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Hap2Gest: An Eyes-free Interaction Concept with Smartphones Using Gestures and Haptic Feedback

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Presenter: Milad Jamalzadeh



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- This is an **elicitation study** on eyes-free interaction with smartphones.
- **Elicitation study:** design of intuitive gesture commands, reflective of end-users' behavior
- Previous research exhibits that users preference patterns match better with gestures created by groups of potential users rather than expert designers.

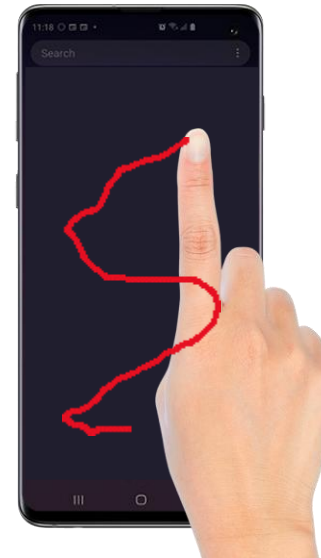


- In the last ten years, an impressive body of work has been published on elicitation studies.
- Romano et al. (2015): study to understand the preferences of blind people with respect to touch and motion gestures on mobile devices
- Unlike earlier elicitation studies, we studied user defined gestures when **haptic feedback** is available to provide feedback, **in absence of visual cues**.

