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Auto UI Code Generation using AI

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ABSTRACT

HTML is extremely fun to write with, it is very easy to learn and therefore gives the power to create any website design in the world! But sometimes designing a web page and to make it look attractive is quite boring. For some people, web designing can be a little daunting, where they would be able to get the functionalities right but not be able to make it look pretty. This is where the system 'Auto UI code generation using AI' can be used where the user could physically draw the user interface he wishes to display and the system could intelligently generate the same on an actual visual screen and also provide the HTML code for it.

Keywords: *Artificial Intelligence, HTML, Website design, User interface, Intelligently generated, Handwritten wireframe, Auto UI.*

1. INTRODUCTION

The system Auto UI Code Generation using AI, takes a handwritten image of the front end design required as input to provide the output on a virtual screen with its respective html code. The idea is to try to do as little as possible when we build the future web. This isn't a rationalization for laziness or shirking responsibility nor it is a suggestion that we build bland, homogeneous sites and apps that sacrifice all nuance or spark to the Greater Good of total compatibility. Instead, it is an appeal for simplicity and elegance: putting commonality first, approaching differentiation carefully, and advocating for consistency in the creation and application of web standards. The system uses Machine Learning which is a subset of Artificial Intelligence to do the job of a human in identifying the various html elements and generating the respective html code. The machine learning model is trained to identify basic html elements like image, text box, button, checkbox, radio button and drop down list. The html code generated is given as output to the user.

2. LITERATURE SURVEY

In Recent Advances in Convolutional Neural Networks by Jiuxiang Gua,19 Oct 2017 [v6] , Proceedings of the International Conference on Computer Vision and Pattern Recognition (cs.CV) stated that in the last few years, deep learning has led to very good performance on a variety of problems, such as visual recognition, speech recognition and natural language processing. Among different types of deep neural networks, convolutional neural networks have been most extensively studied. Leveraging on the rapid growth in the amount of the annotated data and the great improvements in the strengths of graphics processor units, the research on convolutional neural networks has emerged swiftly and achieved state-of-the-art results on various tasks. In this paper, they provide a broad survey of the recent advances in convolutional neural networks. idealize the improvements of CNN on different aspects, including layer design, activation function, loss function, regularization, optimization and fast computation.

In Transfer Learning by Chuanqi Tan , Fuchun Sun, 27 Sep 2016 [V2] , Proceedings of the International Conference on Computer Vision and Pattern Recognition (cs.CV) stated that as a new classification platform, deep learning has recently received increasing attention from researchers and has been successfully applied to many domains. In some domains, like bioinformatics and robotics, it is very difficult to construct a large-scale well-annotated dataset due to the expense of data acquisition and costly annotation, which limits its development. Transfer learning relaxes the hypothesis that the training data must be independent and identically distributed (i.i.d.) with the test data, which motivates us to use transfer learning to solve the problem of insufficient training data. This survey focuses on reviewing the current research of transfer learning by using deep neural networks and its applications.

Defined deep transfer learning, category and review the recent research works based on the techniques used in deep transfer learning.

In Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks by Shaoqing Ren, Kaiming He Ross Girshick Jian Sun proposed a Fast Region-based Convolutional Network method (Fast R-CNN) for object detection. Fast R-CNN builds on previous work to efficiently classify object proposals using deep convolutional networks. Compared to previous work, Fast R-CNN employs several innovations to improve training and testing speed while also increasing detection accuracy. Fast R-CNN trains the very deep VGG16 network 9x faster than R-CNN, is 213x faster at test-time, and achieves a higher mAP on PASCAL VOC 2012. Compared to SPPnet, Fast R-CNN trains VGG16 3x faster, tests 10x faster, and is more accurate.

In Single Shot MultiBox Detector by Wei Liu,Dragomir Anguelov, Dumitru Erhan, Christian Szegedy, Scott Reed, Cheng-Yang Fu, Alexander C.Berg , 29 Dec 2016 [V5] , Proceedings of the International Conference on Computer Vision and Pattern Recognition (cs.CV) proposed that SSD is designed for object detection in real-time. Faster R-CNN uses a region proposal network to create boundary boxes and utilizes those boxes to classify objects. While it is considered the start-of-the-art in accuracy, the whole process runs at 7 frames per second. Far below what a real-time processing needs. SSD speeds up the process by eliminating the need of the region proposal network. To recover the drop in accuracy, SSD applies a few improvements including multi-scale features and default boxes. These improvements allow SSD to match the Faster R-CNN's accuracy using lower resolution images, which further pushes the speed higher. According to the following comparison, it achieves the real-time processing speed and even beats the accuracy of the Faster R-CNN. (Accuracy is measured as the mean average precision mAP: the precision of the predictions.)

