Identification of User Interface Components for a Smart Application from Wireframe Designs

1. The problem

Today development of any Smart Applications requires a number of stages with requirement for individuals with different skills for requirement analysis, design and development. While not all tasks can be automated, a large effort is spent in design and development of User Interface for an application. For example a developer has to manually identify the different User Controls like textbox, button from a designer provided wireframe or a hand drawn image and create the necessary objects in the coding platform.

This process is very time consuming, as a result if we are able to automate the process of identification of controls in a wireframe or a hand drawn image we can speed up the process of code generation using various code generation tools already available like build.me.

2. Current Solution

A recently published Patent on Wireframe Recognition and Analytics Engine (WRAE) (https://www.google.com/patents/US20140068553) tries to address this problem. However the approach taken by the inventor is not scalable and very rigid. It tries to address the process of identification of components using predefined conditions for different element. This limits the scope of use of this application to a very small and specific set of wireframes which comply with the decision rules defined by the recognition engine also identification of new or complex components will limit the scope of use of the presented solution to a very limited set of controls.

3. Proposed Advancement to make the Solution more Flexible and Scalable

As most of the modules apart from the process of identification of UI Controls can be solved using various solution available. This proposal is to identify these User Controls using Pattern Recognition with the help of different machine learning techniques. We could use supervised learning with techniques like Decision Tree or Support Vector Machines after identification of features like contours in a wireframe image.

This solution will make the process of identification flexible and scalable. As with the improvement of the model, addition of more types of training data and feedback for false detection the system will automatically learn to identify different controls. Since we remove the dependency of manually building the decision rules as specified in the Patent WRAE we can scale the application to identify more types of designs which is not possible in the present solution.

Below is the comparison of the present available solution (WRAE) and the proposed solution.

Present Solution	Proposed Solution
The current solution involves three stages:	
1. Input acceptance and feature identification	
The image provided is run through various computer vision process like Canny Edge Detector and Optical Character Recognition using Open Source packages like OpenCV (http://www.willowgarage.com/pages/software/opencv) and OCRopus (https://github.com/tmbdev/ocropy). Different information regarding the position, size and enclosing text are extracted.	The similar techniques used to identify feature in the present solution along with some additional tools can be used to identify the various distinguishing features that are required to identify the label.
2. Identification of Wireframe Components	
Uses predefined conditional decision rules which are traversed and the rule that is satisfied for a particular component are identified. **This solution limits the use to a very limited set of wireframes that are drawn as per the rules that are defined. In real-world it is difficult to expect all user to draw designs exactly as per the specifications thus limiting the use of the solution to small set of expert designers.**	**The proposed solution aims to solve this problem of identification of different components presented in a software application design and tag it with different attributes like type, position, size and component specific properties. By first training the system with different examples and then using the models developed to identify and tag the components.** **This method is definitely expected to perform better as it will be able to identify similar components and tag them accordingly rather than being dependent on set of predefined rules. Also it will be able to evolve its prediction with time with the availability of more types of input designs.**
3. Generation of Source code from identified tags	
Use predefined templates that are associated with the tags. Based on the identified tags the templates are fetched and the code is created.	There are various tools available in the market that generates code from metadata like build.me.

4. Applications

The proposed solution (Second stage) will be developed as a standalone service based on micro service architecture that can easily integrate with products like SAP BUILD that already provides a robust platform for enterprise users to build prototype application before implementing the software. Addition of this feature of converting wireframe images (Image page) to tagged metadata (used for creating Object page) will not only expedite the development process but also enable product managers and designers to receive better feedback about their ideas.

Conversion of Image Page to Object Pages with metadata that can be converted to code