Sketch and algorithm to web translation using faster RCNN and NLP

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Abstract. User interface design is the important role of software development. Creating an innovative and enhanced user experience is a key goal for IT businesses of all sizes and it is an interaction driven by quick prototyping, design and user testing cycles. It requires a lot of cash and exertion just to fabricate a creation grade site. The understanding objective is to utilize present day profound learning calculations essentially improve on the plan work process and empower any business to make site rapidly. The proposed deep learning model converts drawn image into Html code using faster RCNN and algorithm to JS code conversion using NLP. The proposed ml learning project comprises of a Regional convolutional neural network which helps in building a complete website corresponding to the user's sketch, including functionality of the sketch.

1 Introduction

Sketches are the own large scale data sets like the recent Kaggle collection are often collected in vector format, most sketch recognizing methods rasterize vector sketches as binary images and they have image classification techniques. websites are meant for service of a company or an organization. User's use a website for a specific problem. Creating of a website can be enhanced by having sketch of a website. To create a website with a sketch and making all the functions to work by using only a sketch is difficult. There are no such system or software converts the image into code and website. In this article proposed a software which helps everyone to create their own customized website using our software, this software can even help to assign functionality to the bootstrap elements and recognizes the shape, size and location using RCNN algorithm, RCNN which helps in building a complete website corresponding to the user’s sketch.

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UI configuration is the significant piece of programming improvement, this system uses natural language processing which helps the system to understand the simple language and converts the simple words to algorithm using JavaScript. The final goal of this project is to use modern deep learning techniques significantly and simplify the process and enable anyone to create website.

2 Related work

There are number of related solutions for the above problems, there are huge quantity of work related to project are mentioned below:

Sketch2Code: Generating HTML Code from User Interface Design Sketches using Convolutional Neural Networks This paper describes a system that converts hand-drawn user interface designs into HTML code using a convolutional neural network (CNN). The system achieved high accuracy and could be used to generate code for a variety of different types of user interface elements.[1]

Automated Web UI Testing Using Natural Language Processing [2] This paper describes a system that uses NLP techniques to automatically generate test cases for web user interfaces. The system was able to achieve high accuracy and could help reduce the time and effort required for manual testing.

Automated Website Generation Using Machine Learning and Genetic Algorithms [3] This paper describes a system that uses machine learning and genetic algorithms to automatically generate websites based on user requirements. The system was able to produce high-quality websites and could be customized for different types of websites and design styles.

[4] A Deep Learning-based System for Generating Dynamic Web Pages This paper describes a system that uses deep learning to generate dynamic web pages based on natural language input. The system was able to produce high-quality output and could be used to generate a wide variety of different types of web pages.

[5] Web Interface Design Automation Based on Deep Learning and Reinforcement Learning This paper describes a system that uses deep learning and reinforcement learning to automate the design of web user interfaces. The system was able to generate high-quality designs and could be customized for different types of websites and user requirements.

A Deep Learning Approach for Automatically Generating Web Page Layouts [6] This paper describes a deep learning approach for automatically generating web page layouts based on user requirements. The system was able to produce high-quality layouts and could be customized for different types of websites and design styles.

Automated Web Page Layout Generation with a Combination of Convolutional Neural Network and Genetic Algorithm [7] This paper describes a system that uses a combination of convolutional neural networks and genetic algorithms to automate web page layout generation. The system was able to produce high-quality layouts and could be customized for different types of websites and user requirements.

Natural Language Processing-Based Web Interface Generation for Data Querying and Analysis This paper describes a system that uses natural language processing to generate web interfaces for data querying and analysis. The system was able to produce effective and intuitive interfaces that allowed users to interact with complex datasets. [8]

3 Proposed System
The proposed system will be a web application that takes a hand-drawn sketch and converts it into an algorithm that generates a functional website. The system will use the Faster R-CNN (FRCNN) deep learning model to detect and recognize the various elements in the sketch such as buttons, forms, and text fields. Natural Language Processing (NLP) will be used to provide users with the ability to give functionalities to their website through text commands.

The sketch-to-algorithm converter will take a user-uploaded image of a hand-drawn sketch and use the FRCNN model to identify the different elements in the sketch such as buttons, forms, and text fields. The converter will then convert the identified elements into code that generates a website.

The website generator will allow users to give functionalities to their website using NLP. Users will be able to enter text commands such as "add a form" or "create a button that links to another page" and the NLP model will interpret the command and generate the appropriate code. The website generator will also provide a user interface for users to visually customize their website.

The sketch-to-algorithm converter and the NLP-powered website generator will be integrated to provide a seamless experience for the user. After the user uploads their sketch, the converter will generate a website template that includes the detected elements from the sketch. The user can then use the NLP-powered website generator to add functionalities to their website using text commands.

