Interactional Traps and Detours: Losing the Common Ground

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Abstract: Interactional traps and detours are specific forms of inefficient or unsuccessful interactions. An interactional trap is a situation where a user believes their objective is not achievable even though it is or, conversely, believes that it is when it is not. A detour is a less serious breakdown that is repairable, though might in other circumstances be a trap. Traps and detours are breakdowns in 'common ground' between the interacting agents: the phenomena are not solely a consequence of computer system design, or solely a result of user actions, but arise through the interaction between the agents.

Keywords: interaction framework, digital library, undo, web navigation, HCI, common ground.

1 Introduction

Breakdowns in an interaction are rarely due to simple computer failure or just to user error, but are most commonly a result of interplay between the two. Frequently the point at which an error manifests itself is some time after the point where conditions were in place to make the error likely; Reason (1990) refers to such conditions as *latent errors*. In many situations a breakdown is not the result of a single point of failure, but of a sequence of events that culminate in an unwanted situation.

The focus of this paper is on interactional traps and detours. Traps are situations in which a user acquires, and acts on, incorrect beliefs about the achievability of their objective. Traps result in failure to achieve high level objectives. Detours are more general inefficient interactions that do achieve their objectives, but that also involve the user acquiring and acting on incorrect beliefs. Thus, a sufficiently persistent user may be able to convert a trap to a detour (say, by starting over). Although most users will recognise traps, detours may go unrecognised. In both cases users may misdiagnose the symptoms. Once a user has experienced a trap, in future their work patterns will be less efficient, using (possibly avoidable) workarounds and detours, or they may avoid the apparently impossible tasks altogether.

Our work is within the tradition of Interaction Framework (Barnard & Harrison, 1989), which is a framework for understanding interaction as an entity in its own right. Important properties of Interaction Framework are that it considers interaction occurring between *agents* in a *system* via communication *channels*. Interaction is in the form of *events* communicated between agents through these channels. An ordered set of events making an episode of communication between agents attempting to meet objectives defines an *interaction trajectory*.

Symptoms categorise a trajectory in terms of whether the trajectory was *optimal* (most efficient for achieving the objective), and if not, what the symptoms of interactional *trouble* were. Troubled trajectories do not meet objectives, or meet the objectives in a convoluted way. *Interactional traps* and *interactional detours* are both examples of suboptimal trajectories. The point at which the trajectory moves away from an optimal trajectory is called the *point of deviation*.

Troubled interaction trajectories take the form:

$$e_d > \ldots > e_n > e_{n+1} > \ldots > e_r > e_{r+1} \ldots$$

where e_d is the event at the point of deviation (or may indicate lack of mutuality from the outset) and e_n onwards are the events that result in the user acquiring the incorrect belief. In the case of an interactional trap, the erroneous belief remains; in the case of a detour, there will be subsequent events e_r onwards, that make

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up a *repair sequence*. In Reason's (1990) terms, e_d gives rise to a latent error.

The primary cause for the symptoms listed above is poor *common ground* (Clark & Brennan, 1991) between the agents. Events communicate some information about the state of the agents, but issuing an event does not necessarily mean that the recipient will receive the event let alone understand and act on it appropriately. Events in general do not uniquely determine states. The notion of *common ground* concerns mutual understanding of events.

2 Traps and detours

In a protocol study of seven users working with digital libraries, one of the striking findings was that every one of the users acquired incorrect beliefs about the achievability of some domain goal during the interaction. Although the users were of varying levels of experience, they retained incorrect beliefs throughout the remainder of the session (and probably thereafter).

Many of the cases were due to the user expressing a search term inappropriately, and never getting feedback from the system about how it could be done effectively. One user manually stemmed terms (e.g., removed "ies" from "libraries") for a search engine that processed whole words only, while another provided acronyms instead of full terms. Such misconceptions about how the search facility worked resulted in the users ending the interaction believing their goals to be unachievable using those libraries – i.e. they believed the libraries did not contain relevant articles to be downloaded. They were trapped.

Digital libraries and other information retrieval systems are particularly prone to traps, as they are sophisticated systems that depend on users phrasing queries appropriately. However, traps may occur in any complex system. For example, in a study of electronic diaries, we found users who asserted definitively that it was not possible to make entries such as "the third Tuesday of every month" using a particular diary system: they had looked, but failed to find the feature that supported such entries (it was available, but in an unexpected way). Similarly, users of a train ticket machine find that it is not possible to use the machine with a particular discount card. The option is available: some users fail to discover it because it is not located with other (to the users) "similar" choices. When this trap is reported to station staff, they dismiss it, because they have become familiar with the workaround!

Detours are similar in nature to traps, but with less severe long-term consequences. The goal remains achievable within the interaction, but only in an inefficient way. In the study of digital libraries, users were found to make many detours, for example, as they selected an inappropriate link, then retraced their steps, or incorrectly formulated a query, but then reformulated it more successfully.

Traps and detours occur in many other systems. For example, if a user of a particular word processor copies text to the clipboard, then cuts another piece of text but realises *that* mistake (which will have overwritten the material previously copied to the clipboard), they will press 'undo' to reverse the effects of the action. They will see the 'cut' material reappear in the document, but if they then paste, intending to paste the text that was originally copied, the more recently cut text will appear again in the document. The undo event became a point of deviation by confirming the restored state of the document, but not of the clipboard.

3 Conclusions

Interactional traps and detours have features in common with each other, but also interesting differences. In both cases, user and system lack mutual understanding. For traps, there is a point where the user acquires long-term incorrect beliefs about the achievability of their objective, whereas for detours the incorrect belief is of finite duration, and is followed by a repair sequence. The challenge for design is to reduce traps to detours, and to reduce the severity of detours.

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