

Informing Guessing Attacks on Publicly Performed Secrets

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Outline

Motivation

Experimental setup

Simple patterns

Complex patterns

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Motivation

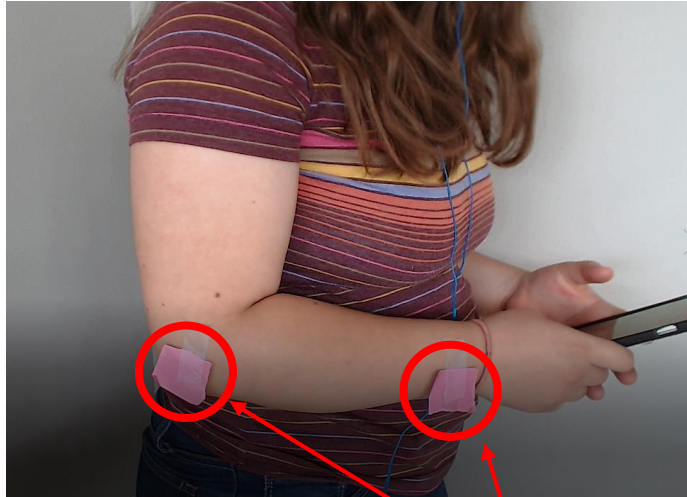
- Research question: can information about passwords be obtained by observing a person unlock a mobile device at a distance?
- Similar efforts in recent research:
 - Focused on hand/finger observation at close distance where device is observable (Ye et al., 2017)
 - Used other methods (accelerometer) to obtain information from publicly performed secrets (Owusu, Han, Das, Perrig, & Zhang, 2012)

Experimental Setup

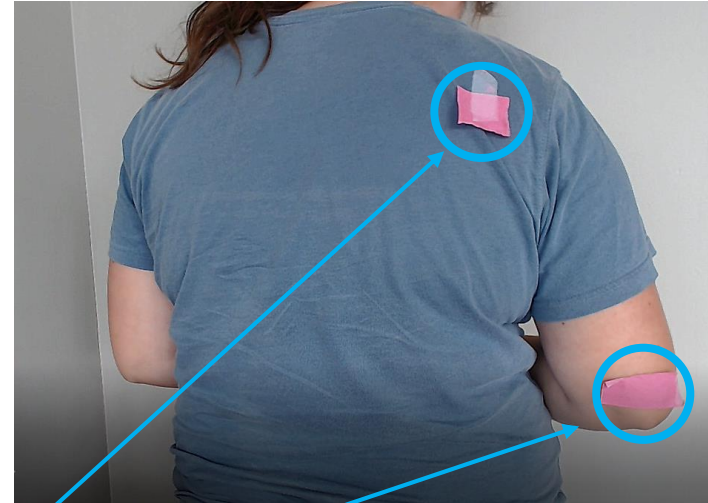
Step 1: Camera work

- Two camera orientations

Side:



Back:



- Two tracking points
 - side orientation: elbow & wrist
 - back orientation: elbow & shoulder

Experimental Setup

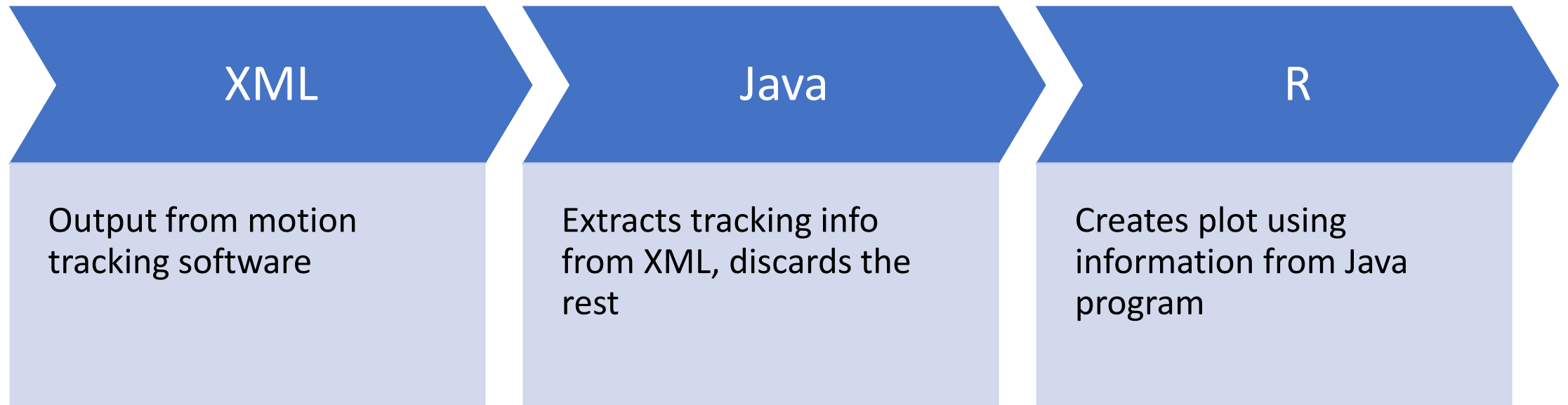
Step 2: Motion tracking

- Software: Kinovea (open source video analysis)