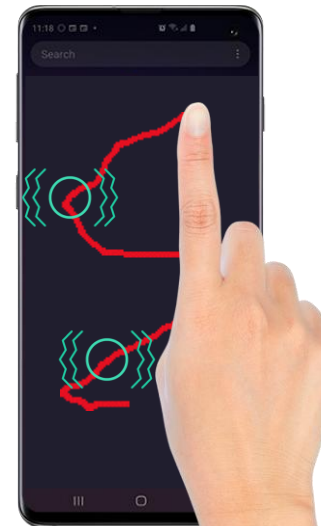




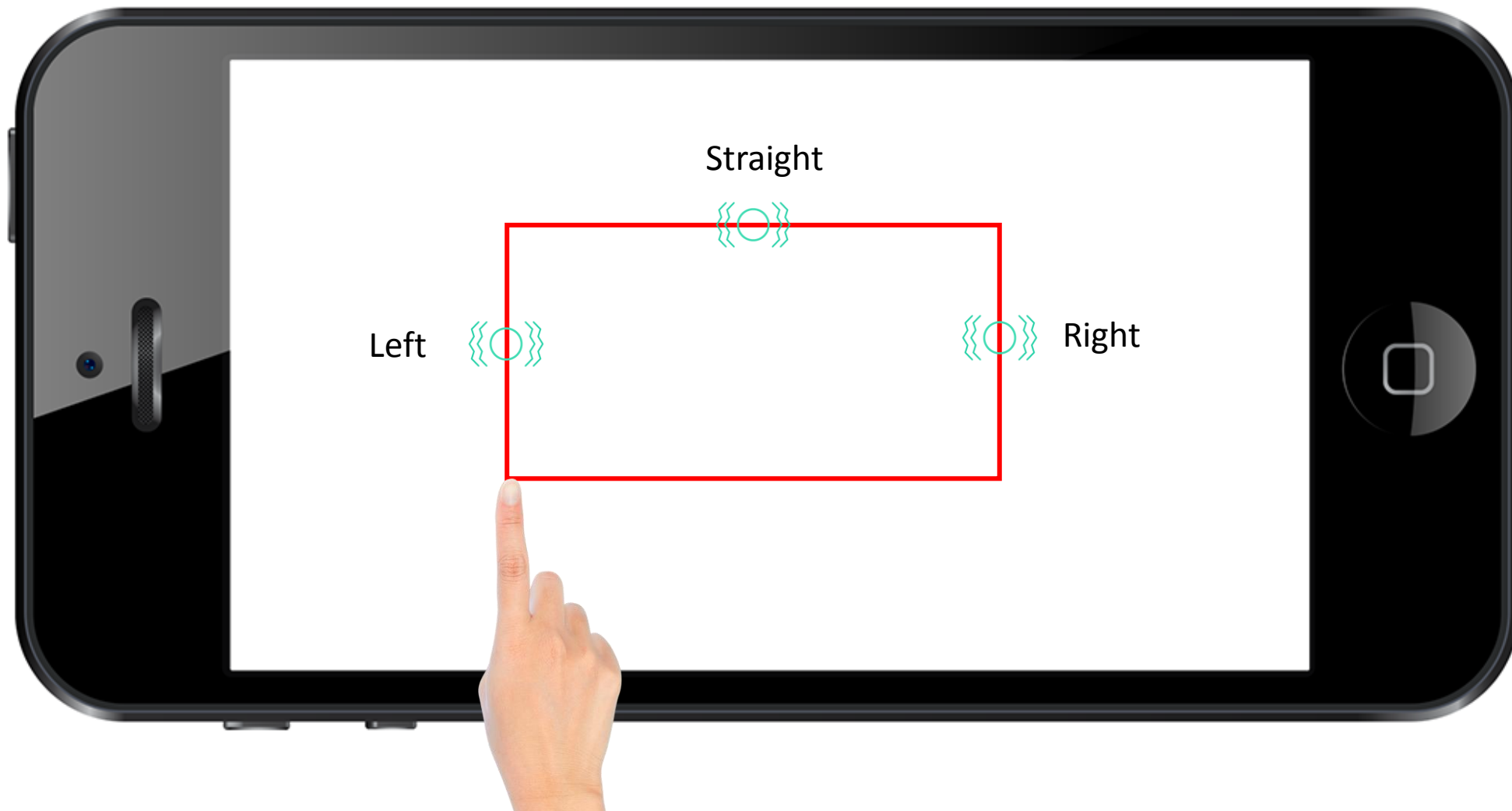
1. Giving command



2. Retrieving information



2. Feedback provided with vibration





(1)

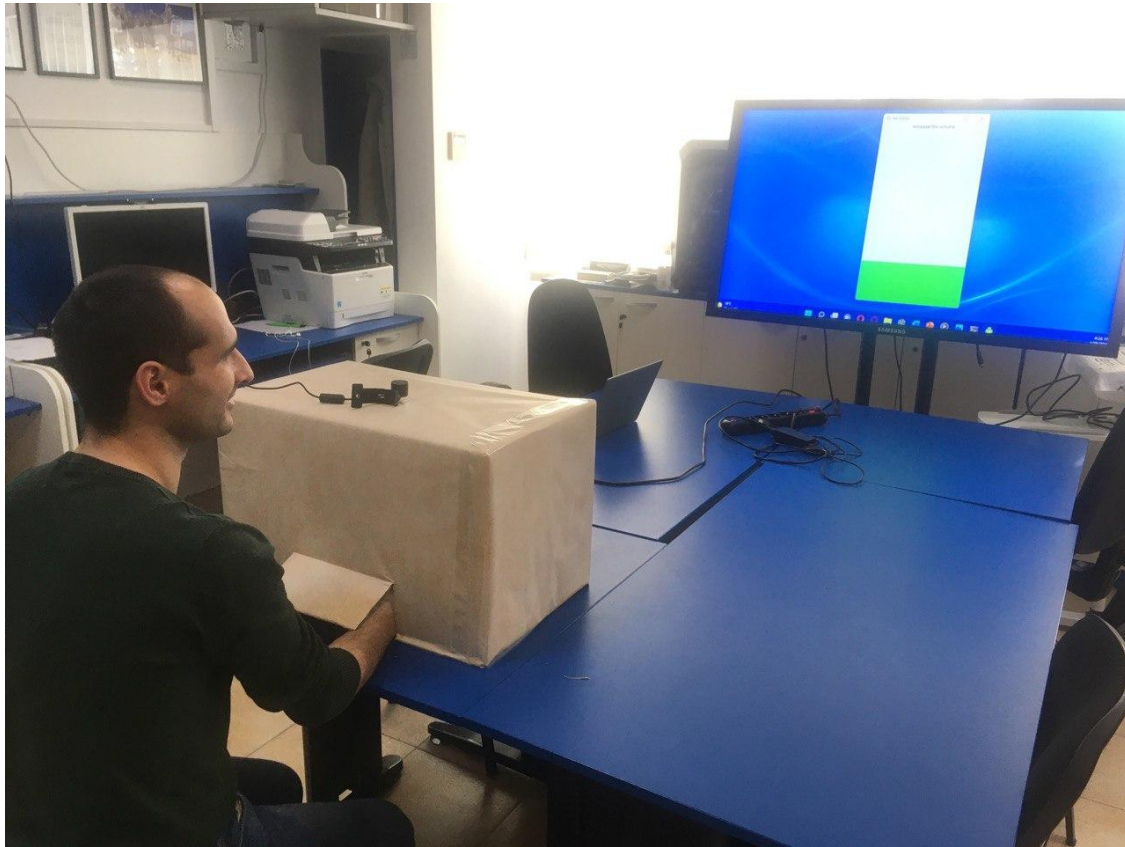


(2)

