

# Improving Understanding and Trust with **Intelligibility** in Context-Aware Applications

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To facilitate everyday activities, context-aware applications use sensors to detect what is happening, and use increasingly complex mechanisms (*e.g.*, by using big rule-sets or machine learning) to infer the user's context and intent. For example, a mobile application can recognize that the user is in a conversation, and suppress any incoming calls. When the application works well, this implicit sensing and complex inference remain invisible. However, when it behaves inappropriately or unexpectedly, users may not understand its behavior, and this can lead users to mistrust, misuse, or even abandon it. To counter this lack of understanding and loss of trust, context-aware applications should be *intelligible*, capable of explaining their behavior.

We investigate providing intelligibility in context-aware applications and evaluate its usefulness to improve user understanding and trust for context-aware applications. Specifically, this thesis supports intelligibility in context-aware applications through the provision of explanations that answer different question types, such as: *Why* did it do X? *Why* did it *not* do Y? *What if* I did W, What will it do? *How* can I get the application to do Y? *Etc.*

This thesis takes a three-pronged approach to investigating intelligibility by (i) *eliciting* the user requirements for intelligibility, to identify what explanation types end-users are interested in asking context-aware applications, (ii) *supporting* the development of intelligible context-aware applications with a software toolkit and the design of these applications with design and usability recommendations, and (iii) *evaluating* the impact of intelligibility on user understanding and trust under various situations and application reliability, and measuring how users use an interactive intelligible prototype. We show that users are willing to use well-designed intelligibility, and this can improve user understanding and trust in the adaptive behavior of context-aware applications.

<http://www.brianlim.net/thesis-defense/>

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