PUSL3119 Computing Individual Project

Project Initiation Document (PID)

Artificial Intelligence based Automated HTML and CSS Code Generation Tool using Design Mockups

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1. Introduction

1.1. problem statement

Nowadays, along with the development of technology, the use of the internet has also spread greatly. Due to this, the increase in the use of internet websites and web applications are also significant. There are websites related to various things related to sports related to knowledge related to financial purposes like promotion or advertisement of different companies etc… These websites and web applications try to provide more efficient service.

The user interacts with the website's web pages. That part is also called the front end. Therefore, it is the developer's responsibility to create an easy, creative user interface that is attractive to users. However, creating an effective webpage takes some time. Collaboration from end users, business experts, software developers, graphic designers, and others working in a variety of industries is necessary for the production of websites.

Usually, this website development process starts with a sketch of the user interface drawn on a piece of paper by the developer. The website by this sketch you can get a comprehensive understanding about the website and build code to develop the website. In this case, developers need to develop the frontend and backend.It is time-consuming to write new code for components with comparable functionality and page structures that alter over time. Developers' responsibilities should be constrained to make the web development process more effective.

1.2. Current status of the problem statement

Therefore, creating a web page by auto generating the code of a web page is a research topic. This reduces the time and cost of developing a number of web pages. Microsoft has created a software called sketch2code for this[]. With this, an algorithm was created so that the HTML code is auto generated by the sketch drawn on a sheet. Computer vision techniques are used to assess the dataset's photographs, and a deep neural network model with convolutional neural networks was used to train the network.

1.3. Solution

The project is referred to as Neurosketch. In this project the main objective when we transform the hand-drawn drawing, like textbox, button, and image, into HTML and CSS code is to create a website template and also generate backend codes. The sketch can be recognized by machine learning and then customized as required by the editor in the application and the code can be auto generated by artificial intelligence. Artificial intelligence, machine learning, computer vision, these technologies used in this project and, utilized computer vision techniques like the CNN model, object identification, cropping, etc... to transform this hand-drawn image into the HTML, CSS

and also backend code for the frontend template. Optical character recognition(OCR) is used to recognize characters and an object detection algorithm is used to detect objects like textbox,button in hand drawing sketch and machine learning is used for image processing and to compare with pre trained data.

To accomplish the above goals, the following features need be improved:

- Should be insert of the sketch photo
- Should be identified elements in hand drawn sketches.
- Should be an editor to customize identified sketch
- Should be auto generated HTML and some CSS, backend code in identified elements.

1.4 Project Outcome

This is socialized as a website. Because of that, none of the developers are ever seen doing web development through a mobile phone. They always do it through a computer. Then a Windows application or a website is useful for them. Meanwhile, this was suggested for a website because of its ease of development and ease of updating.

A mobile app download uses up some phone storage space. The developers' phones occasionally don't have enough storage to download the mobile app. They therefore hesitate before downloading it. The marketing aspect of it will suffer because of this. However, downloading and installing a web application is not required. Therefore, using this is not affected by the user's phone's storage space. Consequently, it is feasible to offer a website of excellent quality.

Additionally, by offering this system as a web application, it can be demonstrated that the work of a mobile application results in lower production costs, lower maintenance expenses, and simpler updating. A mobile app should also be developed on platforms. Because of these factors, the user will see this system as a web application.

2. Business Case

2.1 Business Need

There are several jobs in the web development process. For example graphic designer, frontend developer, backend developer etc. so there are several employees to develop a website with a large number of pages. They do this process by sharing.

Before developing web pages, the user interface is drawn as a sketch on a sheet of paper[]. Then the code developed by one employee may be difficult for the other employees to understand. For example, the backend developer does not know “class” “id” etc… in frontend development. Then the backend developer has to review the code, which is quite a difficult task. Time is also spent.

When a fullstack developer creates a website, he has to do the entire development alone. Here this employee develops both the frontend and backend. For this he has to spend a lot of time and effort.

Currently there are applications that auto generate HTML code such as sketch2code and pix2code[], but there is no application that auto generates CSS and JavaScript yet. This project is expected to generate HTML, CSS and some backend(JavaScript, node.js) code. This project is important for reasons like these.

2.2 Business Objectives

- Save the time
  Saving time is the main purpose behind most new inventions. Time is very important for every person. If one developer develops a website, that developer has to develop HTML, CSS and backend alone and if the web site is developed by a team together, the backend developer doesn’t know the things like “class” “id” created in the frontend development, so the frontend code has to be looked at again. This will take a lot of time. With this project, you can save the time spent on these things.

- Provide a good quality product
  By using this project, you can repeatedly test the website and market a good quality product.

- Financial expenses can be saved
  Because even a single person can develop a website quickly with this project. Does not require a lot of employee maintenance. This saves a lot of financial cost.

