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## Automatic creation of apps using images of arranged physical media

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## **Automatic creation of apps using images of arranged physical media**

### **ABSTRACT**

The creation of software applications, e.g., mobile apps, requires the developer to have some knowledge of coding. This can be a hurdle for people that have creative ideas for applications but lack the requisite computer skills. Per the techniques of this disclosure, user interface widgets are printed on magnets and organized into kits. A user that wishes to create an app physically arranges the magnets on a board to create a UI and takes a picture of the board. Using computer vision, the resulting image is rendered into an editable app UI that is connected to data and ready to be published.

### **KEYWORDS**

- Software development
- App development
- Developer tools
- Visual programming
- App creation
- Low-code development

### **BACKGROUND**

The creation of software applications, e.g., mobile apps, requires the developer to have some knowledge of coding. This can be a hurdle for people that have creative ideas for applications but lack the requisite computer skills. Although low-code tools exist to enable users to create applications, these still pose some hurdles such as:

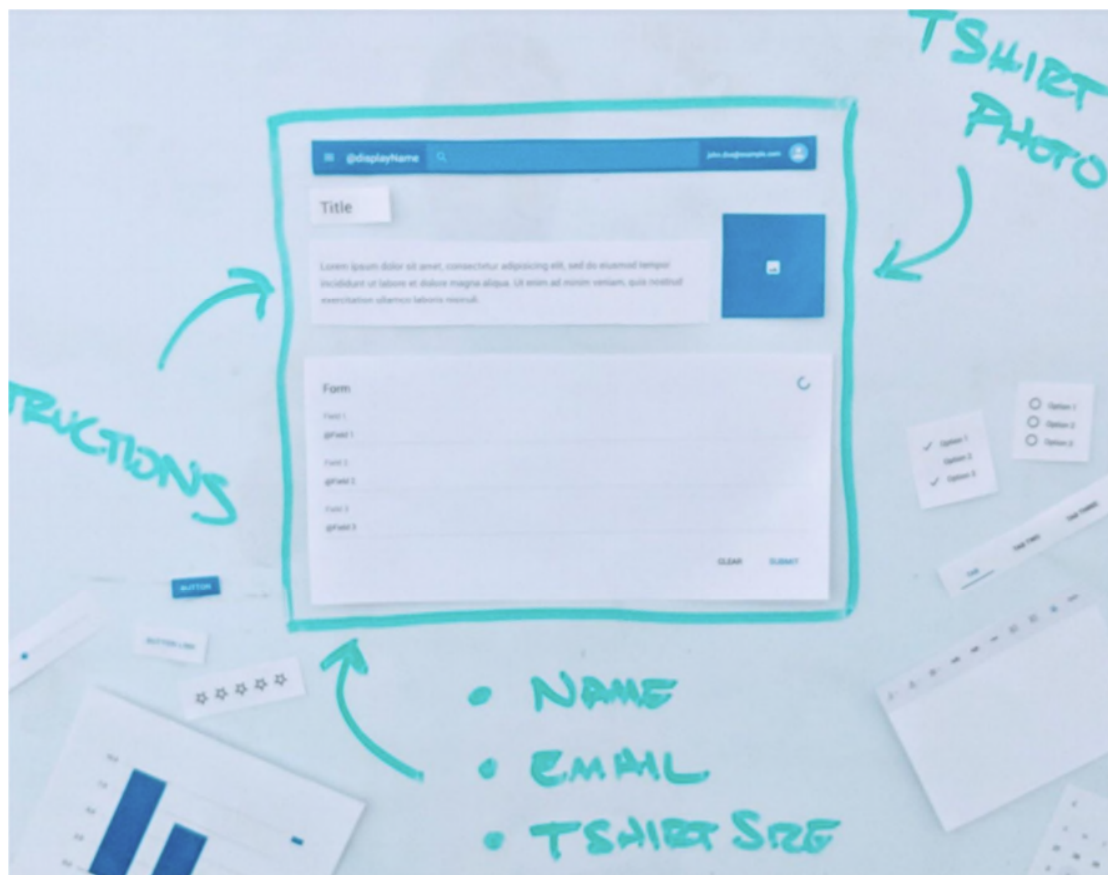
- Even low-code app creation tools are daunting for low/mid-tech knowledge workers. Beyond basic coding skills, a user who wants to create an app requires domain knowledge of the tool's functionality.
- Even with low-code app creation tools, apps are slow to create, especially when the user is new to software development or new to the tool.
- The tools are still dependent on access to a computer and the computer's input interfaces. These are not always equally accessible to all and can exacerbate the previously stated problems of app creation or completely prevent a user from creating an application.

