the computer miss-use act 1990

The Computer Misuse Act (CMA) 1990 is a key piece of legislation that criminalises the act of accessing or modifying data stored on a computer system without appropriate consent or permission

And the data obtained for the training of models, have been obtained through fair means

Professional

The British Computer Society code of conduct is adhered to and not violated.

Third party software and technologies used in this project have been given due credit by being mentioned in the documentation

Everyone will be provided equal access to the work of this research and its prototype to obtain its benefits

Slide 13: SRS summary

During the Requirements specification phase of the project, a stakeholder analysis was carried out.

The requirements for the project were also gathered using various methods, such as questionnaires and literature reviews and observations

The use cases were then identified illustrated and described. Finally, the functional and nonfunctional requirements were decided upon to further progress with the project.

Slide 14: Rich picture diagram explanation

Slide 15: High Level Architecture diagram

Slide 16: Technologies used.

Slide 17: Features

There are several functional requirements that were achieved and those were translated to the following features in the prototype that I have implemented.

It analyzes the image and classifies the image into which GIS type imagery it belongs to, the image after analyzing also gets assigned its best fit conversion parameters

Image preprocessing is possible using the system, which are image colour quantization to a custom cluster number that the user wishes, the user can also just use the value found by the system which is image specific.

De noising is also possible to be toggled on and off on the users' discretion.

And finally the image is converted using all the parameters and options set

Then stored into the local file system of the device

Slide 18: Evaluation of the system

The evaluation process of the system was then carried out

The evaluation goals and aim were initially selected and then evaluators were selected to provide credible feedback to the system that had been implemented. The area of expertise of the evaluators are

- Conversion Platform Users (end users)
- GIS experts
- Software Engineers and Architects
- Graphic Design Experts

Other than the evaluation from the experts I have also done my own personal evaluation of the system, I have also benchmarked the prototype against the uncalibbarated raw raster to vector conversion library, and seen a 20-30% increase in the structural accuracy obtained for the output image. A relfection on whether the FR and NFR were achieved was also done

Slide 19: Contribution

The research contribution of this project can be noted down as follows

- Proposing an approach to identify best fit parameters to obtain an accurate conversion by analysing an image.
- Here the a new approach was identified to optimize conversion of raster images to vector images by making the parameters used in conversion algorithms image specific
- Creating an already trained model for several popular GIS imagery types for classification and analysing purposes.
- Creating an image classification CNN model to classify popular GIS imagery types
- Creating an API to utilize the analysing and converting functionalities developed.
- Exposing this whole system as an API which can be remotely deployed and used to convert images.

Slide 20: limits.

The image model and parameters are only trained on GIS imagery and are optimized for use in those types of images

The raster to vector conversion library is fixed and is not a swappable as per the user requirement.

Output image cannot be viewed and altered using the platform.

Slide 21: Future improvements.