

Beyond Subservience: Using Joint Commitment to Enable Proactive CUIs for Mood Logging

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ABSTRACT

Conversational user interfaces (CUIs) are a promising interaction modality to engage people with self-report activities that are widely used to study people's experiences and support them with their mental health. However, this potential is limited by the prevailing CUI interaction paradigm being subservience to the user, which constrains self-reporting to being user initiated. A more effective approach would be for CUIs to proactively engage users with self-reporting, particularly at opportune moments. This paper proposes that joint action theory, specifically joint commitment, can be an effective framework to support designers in designing effective proactive CUI interactions. Using mood logging as a use case, we highlight three key areas where joint commitment can impact proactive CUI design. We also discuss wider challenges and future areas of research needed to identify the opportunities and challenges of using joint commitment within proactive CUI research and development.

CCS CONCEPTS

• **Human-centered computing** → **Natural language interfaces**; *HCI theory, concepts and models; Interaction design theory, concepts and paradigms.*

KEYWORDS

conversational user interface, proactive interaction, joint action theory, conversation-sensitive design, self-report, mood logging

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1 INTRODUCTION

When studying mental health, self-report activities are widely used to assess people's experiences and to gather data about conditions. Yet, for self-report to be effective, the user needs to be motivated to regularly self-disclose in varying contexts. This places a burden on the person self-reporting which often results in compliance diminishing over time and impacts the accuracy of responses [14]. Using conversational user interfaces (CUIs) could help to support self-reporting. People are willing to self-disclose to CUIs [16, 22, 24, 28] and chatbots can elicit higher quality survey responses than web surveys [20, 29]. CUIs have also been thought to be able to support long-term engagement [2–4].

However, a major issue with CUIs for self-reporting is that the prevailing CUI interaction paradigm is one of subservience and user initiation [15], whereby CUIs are designed to react to and execute the requests of users. Such a lack of proactivity limits their use to times when the user decides to initiate it. A more effective approach would be for a CUI to be able to proactively engage the user, requesting them to self-report in appropriate situations and at opportune moments. Such an approach may reduce attrition, whilst also improving data quality.

For instance, in the case of mood logging (a self-report activity used to support people with their mental health) a CUI could be designed to prompt users to self-report at times where users are free to do so or after mood impacting activities such as exercise. Yet, for these interactions to be effective they need to be situationally appropriate whereby the interaction characteristics (e.g., task duration, sensitivity of the information being requested, or the use of social and empathetic language) align with the user's situation [8]. Inappropriate initiation risks annoying, disrupting, and even embarrassing the user [11, 12].

In order for proactive CUI-based self-reporting to be effective, a harmonious alignment is needed involving the characteristics of the interaction, the user's interaction preferences, momentary state, and context. How to design CUIs to act and engage in such a situationally appropriate fashion is still an ongoing challenge.

2 RESEARCH AIMS

New conversation-sensitive design strategies [26] are needed to support designers so as to ensure that a proactive CUI engages in a situationally appropriate manner that is sensitive to the user's momentary state, preferences, interaction goals, and context. The

work presented aims to argue for, and propose, a framework for such proactivity based on the theory of language use as joint action [10]. The theory’s relevance to human-computer interaction more generally has been long established [5, 6, 9, 13, 18, 23]. It describes language use as a collaborative activity, giving consideration to the goals and momentary situations of its participants. Joint action theory also incorporates the notion of *joint commitment* which describes how a conversation’s participants initiate and engage in dialogue. In this paper we consider how joint action, in particular joint commitment, can be used to inform conversation-sensitive design for proactive CUIs for mood logging. We use the term conversation-sensitive design in recognition that the application of joint action need not directly emulate human-human dialogue, but can be tailored to the nuances of CUIs as dialogue partners [26]. Our paper contributes by providing a framing of CUI interaction for mood logging as joint action and a discussion of how joint commitment can be used to inform the design of proactive CUIs.

3 THE CONCEPTS OF JOINT ACTION & JOINT COMMITMENT

Clark’s theory, from human-human interaction studies, proposes that language use in dialogue is a form of *joint action*, involving an ensemble of participants acting in coordination [10]. It proposes that partners coordinate in an attempt to achieve a variety of goals at the same time. These include domain goals, that is the dominant purpose of the activity (e.g., to mood log), as well as procedural (e.g., completing the mood-log quickly), and interpersonal goals (e.g., building rapport). Partner goals can differ and can also vary across interactions, they can also be made public or kept private during dialogue. In the case of mood logging with a CUI, users may sometimes want to log quickly, while other times they may want to receive empathetic responses, but users may not directly express this to the CUI. Partner goals may also be in conflict. For instance, the user’s priority may be a quick interaction, while the CUI’s goal is to elicit a detailed log about an experience, which may take some time. Critically, for dialogue partners to succeed they must find a way to coordinate their individual actions that sufficiently achieves their collective goals (i.e., mutually agree to a joint purpose).