## DESCRIPTION



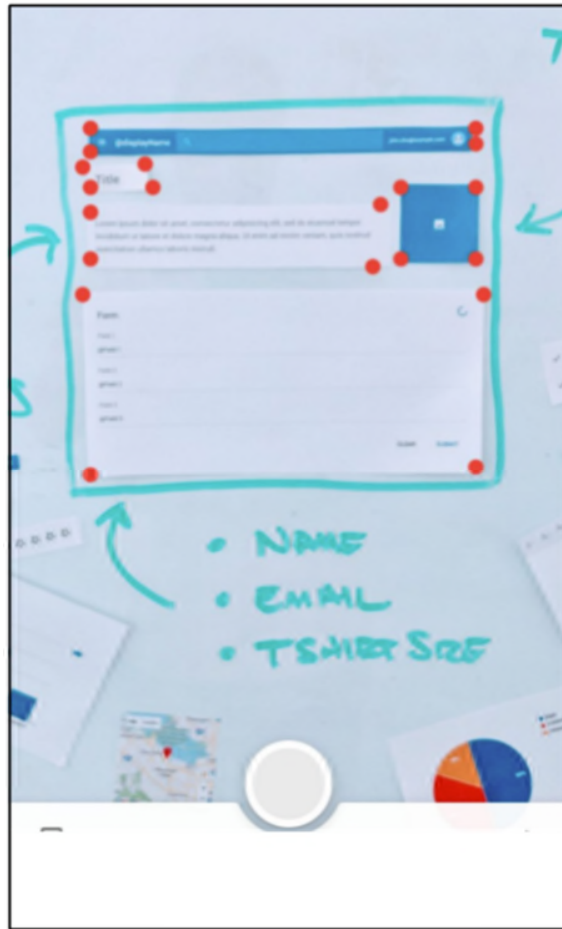
**Fig. 1: UI widgets printed on magnets**

This disclosure describes techniques that enable people without a formal programming background to develop applications. As illustrated in Fig. 1, UI widgets, e.g., text-labels, text-entry boxes, number-entry boxes, date-entry boxes, image-entry boxes, vertical or horizontal panels, navigation arrows, refresh-buttons, icons, forms, tables, charts, calendars, maps, etc. are printed on magnets and organized into kits.



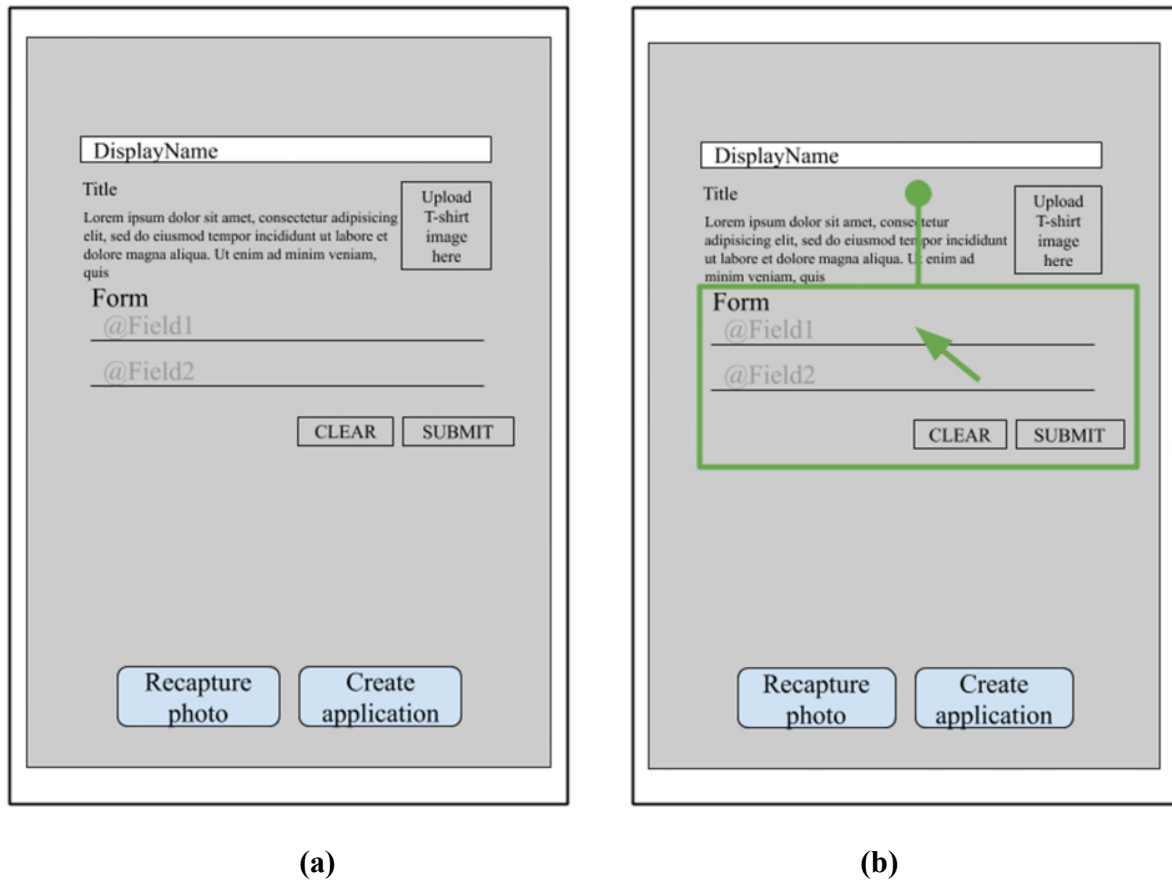
**Fig. 2: The user physically arranges the printed magnets on a board**