Number of participants = 12
Average duration: 50 minutes

1. Avoid having the same gesture for different commands
2. Design gestures that are easier to remember
3. Come up with vibration patterns take less time and effort to understand
4. In the second stage, retrieving information, participants were allowed to use same gesture or a different gesture than the one you used in the first stage, invoking command.





This experiment included 25 referents

- 2 referents in the presence of auditory feedback
 - Accept call, and reject call.



- 14 referents with yes/no feedback
 - Do I have any missed calls?



- 7 referents with categorical response:
 - How is the weather today?
 - From 2 to 12 possible categories



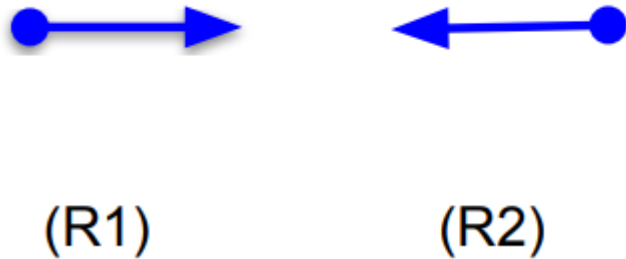
- 1 referent with numerical responses: from 0 to 5



- 1 referent for time range:
 - At which time today I have a meeting: 2-5 pm

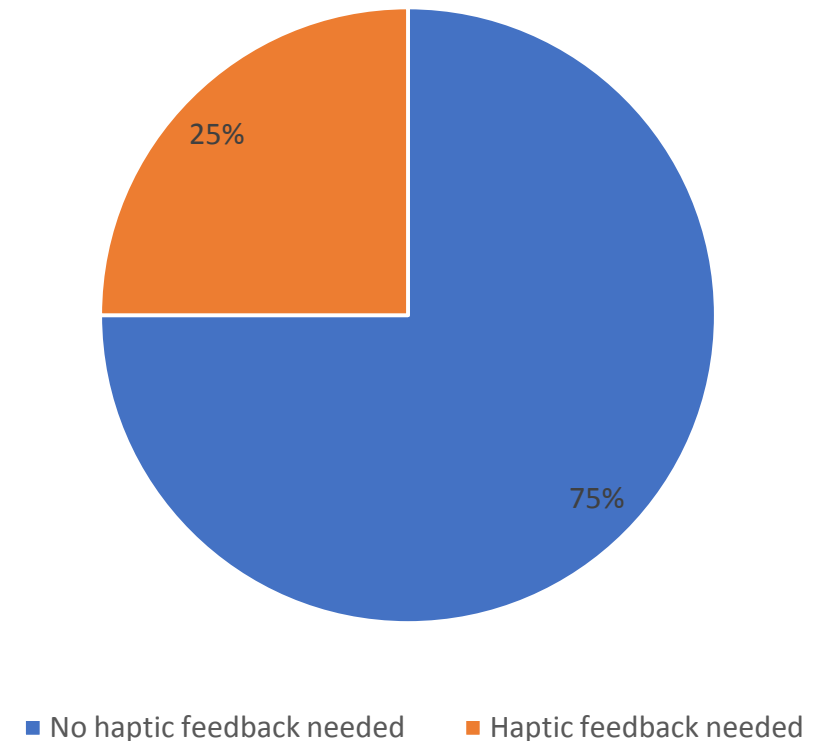


- Reject and accept call



- All participants, who asked for haptic feedback, preferred a single vibration at the end of the gesture.

User responses



B. Scenario with a yes/no response

R3. Is it a call from my favorite contacts?

R4. Do I have any missed calls?

R5. Is my phone silent?

R6. Do I have new messages?

R7. Do I have new messages from a favorite contact?

R8. Do I have new notifications?

R9. Do I have a notification from Instagram?

R10. Do I have a notification from Facebook?

R11. Do I have a notification from Twitter?

R12. Do I have a notification from WhatsApp?