Table 1: Key Definitions for Joint Action and Joint Commitment [10]

Term	Meaning
Joint Action	An action involving an ensemble of participants acting in coordination (e.g., two people talking, a client and CUI interacting).
Joint Purpose	A purpose a joint action could serve (e.g., a specific mood log).
Joint Project	A joint action that serves a joint purpose.
Joint Commitment	Where participants commit to enacting a joint project.

A process by which participants coordinate their actions around their joint purpose is termed a *joint project* [10]. Joint projects are

joint actions that serve a joint purpose which the partners have *jointly committed* to (refer to Table 1 for definitions). The process works by a partner (e.g., the CUI) proposing a joint project and the others (e.g., the user) choosing whether to take it up.

Establishing joint commitment is not always straightforward. Clark [10, p. 204] describe four ways the receivers of a proposed joint project may respond:

- (1) Comply
- (2) Alter
- (3) Decline
- (4) Withdraw

The proposer’s preference for how the receiver responds is in descending order from complying to withdrawing [10]. A *comply* response is where the receiver commits to the project completing it as proposed. An *alter* response is where the receiver proposes back an altered version of the joint project that they are prepared to commit to. If the receiver engages in a *decline* response to the proposed joint project (i.e., by responding that they will not commit to it), opportunity is left for the original proposer to then propose an alteration of the joint project. A *withdrawal* response is when the receiver does not demonstrate consideration of the proposed joint project.

Clark [10, p. 203] also describes four requirements that the partners must fulfill when declaring joint commitment to a joint purpose:

- For A and B to commit themselves to joint purpose r
- (1) *Identification* A and B must identify r
 - (2) *Ability* It must be possible for A and B to do their parts in fulfilling r
 - (3) *Willingness* A and B must be willing to do their parts in fulfilling r
 - (4) *Mutual Belief* A and B must each believe that 1, 2, 3, and 4 are part of their common ground.

As such, fundamental to joint commitment is partners attempting to initiate joint projects based upon their beliefs about other participant’s momentary willingness and ability.

4 DESIGNING FOR JOINT COMMITMENT- THE CASE OF PROACTIVE CUIS

Terminology and concepts related to joint action and joint commitment echo processes that proactive CUIs need to engage in for successful interaction. As such, we propose that they may provide us with a framework to characterise and inform proactive CUI design. For instance, the process of a partner proposing a joint project, hoping that the receiver will commit to enacting it with them, is similar to the dialogue process needed when a proactive CUI initiates an interaction with a user. Each partner needs to consider their beliefs about the other’s ability and willingness to commit to a proposed joint project (i.e., the task the CUI is engaging the user to do). To be proactive, a CUI will need to propose joint projects to users. For their proposals to be successful, the projects should often result in joint commitment. Below we explore this in more detail, illustrating three areas in which the concept of joint commitment in particular can inform the design of proactive CUI interactions

for mood logging: *choosing a joint project to propose, handling uncertainty through pre-sequences, and supporting alterations*. We discuss these in detail below.

4.1 Choosing a Joint Project to Propose

For mood logging, each time a proactive CUI considers proposing a joint project it needs to choose from a set that is potentially large and diverse. These joint projects could vary in their topic (e.g., a past, present, or future activity), the depth of the report (e.g., a Likert item or a series of unconstrained language inputs), and the use of social or empathetic language (e.g., ‘How do you feel?’ or ‘I would love to know how you’re feeling?’). For the proposal by the CUI to be successful, whereby it results in joint commitment, the characteristics of the proposed project need to align with the user and their context.

Table 2: Example Project Proposals

	CUI Proposal	User Response Modality
A	How are you feeling?	Fixed options (e.g., numeric or emoji scale)
B	Hey, I’d love to know how your gym session went?	Free Text

Table 2 presents two example project proposals, A and B, which demonstrate the CUI attempting to get the user to provide a scale-based self-report, and an unconstrained account of an experience respectively. While project A offers a quick interaction by allowing the user to pick from fixed response options, project B asks more of the user as the input is more work, may require the user to reflect more, and will take longer. Given the increased ask of the user to comply with B, it may be the case that the user has the *ability* to comply with A, but not B. However, project B considers a certain topic (a gym session) which could be pertinent to the user at this moment. This contextual relevance may result in the user being more *willing* to commit to project B as 1) it may resonate with user’s momentary cognition and 2) its value to the user may be clearer which is understood to affect user receptiveness to interruption [21]. Furthermore, with B the CUI uses social language by expressing an interest in the user. Depending upon factors including the user’s orientation towards social-agents [21], as well as momentary factors like the user’s mood, this use of social language may influence the user’s *willingness* to commit to B.