As illustrated in Fig. 2, the user can select and arrange printed magnets on a board in a desired user interface configuration.



**Fig. 3: User takes a photo of the board**

As illustrated in Fig. 3, the user can take a photo of the board with the arrangement. Using computer vision, the printed widgets and their relative positions are recognized.



**Fig. 4: (a) Captured image is rendered into a UI preview; (b) The user can edit the UI**

As illustrated in Fig. 4(a), the captured image is rendered into a UI preview. As illustrated in Fig. 4(b), the user can partially edit the auto-generated UI preview, e.g., change or add widgets, modify text, colors, etc. When the user approves the UI, the app is created and connected to data. It is ready for further editing by other app creation software or for publication.

Alternative to printed magnets, the widgets that generate the app can be printed graphics, drawings, sketches, or digital illustrations. The techniques can generate an app from any of these mediums, although certain mediums, e.g., magnets and printed graphics, may be considered as the easiest and most practical under certain circumstances.

Alternative to machine-learning based recognition of the UI widgets, widgets can also be recognized via QR or other code recognition. Codes, such as QR codes, can be printed onto the magnets or printable widgets, and computer vision can be used to reliably detect these codes.

The techniques provide a general-purpose app creation tool, e.g., they apply to the creation of apps for smartphones, tablets, computers, etc. as well as generic web apps such as apps based on JavaScript, CSS, HTML, etc. Widget-based UI creation can enable students to build their first app without having to learn to code; can improve inclusivity by lowering the bar of technical expertise needed for creating apps; can support rapid prototyping of ideas; etc. Some advantages of the use of physical widgets for app development, as described above, include:

- Reduced complexity and knowledge requirements: Using imagery to generate an application enables users to get started quickly and with much less knowledge as compared to conventional app creation tools. Inspired by the ease and speed of production, users may continue to learn the tool and continue to create and improve their application.
- Production velocity: Prototypes and simple applications can be created quickly using the disclosed techniques. All a user needs to do is to draw out, or place, using magnets or other fasteners, the user interface design for their application, and the computerized application is automatically created for them. For this starting stage, a user doesn't even need a desktop or laptop computer, a keyboard, a mouse, or similar equipment. The entire procedure can happen physically and on the user's phone.
- Accessibility: The disclosed techniques enable a user to use more mediums to express and create their design. For example, they can create a physical drawing, place magnets or other printed graphics, create a digital illustration, etc.

- *Division of labor and teamwork*: The individual who comes up with the idea for an application or creates the user interface design does not need to be the user who completes the final programming and data binding. One person can specialize in user-interface design and creation, while another can focus on programming. The resulting division of labor again improves production velocity and reduces the complexity/knowledge requirements. The productivity of the team is thus improved.

## CONCLUSION

Per the techniques of this disclosure, user interface widgets are printed on magnets and organized into kits. A user that wishes to create an app physically arranges the magnets on a board to create a UI and takes a picture of the board. Using computer vision, the resulting image is rendered into an editable app UI that is connected to data and ready to be published.

## REFERENCES

1. Google App Maker, available online at <https://gsuite.google.com/products/app-maker/>