3.1 System Architecture

![Fig1. Proposed System Architecture](image)

![Fig2. System Overview](image)

4 System analysis

4.1 Non-maxima suppression

A method called (NMS) Non-Maximum Suppression is present in several computer tasks. A class of calculations utilized to pick one thing (like bounding boxes) from a large number
of overlapping entities. To get expected results, one can choose the selection criteria. Most frequently, a probability number and cross over measures are utilized as the rules shown in Fig 3.

![Fig 3: Non maxima suppression](image)

### 4.2 (IoU) Intersection over Union

The Jaccard-index, also known as the IoU metric, is simply a technique used to measure the percentage of Cross over between the prediction BBox and the ground truth BBox (Bounding Box). Instead, discovered IoU between two forecasts BBoxes in NMS.

IOU can be modeled mathematically by the following expression:

\[
\text{Intersection Over Union} = \frac{\text{Target} \cap \text{Prediction}}{\text{Target} \cup \text{Prediction}}
\]

In our case rectangle boxes surrounds around the tag view objects inside the image, such that the above mathematical formula is converted into:

\[
\text{IoU} (R1,R2) = \frac{\text{Intersection size (R1,R2)}}{\text{Union size (R1,R2)}}
\]

### 4.3 RCNN model

Introduced the pre trained model of VGG 16 by using transferring learning technique have changed the dataset and given the default dataset as False.

Added the own created dataset of different view tags and trained with soft max activation function, adam optimizer and categorical_cross_entropy loss function.

Results acquired with highest weight of index value near 1 is considered as the classification under it, eg : (0.9,0.1,0.1) -> where max value (0.9), it categorized under 0th index. where, 0th index is classified as button view.

Added HTML generator which can return required tag according to the index value categorized

### 4.4 Natural Language Processing

The result acquired doesn’t contains the event actions. where it only contains the UI interface with some errors due to handwritten sketches.
To get rid of all issues, introduced algo to js conversion using NLP, where the user enters the general commands (left, top, background, id, write, delete, update etc.) where the REGEX recognizes and returns the js script file for the algo typed by the user.

5 Algorithm

5.1 Algorithm for Selective Search

Step 1: Read the image
Step 2: Take num of rectangles value as 50
Step 3: Detect the object and surround each object with num of rectangles
Step 4: Repeat the process until last object detect on image

5.2 Algorithm for NMS

Step 1: Take any two rectangles around object
Calculate the IOU score
Step 2: Repeat the step 1 for all rectangles around the object
Step 3: Suppress all the non-maximum score Rectangles and return the highest score rectangle which is the optimized one

5.3 Algorithm for RCNN

Step 1: Train the VGG 16 model with view tags dataset
Step 2: Read the coordinates of rectangles which are individual object surrounds
Step 3: Predict the individual image object and classify it into required type
Step 4: Apply HTML tag generator to generate html tags for individual classified type of image object.

5.4 Algorithm for NLP

Step 1: Read the input text
Step 2: Match the regex commands with the text given
Step 3: return the index of regex matched element inside regex list
Step 4: Apply javascript generator according to the index returned and return the javascript code.

6 Simulation and analysis

6.1 Simulation for Training Accuracy Model

The simulation of x axis is of epochs from range 1 to 10, and the resultant accuracy is y axis. From the testing can analyse that the accuracy is increasing with the increase of epochs and there is the slight decrements in the graphs with epochs increasing is due to overfitting issue shown in fig 4.
6.2 Simulation of Loss Function

The loss list contains the accuracy values of the model at each epoch, ranging from $1.5 \times 10^{-5}$ at epoch 1 to $8.1 \times 10^{-6}$ at epoch 10.

Due to gradient descent learning rate slight changes on weights, the graph arrived is not strictly decreasing, instead received the variations in graph shown in Fig 5.

7 Results

*Image Upload Page*
User can upload a scanned sketch in this page and start simulation shown in fig 6.
Selective search & Tag Generation
Number of rectangles are formed around the objects to get the best object size and shape in the website.
Here the best rectangles are chosen and remaining are vanished then every object get a unique tag shown in fig 7.

Web Page Before NLP

Web page will be loaded before NLP process started shown in fig 8.

Web Page after NLP
8 Conclusion

This project can be concluded from the study that the Selective Search based RCNN model detects more optimized and many rectangles around object if the image intensity increased and the accuracy is increased by using VGG16 Resnet with pre trained image weights. The interface is further more optimized by using NLP which understands the general English and performs the js and css tasks on the created interface views, where the result looks like the full end website.

9 Future work

Improving sketch recognition, Enhancing algorithm generation, Scaling the website creation process, While the project you described focuses specifically on website creation, the underlying techniques could be applied to other domains as well. For example, similar approaches could be used to generate code for mobile applications or to automate the design of user interfaces for other types of software.

References


