With the model, we can answer the question of "how many social robots can one operator control" by computing fan-out based on performance estimation. By simulation using real-world data as inputs, the quality of service provided by a robot team could be estimated before the actual installation. We believe that this study provides a powerful method of designing a teleoperation system for controlling multiple social robots.

6.2 Limitations

One limitation of this paper is that the parameters for our models were set for a specific context, where robots worked in a defined area and interactions were restricted to a few topics. However, we believe the models can be applied to a large range of problems by adjusting parameters from real-world data for specific contexts.

Also, our model only covered interactions with single round question and answer. For interactions with multiple questions, the customer-robot interaction model can be extended by adding looping of dialog and applying different words to robots for first-round and consecutive dialogs.

Another limitation is that our study did not model random errors of automation. In our model of interactions, we predict the moment when error could happen as the critical phase, but in fact, random errors may happen any time, both for conversation (e.g. sudden departure of customer) or navigation (e.g. robots hit obstacle). In the future, as speech recognition has the potential to make parts of interactions fully autonomous, the possibility of errors caused by this should also be considered.

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