

Multi-stage Human-computer Interaction for Command Refining on an Intelligent Personal Assistant

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Introduction

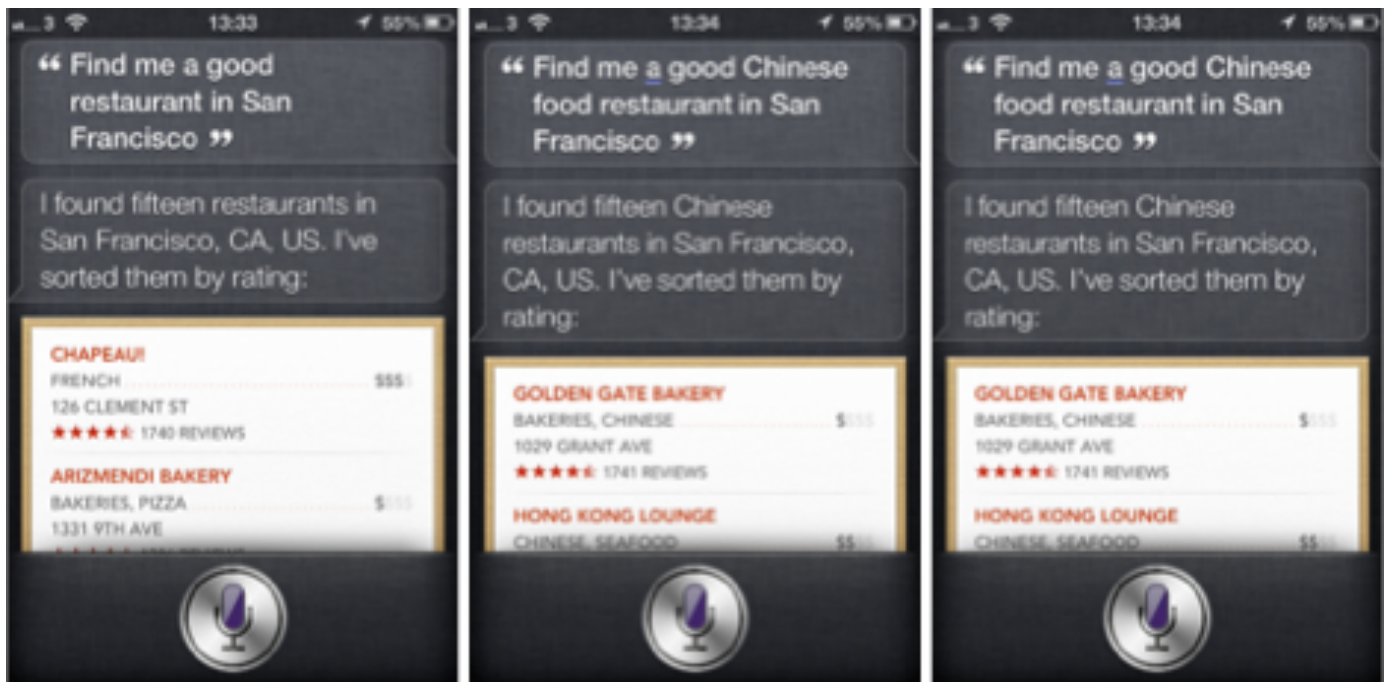


Figure 1. Siri responses to different commands

Your intelligent personal assistant is not that intelligent

1. It combines speech recognition, advanced artificial intelligence, machine learning and natural language processing techniques to try to understand verbal commands given by the users and then perform specific tasks according to those commands
2. It tries to automatically understand the context and the semantics, predict what the user wants it to perform, and then perform that action, based on a single verbal command

A study conducted by Piper Jaffray in 2012, a Minneapolis-based investment bank, graded the technology for resolving requests with the letter "D" (poor) for accuracy

So, what if:

1. It does not have force itself to try to understand the command if it really does not understand
2. It does not have to perform an analysis on your historical actions or understand the situation you are in, in order to perform your command
3. It does not have to try to predict things that maybe you do not even know yet
4. It can help you to think about what you want

in other words, what if they can ask you questions that are relevant to your initial command?

"Find me a restaurant"

"What kind of restaurants do you want to go to?"

"Chinese restaurant"

"Where do you want it to be located?"

