# What do we accept after an announcement?

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The concept of *collective acceptance* has been studied in the philosophical domain in opposition to group attitudes such as *common belief* (and *common knowledge*), that are popular in artificial intelligence and theoretical computer science [2, 6]. The main difference between these two concepts is that the collective acceptance by a set of agents $C$ is based on the identification of the agents in $C$ as members of the same group (or team, organization, institution, etc.) and on the fact that the agents in $C$ recognize each other as members of the same group. Common belief (and common knowledge) does not necessarily entail this aspect of mutual recognition and identification with respect to a *social context*. In this sense, according to [5, 7], collective acceptance rather than common belief is more appropriate to characterize a proper notion of *group belief*.

Our starting point is the logic of acceptance proposed in [3]. It has modal operators $\mathcal{A}_{C:x}$, where $C$ is a set of agents and $x$ is a social context. The formula $\mathcal{A}_{C:x}\varphi$ reads 'agents in $C$ accept that $\varphi$ while functioning together as members of $x$'. Contrarily to standard epistemic and doxastic logic a set of agents' acceptances is not necessarily consistent (even in the same context). The formula $\mathcal{A}_{C:x}\bot$ simply means that the agents in $C$ are not functioning together as members of $x$: they do not identify themselves with group $x$, they are not part of the organization $x$, etc. The logic of acceptance has a standard possible worlds semantics with an accessibility relation $\mathscr{A}_{C:x}$ associated to each group-context pair $\langle C, x\rangle$.[1]

Here we present an extension of the logic of acceptance by two kinds of dynamic operators. The first are announcements of the form $x!\psi$, meaning that $\psi$ is announced in the context $x$: the members of $x$ learn that $\psi$ is true in that context, while the other agents do not learn anything. In terms of Kripke models, all agents eliminate $x$-arrows to those worlds where $\neg\psi$ holds from their possibilities. These announcements are similar to private announcements of dynamic epistemic logic [1, 4].

In our logic the formula $\mathcal{A}_{i:x}p \rightarrow [x!\neg p]\mathcal{A}_{i:x}\bot$ is valid: if $i$ accepts $p$ in context $x$, and subsequently learns that $\neg p$ is the case in that context, then the agent is no longer part of the social context $x$. Agents can revise their acceptances in order to (re)enter a social context. To model this we consider

[1] The accessibility relations have to satisfy constraints of positive and negative introspection, as well as an inclusion principle: when $B \subseteq C$ then either $\mathscr{A}_{C:x}(w) = \emptyset$, or $\mathscr{A}_{B:x}(w) \subseteq \mathscr{A}_{C:x}(w)$, for every possible world $w$. They also have to satisfy a principle of unanimity: if $w' \in \mathscr{A}_{C:x}(w)$ then $w' \in \mathscr{A}_{i:x}(w')$ for some $i \in C$.

announcements of the form $i{\leftarrow}C{:}x$, meaning that agent $i$ adopts $C$'s acceptances in context $x$. In terms of Kripke models, the accessibility relation $\mathscr{A}_{i:x}$ is identified with $\mathscr{A}_{C:x}$.

The resulting logic has a complete axiomatization in terms of reduction axioms for both dynamic operators. Those for $x!\psi$ are similar to reduction axioms of dynamic epistemic logic. Those for $i{\leftarrow}C{:}x$ are as follows:

$$
\begin{array}{lr}
[i{\leftarrow}C{:}x]\mathcal{A}_{B:y}\varphi \leftrightarrow \mathcal{A}_{C:x}[i{\leftarrow}C{:}x]\varphi & \text{if } x = y, i \in B \text{ and } B \subseteq C \\
[i{\leftarrow}C{:}x]\mathcal{A}_{B:y}\varphi \leftrightarrow \top & \text{if } x = y, i \in B \text{ and } B \not\subseteq C \\
[i{\leftarrow}C{:}x]\mathcal{A}_{B:y}\varphi \leftrightarrow \mathcal{A}_{B:y}[i{\leftarrow}C{:}x]\varphi & \text{else}
\end{array}
$$

Other kinds of retraction operations can be devised, and will be discussed in the presentation. For example, we will consider the operation of creating a supergroup $D$ of a given group $C$, where $D$ takes over all of $C$'s acceptances. The logical form of such an operation is $[D{:=}C:x]\varphi$. This allows in particular to express that the agents in $D$ start to function as members of $x$, i.e. to move from $\mathcal{A}_{D:x}\bot$ to $\neg\mathcal{A}_{D:x}\bot$.

Note that our logic differs from dynamic epistemic logic, where no reduction axiom for announcements followed by the common belief operator exist. Intuitively, it means that $C$'s common belief may appear 'out of the blue': it was not foreseeable by $C$ that common belief would 'pop up'. Reduction axioms for group acceptances can be justified by its constitutive aspects of mutual recognition and identification with respect to a social context. Therefore, our logic of acceptance and announcements provides a simple, elegant and effective way of integrating a revision mechanism into the logic of acceptance. This contrasts with other approaches where a lot of machinery had to be added to dynamic epistemic logics in order to integrate a revision mechanism [8].

# References


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