R13. Accept the call and tell me if it's from a favorite contact.

R14. Reject the call and tell me if it's from a favorite contact.

R15. Mute my phone with success feedback.

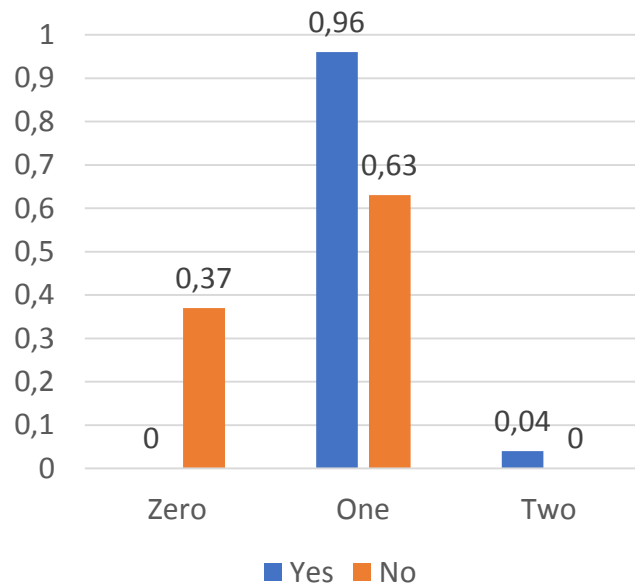
R16. Unmute my phone with success feedback.



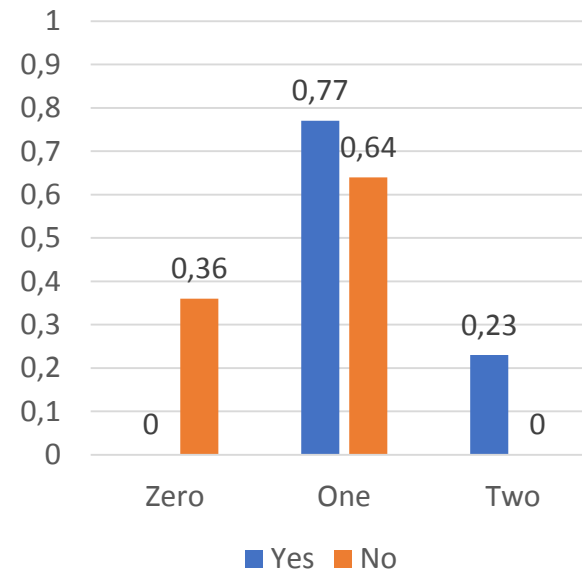
30% of gestures used a letter from the referent.