"near me"

"I found fifteen Chinese restaurants fairly close to your location"

Objective

1. To investigate the multi-stage human-computer interaction for command refining, a new approach to deliver better results and user experience on an intelligent personal assistant
2. To compare the proposed-multi-stage interaction to the single-stage interaction widely adopted on implementations of intelligent personal assistant such as Siri and Google Voice

Methodology

In order to achieve the objective of the project, we broke down our work into three steps:

1. Building an Intelligent Personal Assistant that incorporates both single-stage approach and multi-stage human-computer interaction implementation
2. Design and conduct a preliminary study to support the multi-stage interaction design choice
3. Design and conduct the main study to compare between the single-stage approach and the multi-stage interaction

System Design and Implementation

In order to eliminate factors that might be resulted from different implementations of intelligent personal assistant system, and to allow us to compare between the commonly adopted and the proposed multi-stage approach, we chose to build our own intelligent personal assistant that helps users to find places to eat or drink, which incorporates both approaches.

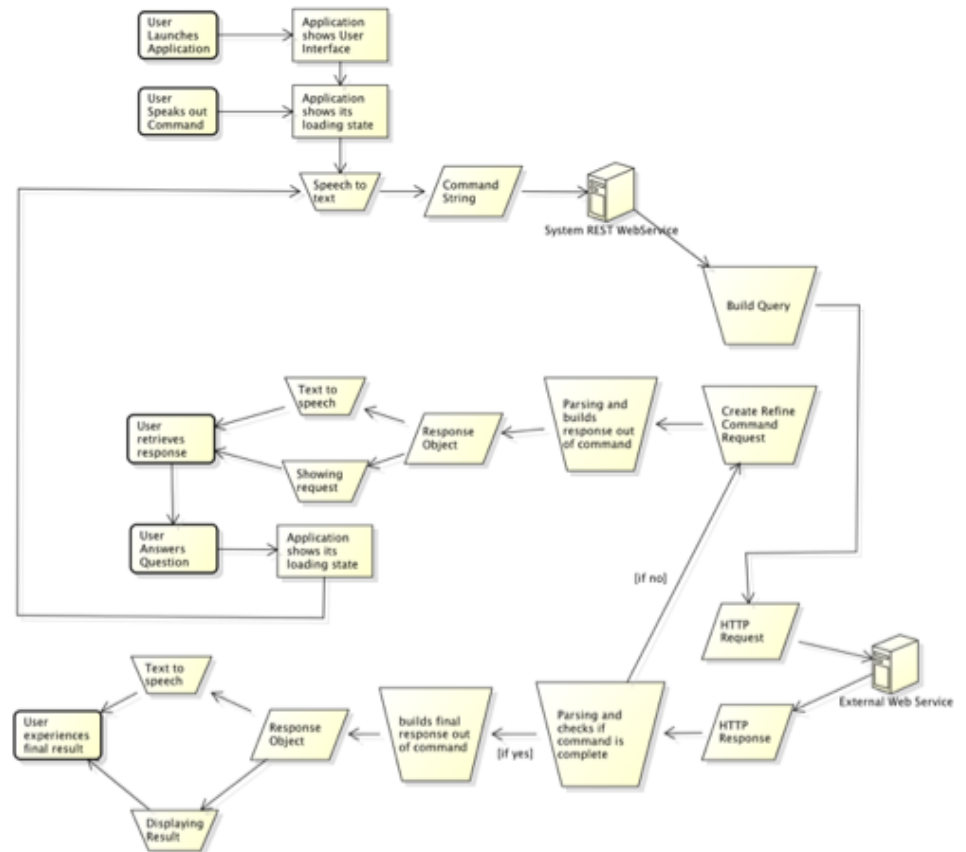
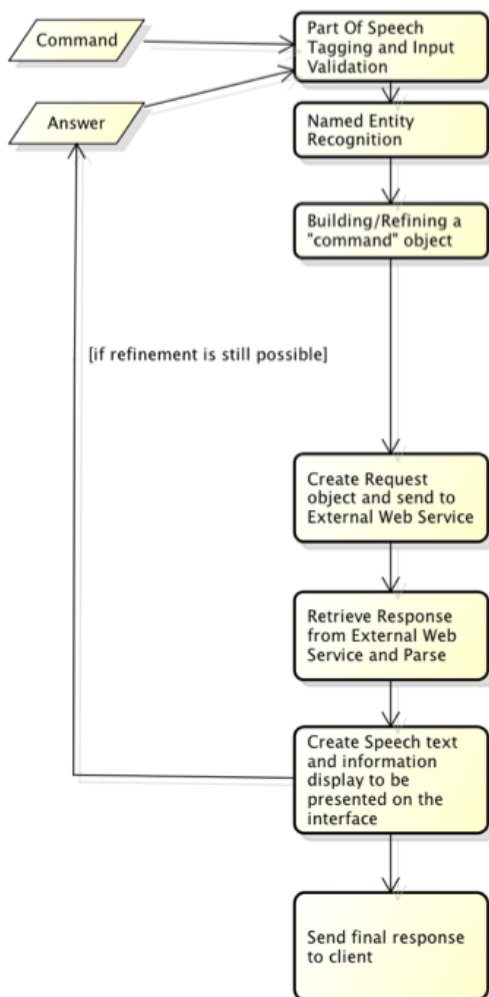


