Todi, Kashyap

Reimagining the role of the expert

Published in:
HTTF 2019 - Proceedings of the Halfway to the Future Symposium 2019

DOI:
10.1145/3363384.3363386

Published: 19/11/2019

Document Version
Peer reviewed version

Please cite the original version:
https://doi.org/10.1145/3363384.3363386
Reimagining the Role of the Expert: From Interface Design to Interface Curation

Kashyap Todi
Department of Communication and Networking
Aalto University, Helsinki, Finland
kashyap.todi@gmail.com

ABSTRACT
User Interface (UI) design has been a core topic of HCI research for several decades. Equipped with design skills and knowledge, the expert interface designer meticulously analyses a design brief, conceptualises design ideas, and constructs viable solutions. The intended outcome of this tedious process is a usable and aesthetically-pleasing UI. Classical approaches in HCI have relied upon providing designers with guidelines, heuristics, and best practices for realising good designs. In recent years, computational approaches have turned towards formalising and automating parts of the design process. In this provocation, I claim that the future expert will hand over the task of creating design solutions entirely to the machine, and instead take on the role of an interface curator who inspects a set of feasible designs and picks out the best possible solutions for a given problem. I discuss the current state of computational interface design, and suggest a path forward towards realising this vision.

CCS CONCEPTS
• Human-centered computing → Interactive systems and tools.

KEYWORDS
Human-centered computing → Interface design, and suggest a path forward towards realising this vision. sketchemorphic design. Further, researchers and practitioners identified the need to involve users during early stages of design, thus leading to design processes such as user-centred [20] and participatory design [22]. Designers often adopted a “fail fast, fail often” ideology, and iterated over designs to improve them. The Design–Implement–Analyze (DIA) cycle is now a well-known approach towards iterative UI design [3].

However, designing using these classical techniques come with their own pitfalls. Design principles are not generalisable, and often hard to keep track of. It seems infeasible to expect a designer to remember every design principle, guideline, or best practice, while they are designing interfaces. Even within user-centred design, it is challenging to include every category of user during the design process. This can lead to biases in the final outcomes, and could result in designs that do not meet the needs of marginalised user populations, or users with particular needs (e.g., accessibility). Further, iterative design is time-consuming, and the trial-and-error process does not lead to a better understanding of what encompasses “good interfaces”.

Another line of HCI research has investigated systematically modelling users, and applying these models towards improving interface design. Initially, the Human-Processor Model [4] explained different cognitive processes that take place when we interact, and provided us with a formal understanding of timing requirements. Fitts’ Law [9] has been one of the most well-investigated HCI models, and has been effectively applied towards evaluating and improving interface designs. Several predictive models of aspects relating to aesthetics, performance, and usability have been proposed and developed. These range from aspects such as visual search [14], which models eye movements, to colour harmony [5], which quantifies how different colour compositions can influence aesthetics of an interface. Recent works (e.g. [21, 26]) have used a combination of models of human perception and performance for generating design solutions. By mathematically formulating a good user interface, we can now overcome several drawbacks of completely manual interface design.

In this provocation, I look towards the future of user interface design, and propose that the future interface design expert will not be as much the interface designer, but rather an interface curator. Their fundamental task then will not be to turn a design brief single-handedly (and manually) into a fully-functional UI. Instead, they will now provide systems with concrete design tasks, which will automatically be converted to feasible design solutions by the machine. Much like a curator at an art gallery, they will use their expertise and insight to browse through a large set of feasible designs and select the most desirable solutions for a given problem. When talking about how we perceive machine agents,
Suchman [24] discusses the distinction between the physical and social. Traditionally, the design tool has been seen as just an artefact that responds to a designer’s actions by providing them with expected outcomes. In [17], Brad Myers hinted that “tools might enforce or at least encourage user interfaces that are highly usable, rather than today’s stance that tools should be neutral and leave the design mostly to the human designer”. With these as inspiration, I suggest that future tools will take this one step further, and act as social agents that take charge of fully generating design outcomes that are objectively good and usable. By doing so, the human expert and the artificial designer could find common ground to open up new lines of communication and collaboration.

2 STATE-OF-THE-ART: WHERE ARE WE NOW?

Over the previous years, several approaches have been proposed for machine-assisted interface design. There has been an extensive amount of research on methods, tools, and techniques towards computational design. While a full discussion of all works in this area is beyond the scope of this paper, I discuss some key aspects and evolution in the state-of-the-art.