In You only look once (YOLO) by Wei Liu1, Dragomir Anguelov, Dumitru Erhan, Christian Szegedy, Scott Reed , Cheng-Yang Fu1 , Alexander C. Berg stated that YOLO (You Only Look Once) uses deep learning and convolutional neural networks (CNN) for object detection, it stands out from its "competitors" because, as the name indicates it only needs to "see" each image once. This allows YOLO to be one of the fastest detection algorithms (naturally sacrificing some accuracy). Thanks to this swiftness YOLO can detect objects in real time (up to 30 FPS).To carry out the detection, the image is divided in a grid of SxS (left image). Each one of the cells will predict N possible "bounding boxes" and the level of certainty (or probability) of each one of them (image at the center), this means SxSxN boxes are calculated. The vast majority of these boxes will have a very low probability, that's why the algorithm proceeds to delete the boxes that are below a certain threshold of minimum probability. The remaining boxes are passed through a "non-max suppression" that will eliminate possible duplicate objects and thus only leave the most exact of them .

3. PROPOSED SYSTEM

The proposed system to Intelligently generate the user interface on an actual visual screen and also provide the respective front end codes from the physically drawn design by the user consists of four important steps discussed below:

- Detect Design Patterns: A computer Vision Model trained to perform object recognition against HTML, hand drawn patterns is used to detect meaningful design elements into an image
- Understand Handwritten text: Each detected element is passed through a text recognition system to extract handwritten content.
- Understand Structure: The information of the detected objects and their position inside the image is feed into an algorithm that generates underlying structures.
- Build HTML: A valid HTML is generated accordingly with respect to the detected layout containing the detected design elements.

The methodology below provides a brief overview of how the system works:

a. The user uploads the handwritten drawing of the HTML page to the system's server. This uploading can be either done through the website designed, through a Flutter Application designed, or through WhatsApp(integrated with Twilio) or through the Telegram Bot designed.
b. Once the Image is uploaded, it undergoes preprocessing for the removal of noise and for the image adjustment.
c. Later the HTML elements in the image are detected and then identified with a known set of HTML elements used for training.
d. The HTML code is then generated for the elements identified in the image and is sent as a response.
e. If this process is done on the website, then the user can even edit the html code editor before making use of it

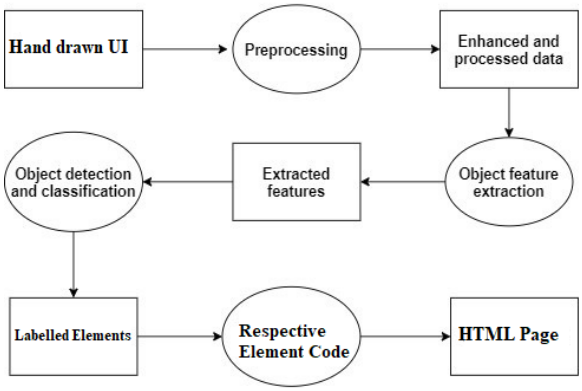

Fig. 1: Proposed System Working

4. SYSTEM DESIGN

A neural network is designed and trained for the detection of HTML elements by using object detection and classification. The dataset was created by drawing various images containing a combination of basic html elements in different positions. In each of these images the html elements are labelled to a different class. Each of these classes represent an HTML element.

The CNN model is used for feature extraction and identifying various objects in a given image. The model is trained and tested to identify the elements and finally give a class score indicating to which class an object or element in that image belongs to. This class score is later taken to generate the corresponding HTML code.

For a given input, the network outputs the accuracy of each object in the image and classifies it accordingly. The problem is to properly classify each object into various classes. In this experiment, 800 labeled images are used to train the neural network, while 200 images are used to evaluate the performance of the trained neural network. Finally, a class score is given for each object in the given input image predicting the proper class to which the object belongs.

5. RESULTS

The model was able to detect the HTML elements for which it was trained. From figure 2 one can infer that the CNN model is able to give the Confidence percentage that an object belongs to a HTML class. Below are a few images of how the system takes inputs and gives the HTML code as output.

