

Can good design be cost-effective: Team builds massive database of mobile-app designs

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Visual, textual, structural, and interactive design properties of more than 70,000 mobile user interfaces can be searched with Rico. Credit: University of Illinois Department of Computer Science.

Scroll through your smartphone screen and you'll no doubt see a small sea of apps for everything from watching sports to tracking the movements of the stock market.

The number of apps has exploded in recent years along with the proliferation of smartphones, tablets, and the ways they can be used.

But designing those apps for maximum utility is mostly a hit or miss process, according to Illinois Computer Science Professor Ranjitha Kumar. There are only limited guides to what works and what doesn't.

Kumar would like to change that, and she believes it is possible with the recent release of Rico, a huge database of [mobile app](#) designs collected by her and a group of other researchers.

Their paper on Rico will be presented at the ACM Symposium on User Interface Software and Technology (UIST), which starts Oct. 22 in Quebec City, Canada.

"Existing practice involves inspecting a bunch of design examples by hand. What you'll usually do when you have a new project is you'll go look at other apps that are doing similar things, and you would actually print them out and try to visualize, 'These are the screens a user would go through to perform this task in this app,'" she said.

But that manual approach is slow and expensive, so designers are likely to look only at what they know. A developer of, say, a diabetes app might try to limit her time and expense by looking first—and perhaps only—at other similar medical apps.

But other apps that seem to have little or no relation might offer design elements that could help them be more engaging, Kumar says. The diabetes app might benefit from a screen where users log the foods they

eat, something that might be built into a food-blogging app the designer might never look at.

By mining designs at scale, semantic relationships can be found between seemingly unrelated apps and learned from, Kumar says.

Rico is the largest such database anywhere, with 72,219 user interfaces (or UIs) from 9,772 Android apps across 27 Google Play categories, she says. It contains visual, textual, structural, and interactive design properties of each of those UIs, and can be searched by all three.

But giving designers a massive database to search isn't the only goal.

"The other part that's really exciting is, once you have all of this data you can start to build machine-learning models that can go beyond simple search interactions," Kumar said.

A designer, for instance, might begin their process with a rough idea of what they want on a given screen, and trust Rico to supply the details. If they're working on a log-in screen, Rico might eventually be able to fill in the basics of what a good log-in screen should have, saving time and money.

Kumar worked with seven other researchers on Rico, including ECE ILLINOIS PhD student Biplab Deka and CS @ ILLINOIS alumni Zifeng Huang and Chad Franzen, both of whom completed bachelor's degrees in May.

They started gathering data late last year, first downloading 9,700-plus apps, then setting up a farm of about 10 Android phones in their lab.

Then, using the crowdsourcing site Upwork, they hired 13 workers scattered across the United States and beyond to spend five months using

the apps through a web browser linked to the phone farm.

As the crowd workers performed tasks on the apps, their interactions were traced and recorded. Then, these manual interaction traces were followed by an automated exploration to uncover less common screens.

Now Kumar wants designers and researchers to put Rico to use "to build all sorts of things," she says.

Ultimately, she hopes she can make good design simple enough that it makes economic sense to designers.

In a second paper at UIST, Kumar and her group will present a testing platform for correlating app design with performance without requiring access to the app's code. The platform allows designers and researchers to specify tasks for crowd workers to perform, and computes aggregate performance metrics such as completion rate and the average time spent on a task.

"It's trendy for businesses to make grandiose claims about how important design is to them," she said. "But ultimately companies only invest in good design when they can tie it back to measurable business goals. The hardest part of design is quantifying the payoff up front."

Provided by University of Illinois at Urbana-Champaign

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