Initially, the focus of computational user interface design was on completely automating the generation of interfaces. Model-based methods typically accept a design-specification as input, and used this to construct full layouts (e.g. [2, 7, 10]). They could generate alternative layouts for different user needs [11], or for different screen resolutions [8], thus addressing issues such as accessibility and device compatibility. Automatic approaches could re-target the content of an interface to match an example design [16], or could adapt the interface based on a collection of previously seen interface designs [25]. However, these do not fit well with traditional design approaches. In retrospect, it seems like a majority of these techniques and tools were targeted towards engineers who lacked the skills or knowledge to create good user interfaces. This resulted in the necessity to over-specify the design problem, which seems to be incompatible with interface designers’ workflows.

Mixed-initiative computing [12] suggests that humans and machine work on a common task collaboratively, while distributing tasks that best suit them. In this spirit, recent interactive design tools (e.g. DesignScape [21], Sketchplore [26]) attempt to provide computational support without burdening the designer with task specification or problem engineering activities. They fit in with designer activities, and actively suggest design improvements and alternatives based on what the system can automatically infer about the design task. These tools apply different computational approaches that can, for example, generate entirely new designs using predictive models or design heuristics, or mimic existing designs through example-based retargeting [16]. Optimisation techniques have been proposed for keyboard layouts [13], menu designs [1], and for gestural interactions [23] too. These enable the system to find objectively good solutions from a large design space within a feasible time-span. Further, machine learning approaches such as multi-armed bandits can support exploration and exploitation of a large number of design alternatives.

3 CREATING DESIGN TOOLS FOR INTERFACE CURATION

To support future interface curators, interactive design tools will have to organically integrate with the design curation process. There are some key components that would be required towards realising these goals:

1. **Specifying the design task**: The first step towards creating a design solution is to analyse the design brief, and concretise the problem at hand. Interactive tools will need to allow designers to flexibly provide concrete design requirements for the task at hand. This design task provides the starting point (input) for a system or algorithm that can find design solutions. Some possible techniques for specifying the input could be through sketching, textual descriptions, or conversational interfaces. The system should avoid requiring over-specification of the problem, which although beneficial for finding solutions, can be cumbersome or infeasible for the design expert.

2. **Deriving semantics of the target interface**: Semantics provide meaning to an interface. They cover aspects such as relationship between elements and flow of user interactions. Current computational techniques that automatically generate design solutions often ignore the semantics of the interface. This can result in designs that might in theory perform well, but are not functional in practice. It will be beneficial for future tools to explore techniques that enable the designers to conveniently explicate the semantics of a desired interface, or to (semi-)automatically infer the intended semantics, for example, through data mining approaches [6, 15].

3. **Finding design solutions**: The key responsibility of a system that supports interface curators is to find feasible design solutions for a given design task. In this step, the machine takes the design task and desired semantics as input, and detects suitable designs from a large design space. To do so, approaches such as generative design, retargeting, and design optimisation could be adopted and improved upon. An important consideration for an interactive tool would be to construct or find these solutions rapidly in real-time.

4. **Presenting the viable solutions**: Another important aspect for a tool that enables curation is the actual presentation of found design solutions to the expert. Automated design approaches can often lead to the generation of several design solutions, which although theoretically unique, are practically quite similar in nature. The tool should not overwhelm the curator with a surmounting number of choices, especially several similar solutions. Instead, they should aid the curator in the process of discovering several diverse solutions that meet the design requirements. This could be achieved by systematically measuring the diversity between designs, applying approaches such as exploration-and-exploitation, and by using intelligent visualisation techniques.

5. **Iterative improvement of solutions**: As designers select desirable alternatives, they might detect the need to further
refine the designs. Tools should thus support the iterative de-
sign approach, enabling quick improvements once an initial
set of viable designs is found.

(6) Providing explanations and design rationale: To make
the results interpretable to the curator, and to support the
design choices made while finding solutions, tools should
also strive towards providing explanations and rationale as
to the selected designs are objectively good. By doing so, they
can also highlight differences between several solutions. For
instance, two designs might be quite different as they are
intended towards two distinct user populations. It would
be desirable to highlight such aspects to the curator, thus
enabling them to make informed choices.

3.1 Discussion
In this provocation, I have proposed a new role for the UI design ex-
pert within the interface design process: one of the interface curator.
While interacting with future design tools, these experts will now,
instead of spending valuable time constructing new designs from
scratch, utilise their skills towards recognising the best design so-
lutions from a set of feasible designs that are generated or selected by
a machine. The dialogue between the curator and the proactive
design tool will enable rapid generation of final designs that are
justifiably and objectively usable. Further, they will enable the de-
tection of multiple good solutions, each catering to different needs
and requirements of user populations. By reconfiguring the roles
of the human and the machine as proposed in the paper, the next
generation of interface and interaction design can ensure better
use of available resources and better outcomes for the end-user.