Our comparison of proposals A and B shows how the characteristics of different projects may affect the user’s likelihood of committing. It demonstrates how the structure of joint commitment supports us with relating beliefs about the user and their context to the appropriateness of different projects, through consideration of the user’s ability and willingness. To design for joint commitment, conversation-sensitive strategies would need to enable designers to balance how likely the user is to commit to projects, given the CUI’s beliefs about their ability and willingness, with how well the projects would achieve the interaction goals.

4.2 Handling Uncertainty Through Pre-sequences

Central to designing for joint commitment is the CUI’s belief about the user’s ability and willingness which is intrinsically uncertain. Discrepancies between the CUI’s belief about, and the actual situation of, the user could lead to the CUI proposing joint projects that the user is not prepared to commit to. Considering again the example proposals presented by Table 2 with the expectation that B will take longer to enact, how long the CUI believes the user to have available for an interaction could determine its choice of project A or B. For example, if the CUI believes that project B better aligns with its and the user’s goals, the user is in an appropriate context, and that the likelihood of the user having enough time to enact the project is high, then project B seems a good choice for the CUI to propose. However, if the likelihood of the user having enough time is lower, then the risk of the user declining or withdrawing from the proposal of B becomes higher.

To support CUIs with choosing which joint project to propose, *pre-sequences* could be used. Pre-sequences are used by partners who want to propose a joint project, but anticipate that the receiver may not be prepared to commit to it [10]. The purpose of a pre-sequence is to identify if the conditions for a joint project are satisfied prior to its proposal in order to avoid partner’s altering, declining, or withdrawing the joint project. They are an example of grounding whereby the knowledge gained through the pre-sequence is added to the participants’ common ground, thus increasing the certainty of partners’ beliefs about the others [10].

Table 3 presents two example pre-sequences. Example 1 explic-

Table 3: Example Pre-sequences

	Pre-sequence
1	Do you have 5 minutes?
2	Looks like you’re on the bus home, is that right?

itly targets the user’s ability by attempting to ground if the user has 5 minutes they could use to enact a joint project. The second example takes a more implicit approach by attempting to ground the user’s activity. By grounding the user’s activity, the CUI could make multiple inferences pertaining to the user’s willingness and ability; in the case of grounding that the user is on the bus home, the CUI could infer both factors affecting the user’s ability (e.g., the time the user has available) and willingness (e.g., how private the setting is).

To make effective use of pre-sequences, a way of deciding if it is best to 1) propose a project directly, 2) use pre-sequences to first assess if the user can commit to the project, or 3) propose a different project, is needed. There is also the challenge of deciding which pre-sequence to use. A principle that guides the use of pre-sequences is that of greatest obstacle whereby “all else being equal, two people trying to establish a joint purpose will try to first overcome the greatest, or most likely, obstacle to reaching it” [10, p. 308]. Accordingly, the potential barriers to joint commitment need to be considered so as to design effective pre-sequences. Inaccurate

inferences about the user’s context can negatively affect user engagement [1] warranting a cautious approach that makes greater use of pre-sequences. We note that what is deemed appropriate in terms of pre-sequence use may vary between users, especially in relation to user’s social-agent orientation [21].

4.3 Supporting Alteration Responses

The previous subsections have focused on how to choose and propose a joint project that the user is likely to comply with. Sometimes these efforts will be unsuccessful. In these situations a proactive CUI should allow users to alter the proposed project as this is preferable to them declining or withdrawing.

To inform the design of responses to support alteration, as with pre-sequences, we can consider the potential obstacles to the user complying. If we can identify the highest risk obstacles, we can then attempt to provide the user with ways to alter the proposed project around these obstacles. Table 4 presents an example project proposal alongside example fixed response options for alteration.

Table 4: Example Alterations

CUI Proposal	Example User Responses (Fixed Options)
Hi, looks like you’re on the bus home, do you have a few minutes to chat about your gym session?	1) No, but I do have time for a quick mood rating. 2) I’d rather not on the bus, ask me when I get home.

The first example alteration stems from considering obstacles relating to the user’s ability. It offers a way for the user to alter the project from one they do not have the ability to commit to, due to its duration, to one they are able to commit to. The second example alteration considers more the user’s willingness due to contextual factors (i.e., if they are prepared to enact the joint project in their current setting) proposing an alteration they may be more willing to engage in.