Figure 2 (left). Process Flow Chart
Figure 3 (above). Multi-stage Interaction System Flow

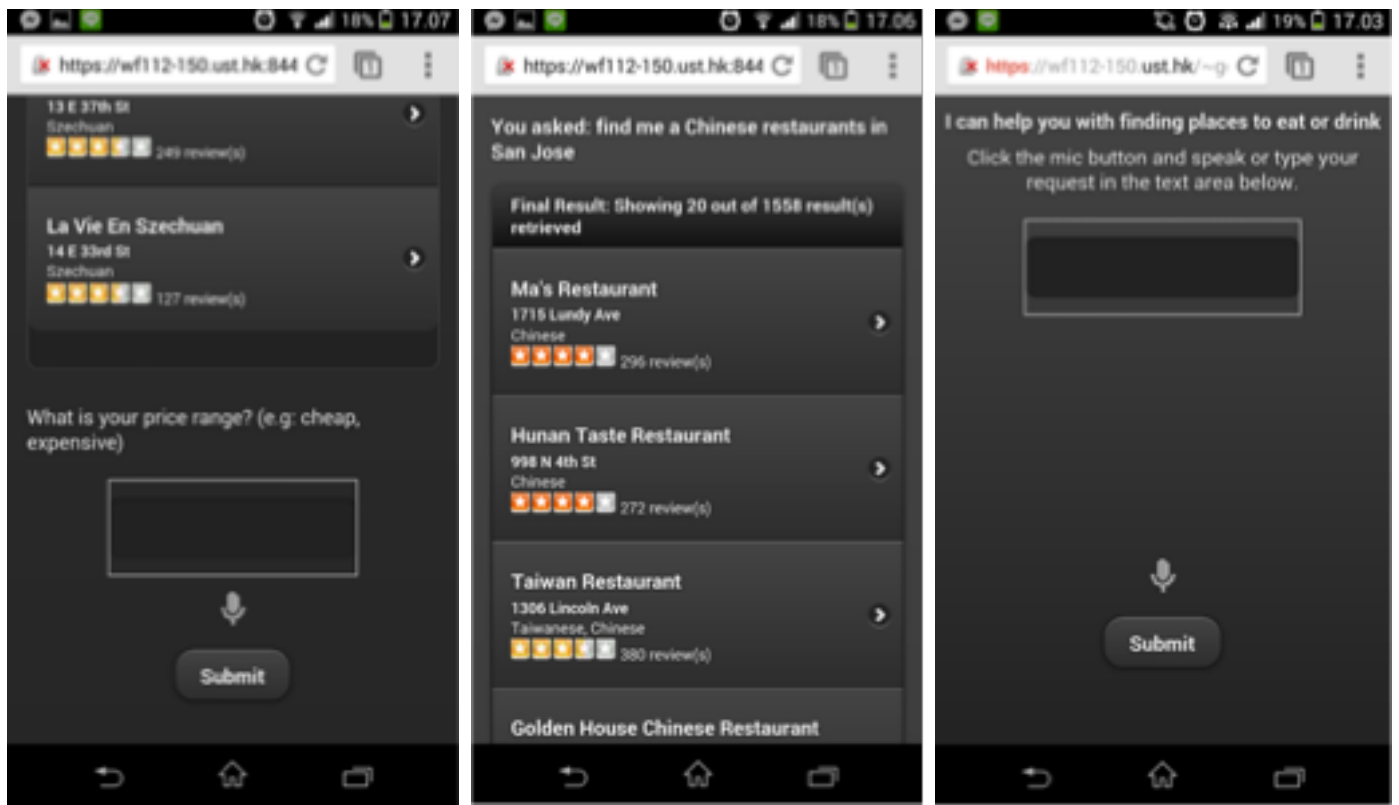
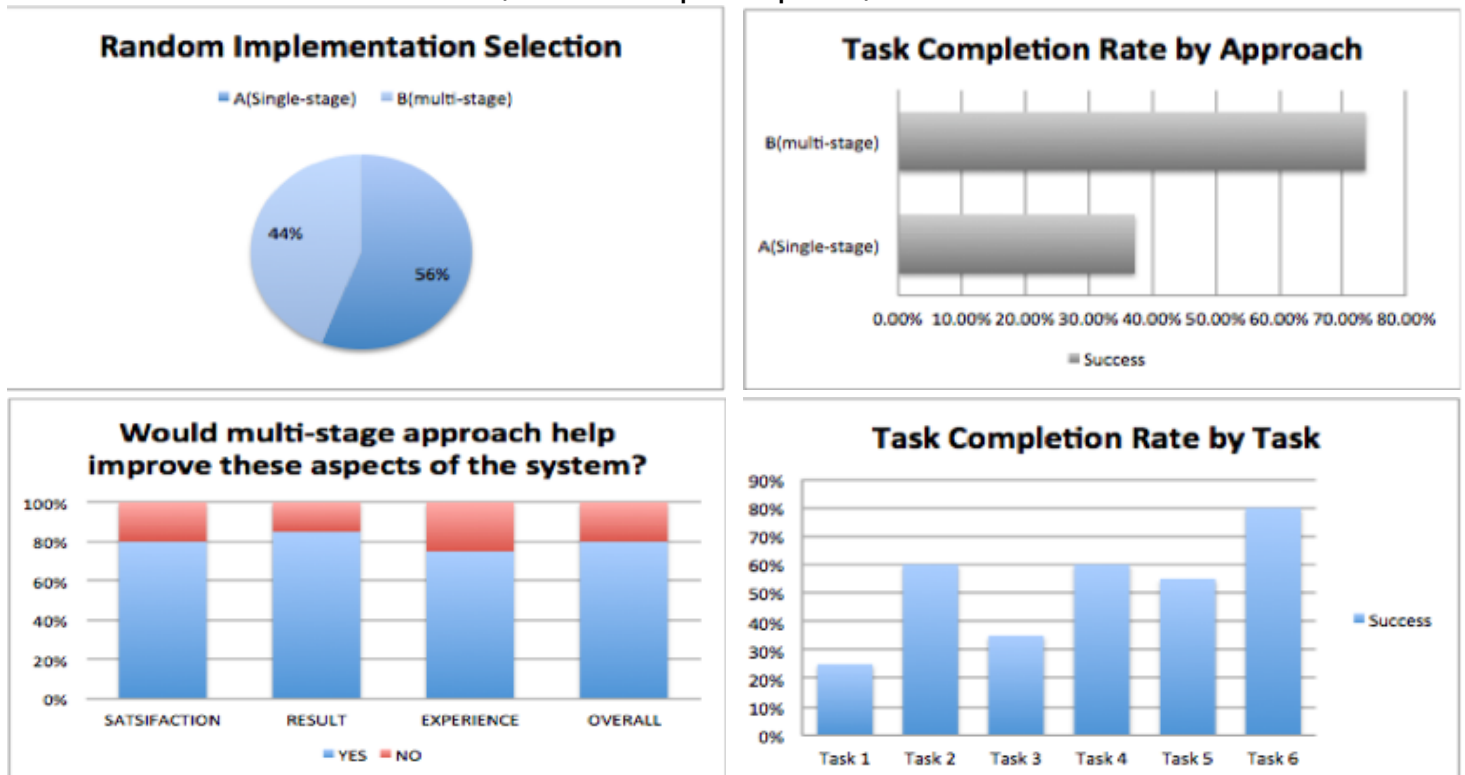


Figure 4. System User Interface
Results

N (number of participants)=20



Conclusion

1. Multi-stage approach yielded significant improvement in task completion rate (97% improvement in task completion rate)
2. The approach is perceived to give a better satisfaction (52%) and user experience (51%)
3. Multi-stage approach should be supported by relevant questions and proper depth of filtering, this depends on the nature of task