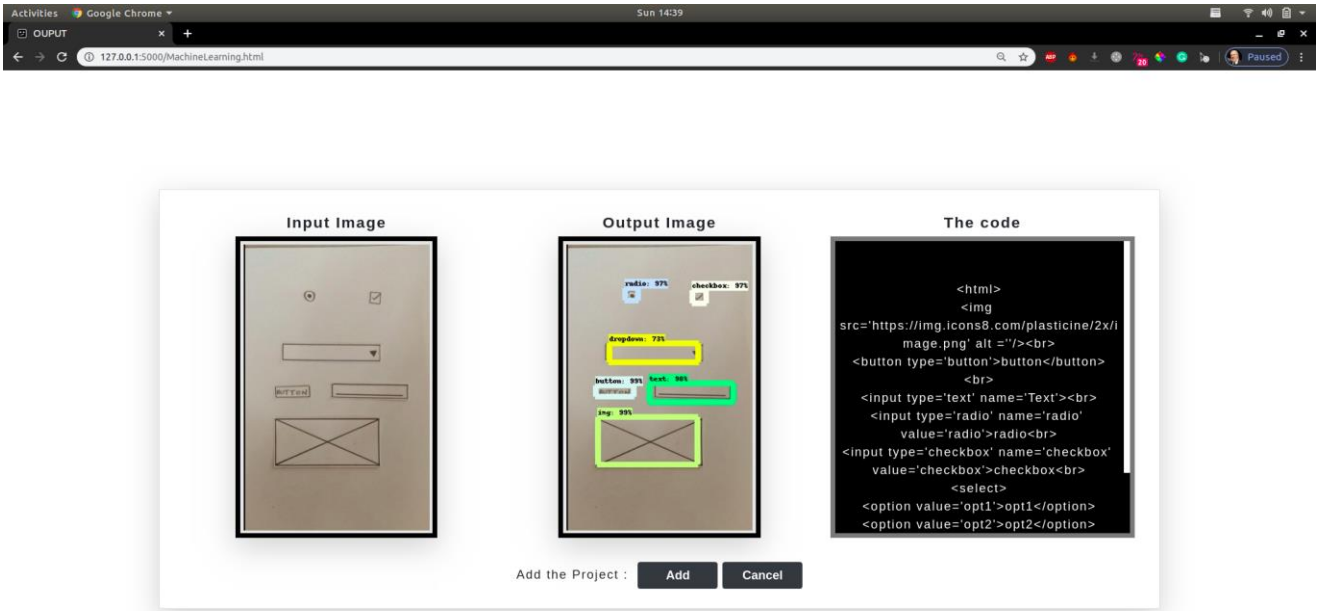

Fig. 2: Website Working

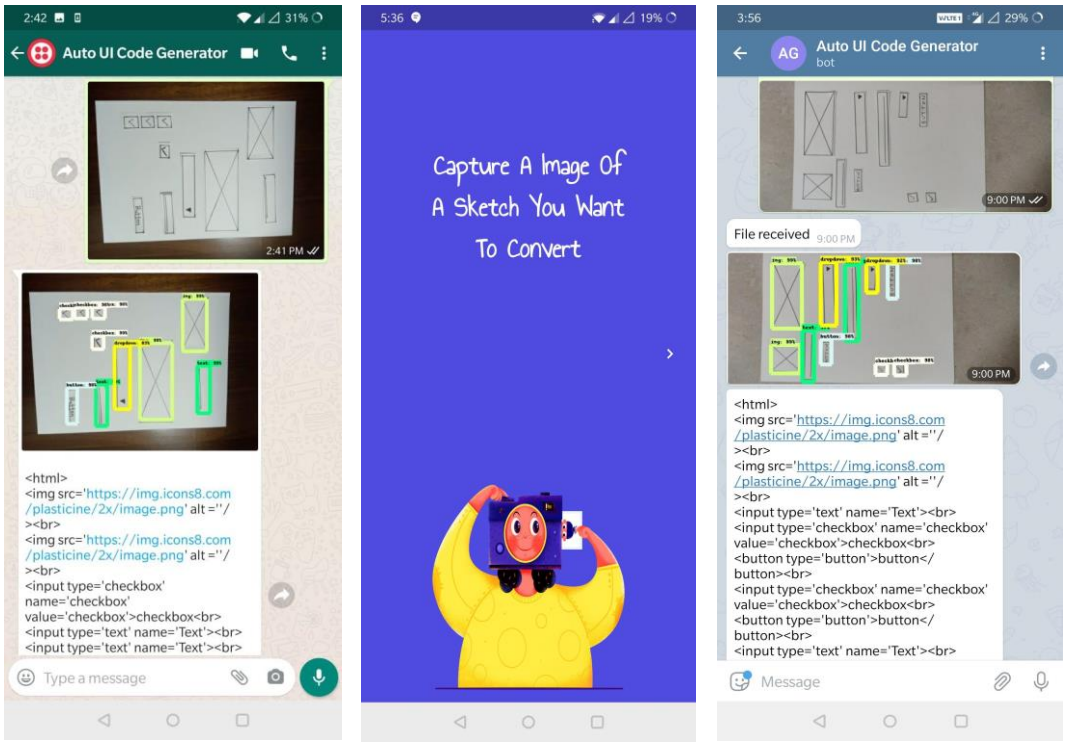

Fig. 3: Different ways of using the system.(WhatsApp, Flutter App, Telegram Bot)

6. CONCLUSION

The system Auto UI Code Generator using AI uses a Machine Learning model to perform object detection. The model is trained to identify basic html elements like image, text box, button, checkbox, radio button and drop down list. The object detection model identifies the html elements and the position of each element to generate the html code. The system involves the development of a website where the user can use as an interface to give input and get the respective html code. It also involves the development of API's that can be used by Twilio so that the user can use WhatsApp as an interface instead of the website. Intelligently generate the user interface on an actual visual screen and also provide the respective front end codes from the physically drawn design by the user.

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8. REFERENCES

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