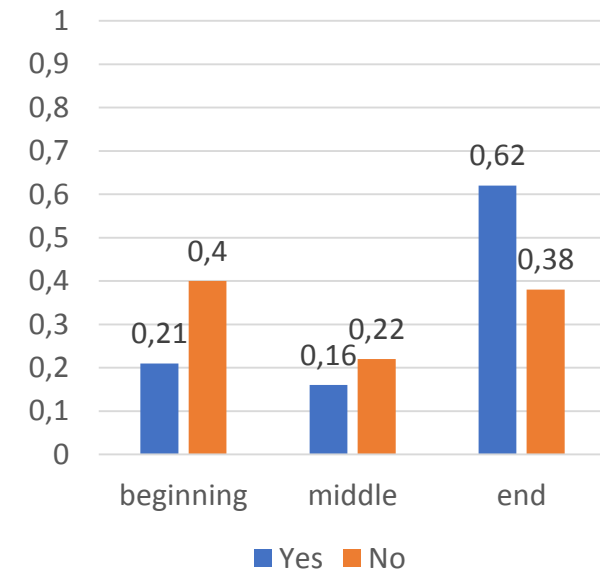
Vibration points



Number of vibration

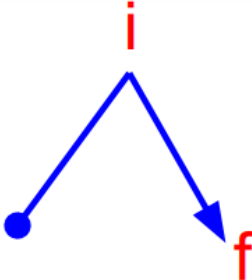


Vibration location

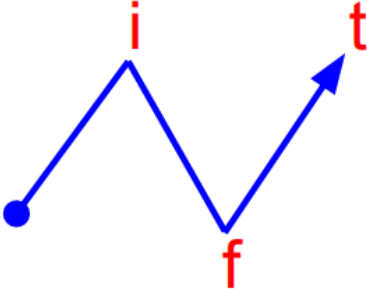


C. Scenario with categorical responses

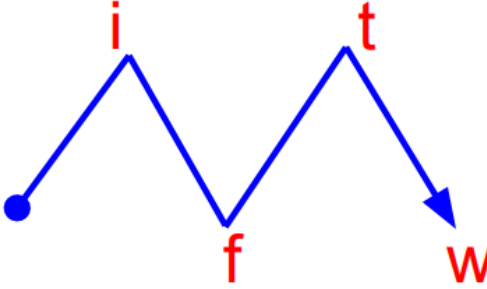
- R17.** Which application do I have a notification from (Instagram or Facebook)?
- R18.** Which application do I have a notification from (Instagram, Facebook, or Twitter)?
- R19.** Which application do I have a notification from (Instagram, Facebook, Twitter, or WhatsApp)?
- R20.** Which application do I have a notification from (Instagram, Facebook, Twitter, WhatsApp, or Telegram)?
- R21.** How is the weather today? (sunny, cloudy, rainy, or snow)
- R22.** Which day of the week is it? (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, or Sunday)
- R23.** Which month is it? (January, February, March, April, May, June, July, August, September, October, November, or December)



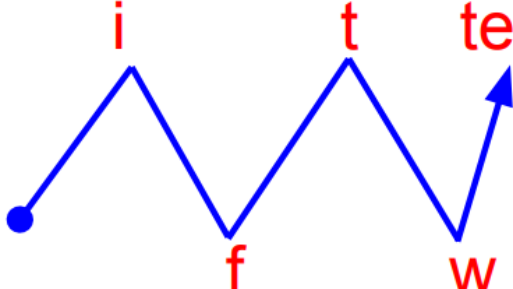
(R17)



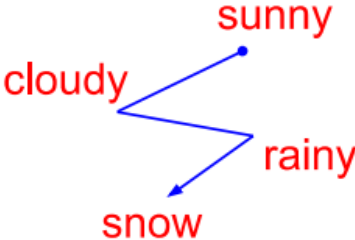
(R18)



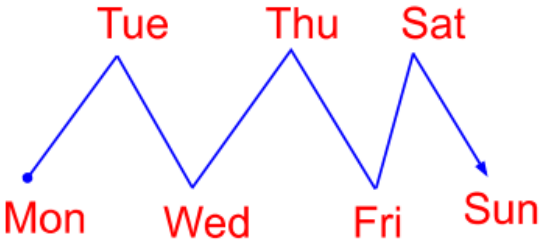
(R19)



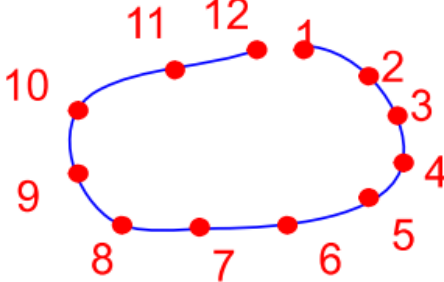
(R20)



(R21)



(R22)



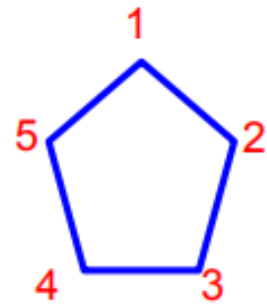
(R23)

D. Scenario with numerical responses

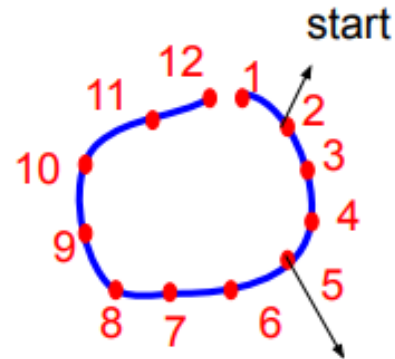
R24. How many new notifications do I have? (0, 1, 2, 3, 4, or 5)

E. Scenario for time range

R25. At which time today do I have a meeting?