3. Project Objectives

- Web application

The web application is given to the user as the final result of this project. This web application uses HTML CSS JavaScript. In this web application, the user has options like sign in, sign up, insert sketch, an editor,change theme, change font size. This task is not difficult because developers know these scripting languages.

A lot of performance is required to run mobile applications. Because the web application runs through the cloud server, performance is not required. So a web application is suitable.

- User can insert a image of sketch

  After inserting a photo of the sketch into this insert image option, it recognizes the elements in the photo using machine learning (image processing) technology. Then the recognized sketch goes to the editor in the web application. This task is a bit difficult because the developer has to learn the technologies used in this task.

  The user does not need to draw the wire frame from the editor. The drawing sketch image processing can be obtained as a wireframe for the editor.

- User can edit the recognized sketch

  This editor takes the main place in this project. This is used to customize the sketch recognized by image processing. The most special thing about this editor is that if the user wants to transfer data from page to page without the website database, the user can include things like session variables and cookies into the website. Can be done for this editor, artificial intelligence, machine learning, deep learning like computer vision technologies are used, so this is a great challenge for the developer to develop this editor.

  Users can add required elements and remove unnecessary elements. And several web pages can be customized at the same time. So users can take the full website as an output at one time.

- HTML and some CSS, JavaScript code auto generate

  This is the most important final deliverable of this project. The editor can auto generate HTML, CSS and JavaScript code by customized web pages. This is the main feature of the editor. This uses computer vision technologies. It is a big challenge for the developer.

The user can get a full website as an output by hand-drawn sketch by spending less time.

4. Literature Review

Abstract

Before developing a user interface, it is essential to draw a wireframe. Coding to convert the hand drawing wireframe into a UI is a process that takes a lot of time. This process can be accelerated by automating this process. This process will be significantly sped up by an automated system that can substitute human efforts for the simple implementation of UI ideas.In this study, we propose a unique method for UI element detection in input hand drawn sketches using a Deep Neural Network that has been trained on a database of such hand drawn sketches. Here we will use a method to identify the elements in the hand drawn sketch and turn the identified elements into HTML, CSS and backend code.

Key words : UI prototyping, Sketch-to-code, Computer Vision, User Interface, Deep learning,

4.1. Domain overview

Full-stack engineers are accountable for tasks including writing code for programs and apps, communicating with other programmers and team members, resolving problems at all stack levels, running tests, and overseeing web development. They are often required to be skilled in five or six domains, including user interface, HTML/CSS, databases, and infrastructure backend.

Developers are in charge of putting client-side software into action based on a designer's mockup of the User Interface. The user interface interacted with each other by the user. Designers and developers use a hand drawn sketch in the UI to communicate. Developers spend a lot of time creating a prototype in order to collect feedback from stakeholders.After this stage, the prototype's code is removed, and the application is constructed via the typical phases of application development. Developers then turn these sketches into UIs that are UI code. This is the process that takes time.

Generating code from image recognition is a new research field.Since it includes a machine drawing conclusions from sketches, comprehending them, and deriving logical information from them, interpreting sketches in the form of pictures by a machine is a challenge of computer vision[].

4.2. Existing systems

Consequently, auto-generating web page code to create web pages is a study area. As a result, creating several web pages takes less time and money. For this, Microsoft has produced a program named Sketch2code[]. Sketch2Code, which makes the first contribution to instantaneous UI prototyping, uses a Convolutional Neural Network [] to take an image of a hand-drawn sketch on a white background and turn it into an Object representation of the UI, which is then read by the UI parser to produce code for specific platforms.To make this possible, post-processing and neural network outputs work together to create a UI representation object, which is then processed to create code for various platforms in the following phase. The finished solution allows real-time conversation with automatic live reloading as well as a representational UI application that is adjusted by human developers and deploys source code.

4.3. Technical analysis

- **Computer Vision**
  Early computer vision research projects mostly employed computer-aided design []as an input.In the alteration of architectural images, computer-aided design tools yielded outstanding outcomes. The standard issue in computer vision has been object detection in pictures, and CNNs [] have emerged as the best approach.

- **Detection of Objects**
  To locate items in the input image, contour detection, erosion, and dilation were employed as image processing techniques. These elements in a sketch can be located via contour detection and morphological transformation. As outside component borders are formed using contour detection, morphological erosion is utilized to maintain substantial items, removing little things. These technologies increase the clarity of objects.

- **Object Recognition**
  After entering a photo of the sketch into the web application, it is sent to the trained model using convolution neural network. It is possible to identify the elements in the hand drawing sketch. The Mask Region-based CNN or Mask RCNN is one of the most sophisticated systems for object detection.

- **Training data set**
  A collection of elements in sketch images is known as a data set. A set of data obtained to train a machine learning algorithm is called a training model.

- **CNN**
  After the identified objects were cropped, the collected components were labeled using the trained CNN model. The ImageNet dataset [10] was used for the picture classification job, and they might leverage that system going forward to develop a tracking system. Multiple convolutional layers can be used to enhance visual tracking, as shown by [11].

