Position Paper for CHI 2018 Workshop on Rethinking Interaction: Everyday Life Feedforward

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Abstract

We propose *Everyday Life Feedforward*, an assisting concept to support users in everyday life interaction with arbitrary devices or other people. We characterize the feedforward guide along its (a) *Activation*, (b) *Presentation*, and (c) *Level of Detail*. To illustrate our idea, we exemplarily support Elodie when preparing crêpe. We connect her analogue and digital environments and help her learn the necessary steps.
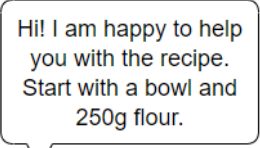
Author Keywords

everyday interaction; feedforward; AR; UX; assistance.

ACM Classification Keywords

H.5.1 [Information interfaces and presentation (e.g., HCI)]: Multimedia Information Systems

Introduction

Technology nowadays offers tremendous possibilities. Regarding the relation between human and devices, we do not only face one-to-one situations, but one-to-many and many-to-many scenarios. We do not only interact with a number of devices, technology can takeover several tasks for us. Thus, evolving true human-computer partnerships is a main challenge in development and research. As an example, Schmidt and Herrmann state the need of new interaction paradigms for intervention UI's [4]. The workshop *Rethink-*
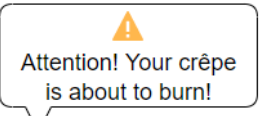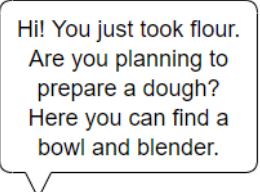
1.

> Hi! I am happy to help you with the recipe. Start with a bowl and 250g flour.

Elodie actively started the guidance.

2. a)

> ⚠
> Attention! Your crêpe is about to burn!

The system recognized a critical situation and thus started the guidance.

2. b)

> Hi! You just took flour. Are you planning to prepare a dough? Here you can find a bowl and blender.

The system recognized Elodie hesitating and thus started the guidance.

Figure 1: *Activation*: example messages provided by a feedforward guidance for preparing crêpe. The guidance was started (1.) user-triggered and (2.) system-triggered.

ing Interaction calls for theoretical frameworks, principles and real-world examples to overcome the limits of current interactive systems[1].

As a consequence, we propose *Everyday Life Feedforward*, an assisting guidance based on the feedforward principle. Our concept can support users in the interaction with arbitrary (household) devices in their everyday life.

Motivation

Users face various interaction difficulties with new technology as well as in everyday life. In a previous study, we found out that tasks involving multiple devices (i.e. a mobile device and a computer) were reported by users to be difficult. An example which was named multiple times is transferring files from the mobile device to a computer. Furthermore, users face different kinds of interaction problems in everyday life, involving multiple devices (e.g. transferring data between digital devices, using multiple kitchen utensils to prepare a meal) or people. Problems include, but are not limited to: cooking, use of arbitrary (household) devices, organizing a team meeting or changing tyres. Most of the problems can be solved by following an "algorithm" of steps that are necessary to manage the intended task. Thus, they could be computer-assisted quite easily.

To guide users and help them learn, feedforward systems were successfully applied in research (e.g., OctoPocus [1]). Feedforward helps users to know possible actions and their results in advance of the action itself [3]. Also, for casual tasks involving multiple devices, guidance might be necessary and could be realized by the means of a feedforward mechanism. Aspects and design dimensions for feedforward mechanisms have been defined (e.g., [1, 5]).

As an example, imagine Elodie. She loves eating fresh dishes, but does not assess herself to be a good cook. On a lazy Sunday, she wants to prepare crêpe for herself and her room mates.

We propose an augmented reality based guidance, combining her digital and analogue environments. Our concept can support Elodie in several ways: (a) Motivation (motivate her to cook as she does not like to do it), (b) Teaching (teach her how to cook), and (c) Well-Being (persuade her to cook balanced and healthy food).

Concept: Everyday Life Feedforward

We propose an intelligent feedforward guiding system for everyday live, which may be based on augmented reality (AR). Our aim is to support users in daily interaction situations. Such a feedforward system can be characterized along several design dimensions. Those dimensions include, but are not limited to the following. Options of each dimension can be combined freely.

Activation

The guidance can be activated in two ways (referring to [2], feedforward can be activated by the user or by the system):

1. *The user actively starts the guidance:* the feedforward assistance only appears when started by the user (Elodie intends to prepare crêpe, but does not know how to start. Thus, she actively requests guidance).
2. *The guidance appears when necessary:* the feedforward assistance appears automatically, e.g. when it recognizes: (a) a critical situation (crêpe about to burn) or (b) the user hesitating (Elodie takes flour but does not continue).
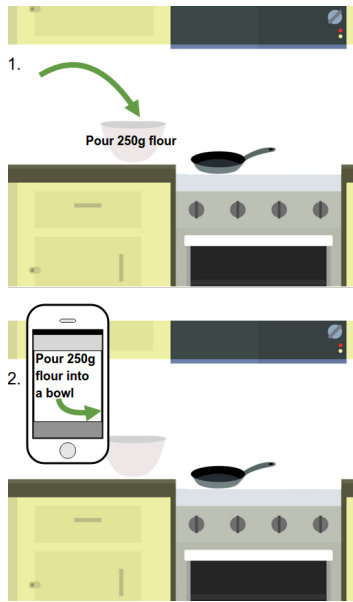
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[1] https://ex-situ.lri.fr/workshops/rethinkinginteraction-18

Figure 2: *Presentation*:
feedforward guidance for preparing crêpe can be presented in several ways:
(1.) AR-based, highlighting the respective elements in the real-world,
(2.) UI-based on an arbitrary device.