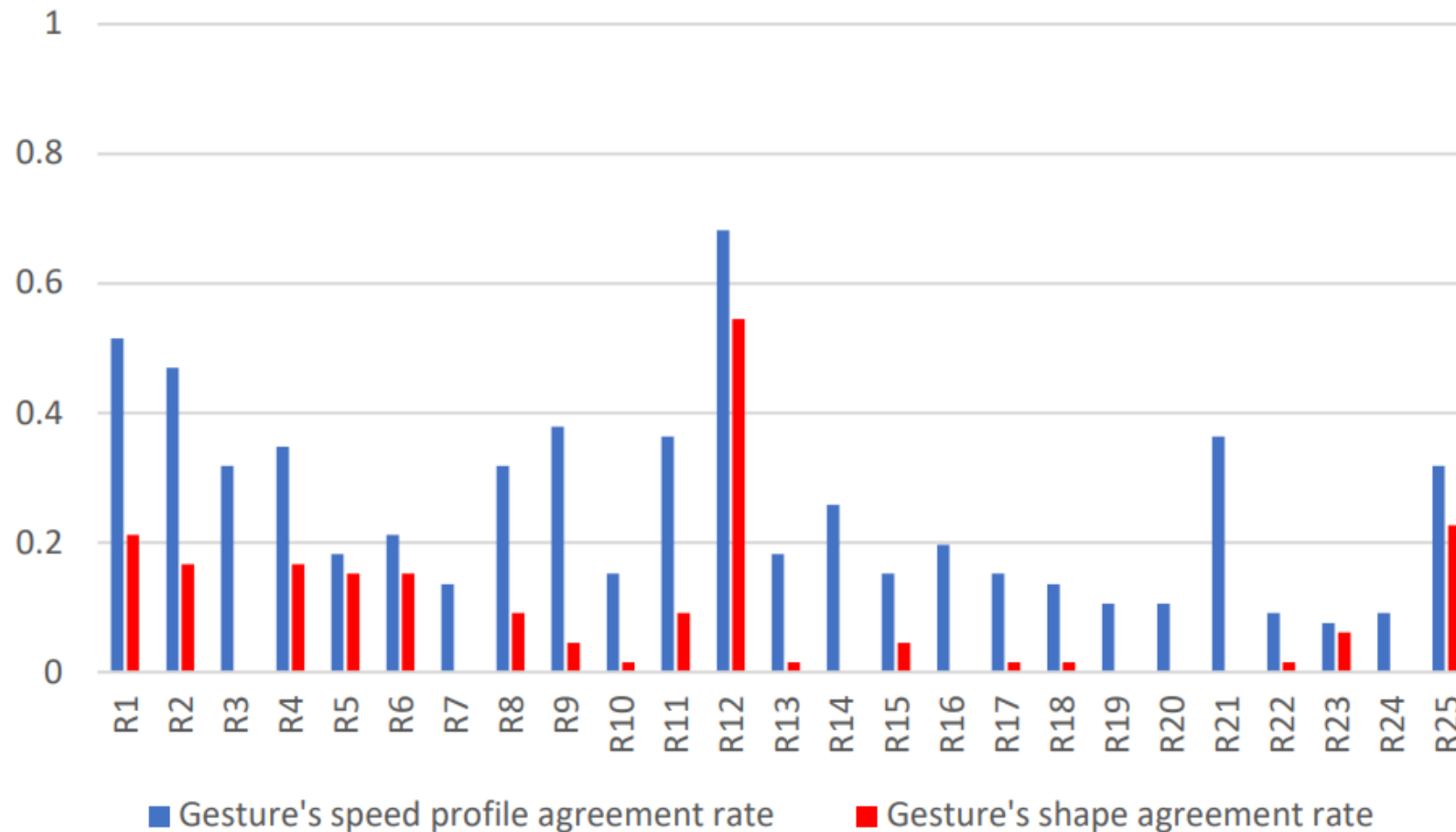
(R24)



(R25)

50% of the responses

$$AR(r) = \frac{|P|}{|P| - 1} \sum_{P_i \subseteq P} \left(\left| \frac{P_i}{P_t} \right| \right)^2 - \frac{1}{|P| - 1}$$



- We conducted the first elicitation study in the literature where gestures on touchscreens are selected not only by the task but also by considering the tactile channel for retrieving information.
- The results show that in more than 96 percent of the cases, participants prefer to have the same gesture for input and output.
- Our findings also show that there is a clear relationship between the type of gestures and vibration patterns suggested by users and the type of output information.
- Moreover, we showed that the gesture's speed profile agreement rate is significantly higher than the gesture's shape agreement rate, and it can be used by the recognizer when the gesture shape agreement rate is low

Thank You
For Your Attention!

Any Questions

