1. Provide a brief summary of the paper?

This paper mainly discusses using robot to communicate false information or hiding information. In one word, deception. Among numerous types for deception, it focuses on deception via motion. It shows an analysis of deceptive motion, beginning with how humans would deceive, then moving to a mathematical model that allows the robot to generate deceptive motion by itself, and ending with comments on the implications of deceptive motion for human-machine interactions.

2. What are its strong points and main contributions?

- It analyzed human strategies for deceptive motion. Shown in Fig.1, it offers 3 models of deceptive motion that the robot arm could make. Each of them tries to deceive the person in front of
2 bottles by giving wrong intentions. The first one is showing a trajectory that conveys the wrong goal (along with its higher-dimensional counter-part on the left). The second one shows a trajectory that switches between conveying either goal, and the last one shows a trajectory that keeps the goal as ambiguous as possible.

• It introduced a mathematical model that enables the robot to autonomously generate such motions. It includes deceptive motion as trajectory optimization for each of the 3 deceptive strategies. While the decoy strategy keeps the probability distribution as near to 1:1 as possible, and the switching strategy conveys the real goal for portion of the trajectory, the decoy strategy biases the distribution toward the other goal as much as possible for the entire trajectory duration: the observer will be confidently wrong.

• It tested users’ reactions to being deceived. See in study 2, observer's reaction to 3 strategies varies. The exaggerating and ambiguous strategies were more deceptive than expected, and the switching was less deceptive.

3. What are its weak points?

• Some statements still need larger sample sizes to test in the
future. For example, across all user reactions, they found that deception significantly increases ratings of engagement, intelligence, and adversarial standing, but can negatively impact trust: even though the robot plays by the rules, the users become aware of its capability to deceive. These effects seem to be larger when users perceive the deception as intentional.

4. Are the approaches technically sound?
It is sound, since we can see a clear thread of thinking and proof on the paper, with sufficient and concrete data. In the Part III, it gives the mathematical model of deception for future analyse. And in Part V, it compares 3 different strategies via manipulated factors and dependent measures. Similar to the previous study, it manipulated the deception strategy use, and the time point at which the trajectory is evaluated. This yielded a total of 18 conditions. It used the same dependent measures as in the second study, incorrectness and false prediction confidence. For Participants, it used a between-subjects design again, and recruited a total of 360 users on Amazon’s Mechanical Turk. They eliminated users who failed to answer a control question correctly, leading to 313 users.
5. Comment on the experimental methodology used in the paper.

This paper mainly apply manipulated factors and dependent measures for analysis. It mainly focus on the real reaction from the observers, whose reaction is recorded under 20 different conditions. It is solid also because it gains the result from over three hundreds observers.

The conclusion drown from such data is under concrete description and graph representation. For instance, as shown in Fig.8, the exaggerating strategy was the most successful at deception, followed by the ambiguous strategy. As shown in Fig.10, the correctness rate over time for the three strategies. Such experimental evaluation has similar results to the theoretical prediction from Fig.6: the exaggerating strategy decreases correctness over time, the switching strategy oscillates, and the ambiguous strategy stays closer to 1/2.

Further in Study 6, using experimental method to explore implications of deception for HRI. By exploring if people interprets deceptive motion as intentional. The participants play a game against the robot, in which they have to anticipate which bottle (of the two in front of them) the robot will grab, and steal it from the
robot. The faster they do this, the higher their score in the game.

To sum up, it is these creative experimental methods that make its conclusion believable.

6. How is the organization and presentation of the paper?
Starting by giving an concise and clear Abstract, this paper elaborates the basic knowledge in Introduction. It covers the 3 strategies that are used to examine deceptive motions. Subsequently, this paper deliver a mathematical model for deception which make the following experimental tests more concise. After performing the tests, it offers concrete analyse in the part of generalisation to arm motion. Nevertheless, it discusses the implications of Deception for HRI, for making sure that if people interprets deceptive motion as intentional. Before the final conclusion, it firmly discusses about longer term effects. To sum up, this paper has been graceful organized, clearly conveying the findings and process of getting them.

7. Describe an idea on how you might improve upon the work reported in this paper, or how it might inspire you to apply the findings into another application, or generalise it to a broader formulation, etc.
This paper introduces an very interesting counterpart for clear communication, i.e. deceptive motion. However, beyond its 3 deceptive strategies, it could be more and arbitrary deceptive motions. We can further develop those and make analyse on them.

When it comes to test the observer’s reaction. It could be lest subjective. We could use more definitions to quantify the feelings, which makes it more convincing.