To effectively support alteration a way of deciding when to provide the user with alteration responses is needed. Offering alterations may reduce the risk of joint projects being declined. Yet it may also result in less preferable joint projects where, had alterations not been suggested, the user would have committed to the preferred project in any case. Providing alteration responses may be most appropriate in situations when the CUI has a less specific goal. The presentation of potential alterations by the CUI can also demonstrate its functionality and capabilities as well as allow users to reflect and inform the CUI of what activities they may have time for.

5 DISCUSSION AND FUTURE WORK

Particularly within the area of mental health, technologies such as CUIs have the potential to help with the self-reporting of aspects, such as mood, that can support the assessment and investigation of specific conditions. Although CUIs show promise in encouraging self disclosure [16, 22, 24, 28], the subservient and user led paradigm of CUI interaction means that their usefulness for self-report

is limited. Here we propose that for CUIs to reach their potential they need to be designed so as to proactively engage the user with self-report. In this paper we propose that the theory of joint action [10], in particular the concept of joint commitment, should be considered as a framework to conceptualise and design proactive CUI requests. Through focusing on mood logging as a use case for such interactions, we identify three key areas where such a framing may help in designing proactive CUI dialogue approaches and actions. These focus on choosing a joint project to propose, how uncertainty can be supported using pre-sequences, as well as the need to support alteration responses. Although we focus on mood logging as an example use case and focus on three key areas relevant to mood logging, the areas identified and the context are not intended to be exhaustive. Rather, this paper aims to act as a catalyst in considering how joint action and joint commitment can support the design of proactive CUIs. Below we discuss some of the wider challenges and future work required to embed joint action and joint commitment within proactive CUI design.

5.1 Designing Proactive Initiations

As prior work [8, 17] has established, the user’s momentary state and context affects the suitability of proactive interactions; the structure of joint commitment provides a way to incorporate the CUI’s beliefs about these factors into conversation-sensitive design. As the CUI’s beliefs, constructed using context-aware techniques [7, 27], are intrinsically uncertain, this uncertainty should be represented by the CUIs designed.

Similar to existing tools, this uncertainty could be included in design by using flow charts allowing designers to construct belief-conditioned ‘flows’. To support designers working with beliefs, care will need to be taken with belief representation potentially involving designers in its configuration, especially as requirements may differ between applications. Tools could offer design-support for the use of pre-sequences and alteration responses by seeking to aid designers with identifying and accounting for potential obstacles and user barriers to joint commitment. Future work should seek to explore how tools and approaches can be developed to support designers in this process.

5.2 Conversation-sensitive Design of Joint Actions

Joint action theory [10] is a theory of human-human, not human-CUI, interaction. As such, rather than trying to directly emulate human-human joint action, modifications may be needed to better align the theory to proactive CUI design [23] to ensure conversation-sensitive design [26]. As prior work has shown [11, 15, 25], people perceive interaction with CUIs differently to interactions with people, meaning that a wholesale emulation of joint action in proactive CUI design may not be appropriate. For instance, joint action theory is rooted in the social behaviours and rituals performed during human-human interaction [10], however the benefits of CUIs using social behaviours are mixed [21] with some users expecting and preferring more utilitarian interactions [11, 21]. This may be influenced by a user’s social agent orientation, with those that hold a lower social-agent orientation seeing an emulation of joint commitment as too social or verbose. Future work should aim to explore

what aspects of joint action and joint commitment can be emulated and what aspects of this theory need to be appropriately tailored to more effectively support proactive CUI interactions.

5.3 Towards Collaboration with Current CUIs

As well as informing CUI proactivity, the concept of joint commitment could also be used to inform the design of current CUI interactions to be more collaborative in nature. For instance, during user-initiated interactions, the CUI could seek to alter the joint projects proposed by the user toward projects that better align with mutual interaction goals. In health settings, it may even be appropriate for the CUI to decline the user's proposals (e.g., to not engage in harmful self-report in attempts to maintain unhealthy behaviours [19]). Yet, along with opportunity, altering user proposals carries the risk of damaging the user experience causing attrition. Alteration attempts should look to be sensitive to the user's situation and, when appropriate, afford the user the ability to decline the alterations such that the CUI then commits to the user's original or altered proposal. An important topic for future research lies in how the concepts outlined in this paper can be used to generate more collaborative interactions in current CUI instantiations and how specific CUI based behaviours, that are informed by these concepts, may influence user behaviour and perceptions.

6 CONCLUSION

In this paper we have framed CUI interaction as joint action and considered how this framing, with focus on joint commitment, could inform the design of more proactive CUIs for self-report. Our work demonstrates that joint commitment is a valuable way to reason about the design of these interactions by supporting us in relating the CUI's beliefs about the user and their context to the appropriateness of interactions. Creating conversation-sensitive design strategies, informed by joint commitment, will not only be enabling for self-report CUIs, but for a broader class of CUIs that proactively assist us during our daily lives.

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