- **HTML Code generation**
  HTML code is then generated from the .gui file that was created for the elements that were recognized.first header and footer then one one of the elements in the rows are mapped and the code is generated.

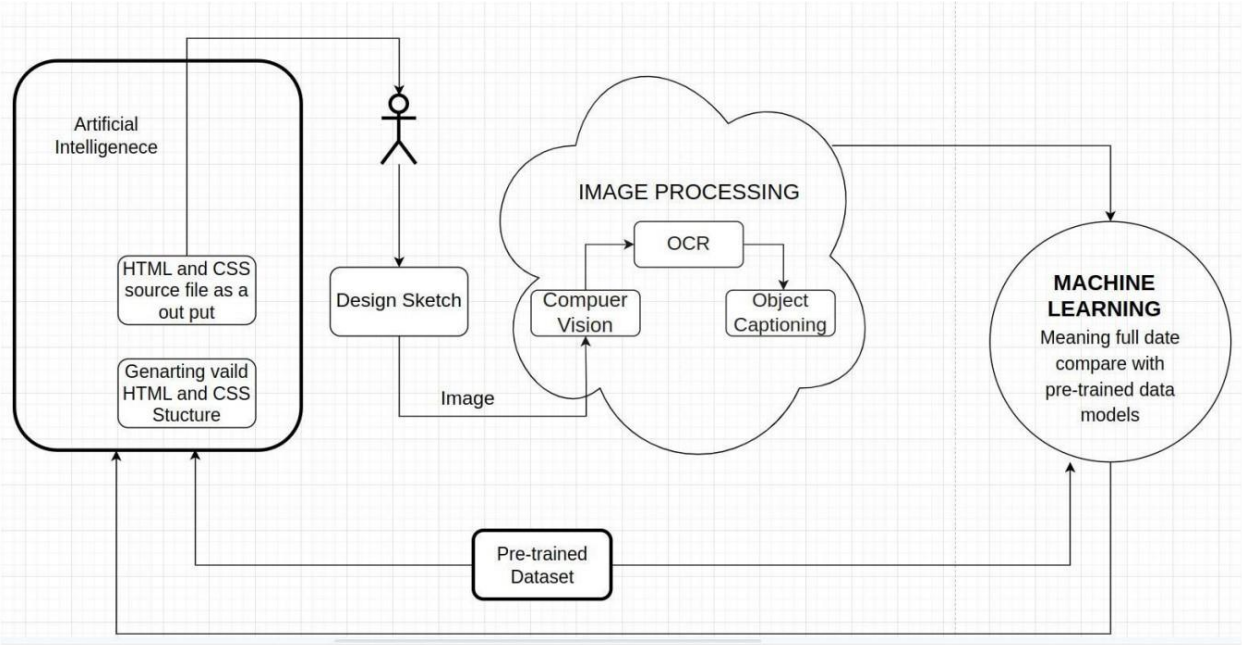
4.4. Reflection

The work that is being presented shows how UI components may be taught to recognize a neural network in hand-drawn drawings. More tagged instances of drawings can boost performance, which is influenced by the training set. During analysis, we assessed the model using a variety of photos. After correcting overlapping components, the model learns the shapes of the UI components and provides a final UI representation object that the UI parser may use to construct platform-specific UI.

5. Method of Approach

So far, the software tools and technologies required for this project have been decided and the research on the steps required to develop the project has been completed.

Structure of the project



System Architecture

Software tools and technologies

Name	Reason
HTML, CSS and JS	Front end development web Application
Node.js , express.js	Backend development web Application
Tensorflow libraries	Detect objects and cropping components
Machine learning	To recognize sketch
Optical character recognizing	To recognize characters
Artificial intelligence	Auto generate source HTMLand CSS, Backend
Figma	UI design

HTML builder algorithm	Converted into HTML code
Python	Backend technologies

Developer used both sublime text and vs code for coding but used vs code for this project because vs code has a lot of extensions.

The developer is trying to develop and complete the user interface and database of the web application without an editor before the next interim.

6. Initial Project Plan

- This chapter should explain about the development faces of the identifiedproject
- In this section you have to comes up with valid and suitable time duration foreach development face
- By december 1st week, you can start the project development**7. Risk Analysis**

Risk	Risk management mechanism
Schedule overrun for the task	Always working to complete the task in less time than the allotted time for a task
Difficulty learning about technologies	developer uses scripting languages and computer vision technologies. Knowing about scripting languages but having to learn about computer vision technologies.For further information, speak with the supervisor to find out about similar technologies.
Unable to find necessary resources in the internet	During the supervisor meeting, talk with the supervisor and get the necessary resources.

Hardware failure	Every completed task is backed up to an external hard drive.

8. References

- Each citation should include under references using harvard referencing style