REFERENCES
interactive optimization of menu systems. In Proceedings of the 26th annual ACM
symposium on User interface software and technology - UIST '13 (2013). ACM Press,
331–342. DOI: http://dx.doi.org/10.1145/2501988.2502024
In Proceedings of the 2nd Annual ACM SIGGRAPH Symposium on User Interface
10.1145/38660.38670 event-place: Williamsburg, Virginia, USA.
Human-Computer Interface. (1980).
ACM, 624–630. DOI: http://dx.doi.org/10.1145/1179352.1144933 event-place:
Boston, Massachusetts.
[6] Biplob Deka, Zifeng Huang, Chad Franzen, Joshua Hibschen, Daniel Afergan,
Yang Li, Jeffrey Nichols, and Ranjitha Kumar. Rico: A Mobile App Dataset for
Building Data-Driven Design Applications. In Proceedings of the 30th Annual
ACM, 845–854. DOI: http://dx.doi.org/10.1145/3126594.3126651 event-place:
Quebec City, QC, Canada.
[7] Jacob Eisenstein, Jean Vanderdonckt, Jean Vanderdonckt, and Angel Puerta. Ap-
plying Model-based Techniques to the Development of UIs for Mobile Computers.
In Proceedings of the 6th International Conference on Intelligent User Interfaces
(2001) (IUI ’01). ACM, 69–76. DOI: http://dx.doi.org/10.1145/359784.360122 event-
place: Santa Fe, New Mexico, USA.
generation of user interfaces for multiple devices from a high-level model based
on communicative acts. In 2007 40th Annual Hawaii International Conference on
HICSS.2007.236
[9] Paul M. Fitts. 1954. The information capacity of the human motor system in
controlling the amplitude of movement. 47, 6 (1954), 381–391. DOI: http://dx.doi.
.org/10.1037/h005392
Interfaces. In Proceedings of the 9th International Conference on Intelligent User
964461
genetrating personalized user interfaces with Supple. 174, 12 (2010), 910–950.
DOI: http://dx.doi.org/10.1161/j.amrit.2010.05.005
SIGCHI Conference on Human factors in computing systems the CHI is the limit - CHI
[13] Andreas Karrenbauer and Antti Oulasvirta. Improvements to keyboard optimiza-
tion with integer programming. In Proceedings of the 27th annual ACM symposium on
DOI: http://dx.doi.org/10.1145/2649218.2647382
Models of Active-vision-based Visual Search. In Proceedings of the SIGCHI Confer-
DOI: http://dx.doi.org/10.1145/2556288.2557324 event-place: Toronto, Ontario,
Canada.
[15] Ranjitha Kumar, Arvind Satyanarayan, Cesar Torres, Maxine Lim, Salman Ah-
mad, Scott R. Klemmer, and Jerry O. Talton. Webzeitgeist: Design Mining the
2466420
[16] Ranjitha Kumar, Jerry O. Talton, Salman Ahmad, and Scott R. Klemmer. Brico-
2206. DOI: http://dx.doi.org/10.1145/1979942.1979962 event-place: Vancouver,
BC, Canada.
[17] Brad Myers, Scott E. Hudson, Randy Pausch, and Randy Pausch. 2000. Past,
http://dx.doi.org/10.1145/344949.344959
www.nngroup.com/articles/ten-usability-heuristics/
Perspectives on Human-Computer Interaction. L. Erlbaum Associates Inc.
[21] Peter O’Donovan, Aesem Agarwala, and Aaron Hertzmann. DesignScape: Design
with Interactive Layout Suggestions. In Proceedings of the 33rd Annual ACM
1221–1224. DOI: http://dx.doi.org/10.1145/2702123.2702149
[23] Srinath Sridhar, Anna Maria Feit, Christian Theobalt, and Antti Oulasvirta.
Investigating the Dexterity of Multi-Finger Input for Mid-Air Text Entry. In Proceed-
ings of the 33rd Annual ACM Conference on Human Factors in Computing Systems
event-place: Seoul, Republic of Korea.
Actions. Cambridge University Press, New York, NY, USA.
[25] Kashyap Todk, Jussi Jokinen, Kris Loytyn, and Antti Oulasvirta. Familiarisa-
tion: Restructuring Layouts with Visual Learning Models. In 23rd International
http://dx.doi.org/10.1145/3172944.3172949
[26] Kashyap Todk, Daryl Wear, and Antti Oulasvirta. Sketchplore: Sketch and Explore
1145/2901790.2901817