Figure 1 shows examples for help messages that either came up user-triggered (1.) or system triggered (2.).

Presentation
Assuming the assistance system is based on AR, the output of the feedforward assistance can be arranged around two anchors (refer to Figure 2):

1. *Real world:* the AR assistance highlights the necessary objects in the real world, eventually giving additional explanations (e.g., highlighting a bowl and asking Elodie to pour the adequate amount of flour).
2. *UI:* the assistance is shown on a UI, which can be shown in AR or on any other screen (e.g., asking Elodie to search for a bowl and to pour the adequate amount of flour).

Level of Detail
The feedforward assistance should furthermore cover an adequate level of detail, according to the user's expertise and experience (referring to [1], the amount of information transferred via feedforward is a relevant dimension). As an example, the necessary steps for preparing crêpe could be explained in fine detail for the first usage of the system (e.g., take a bowl – pour flour – ... – pour dough into pan – ...) and reduced progressively for further usages and increasing cooking skills (e.g., prepare dough – fry crêpe).

Goals
An everyday life feedforward assistance system can support several purposes.

1. *Performance & Efficiency:* By using the system, Elodie can increase her performance and efficiency (e.g., hesitating and thinking about next steps is reduced).
2. *Enabling:* The proposed system enables users to execute the action, e.g. cooking, which Elodie might not be able to execute otherwise (e.g., due to a lack of knowledge or limited capabilities).
3. *Experience:* A major goal is the user's experience when successfully managing a challenge (e.g., cooking a superior dish). Elodie might be positively influenced by a sense of achievement and may also be motivated to do the same task more often.
4. *Teaching & Learning:* With increasing usage of the system, the user may learn what to do on her own. By applying progressive reduction[2], the feedforward content can be minimized for experienced users. If the system recognizes an experienced user, it could skip certain guidance as the user already knows what to do, while novice users could experience the full support (referring to Shneiderman's golden rules[3], adding appropriate features for novice as well as expert users is essential).
5. *Comfort & Laziness:* By using the system, Elodie does not have to extensively think about the required steps for the intended task (preparing a crêpe). Hence, she can "lean back" while the system supports the action chain.

Challenges & Discussion
The workshop proposal identifies three main challenges when rethinking interaction within the digital world. We address the challenges as follows.

Appropriation & Integration
By the means of our proposed system, we combine digital and real world environments. However, an intelligent everyday life feedforward system would have to be integrated in the user's natural way of interaction. Depending

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[2]https://www.dtelepathy.com/blog/design/progressive-reduction-evolving-the-experience-for-your-most-frequent-users
[3]https://www.cs.umd.edu/users/ben/goldenrules.html

on the output and presentation of our system, Elodie might have to switch her attention between the given guidance (i.e. via AR or UI on an arbitrary screen) and the real world where she wants to achieve the task. This takeover of attention should be realized with minimal effort. On the other hand, using the provided guidance should not distract social contacts or other activities (i.e., while preparing crêpe, Elodie might want to talk to her room mates). Finally, our system provides a flexible, digital environment that supports appropriation by end-users.

Learning & Support
We do not replace human activities by a fully automated system. On the contrary, with our system, we guide and support casual human activities. Elodie will be optimally supported and taught how to prepare crêpe. She should not feel being treated like a child. She should keep a maximal freedom of action. On the other hand, too much comfort could also have negative consequences. She should not habituate extensively to a guidance being present as she should be able to achieve things without guidance (e.g., people tend to fully rely on their navigation systems). The system should find a compromise between guiding her versus annoying or imposing her with explanations.

Nevertheless, an essential feature would be to help Elodie learn how to achieve certain tasks. The explanation of necessary steps could be reduced progressively. Thus, she can gain new abilities by using our system.

Shift & Consistency
We also support the shift across different types of human-computer partnerships. We provide different levels of detail for users with various experience. Our system allows for "shared control", it provides guidance and support rather than a separate explanation or full automation.

With regard to arbitrary tasks, guiding the user to a solution is not always obvious. There may be many ways to achieve a special action's goal (e.g., order of steps, arbitrary household devices, ...). On the other hand, problems with one-way solutions, which only provide a limited number of options, exist (e.g., changing tyres).

Conclusion & Outlook
As an aspect of *Rethinking Interaction*, we presented *Everyday Life Feedforward*, an intelligent guidance concept for casual interaction tasks with arbitrary devices. As an example, by the means of our concept, Elodie is supported when preparing crêpe. A feedforward guidance can be characterized along its (a) *Activation*, (b) *Presentation*, and (c) *Level of Detail*. Those dimensions can easily be extended to other use cases, including steps following a known algorithm. In future work, guidance for free, creative tasks should be further explored.

Acknowledgements

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