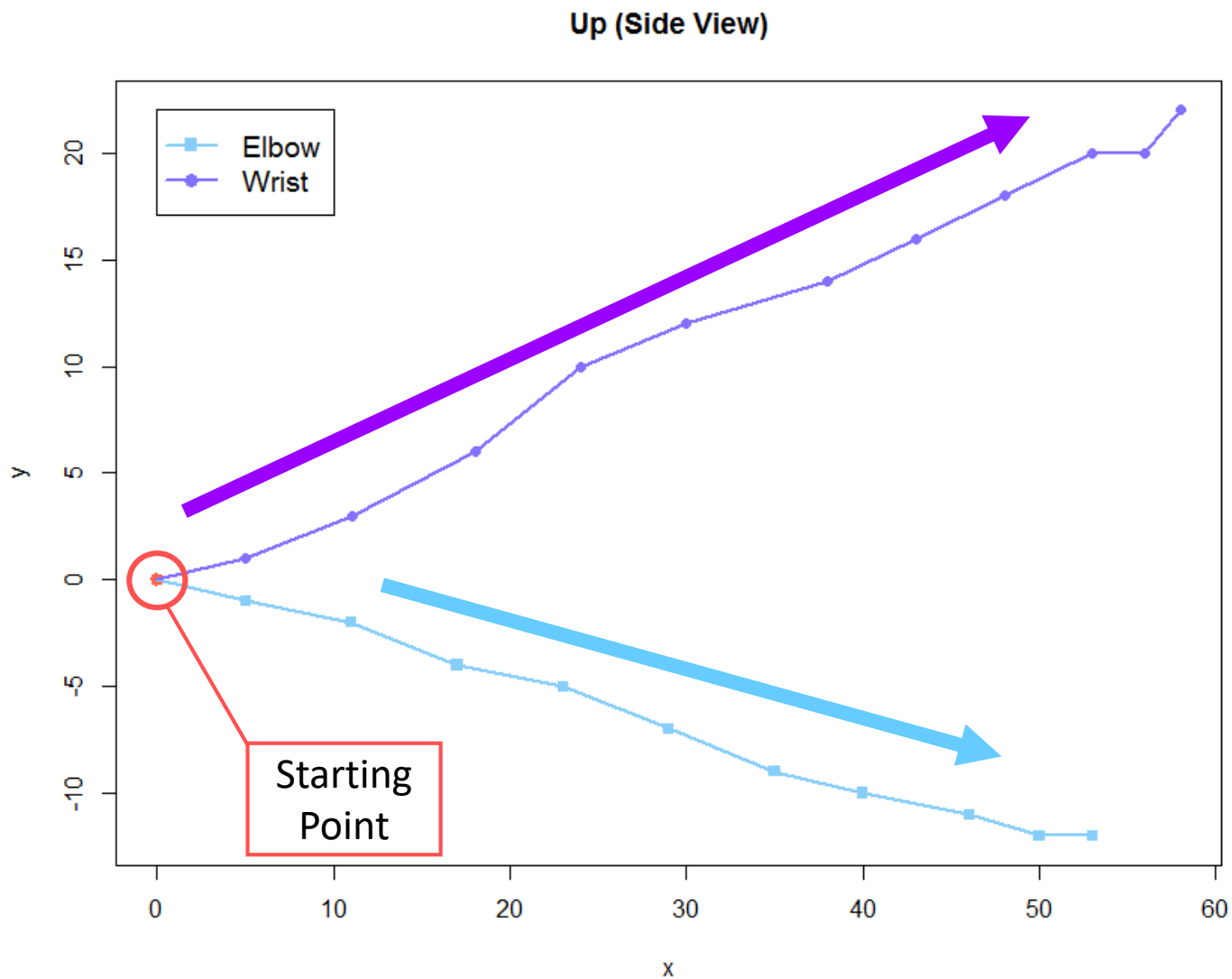
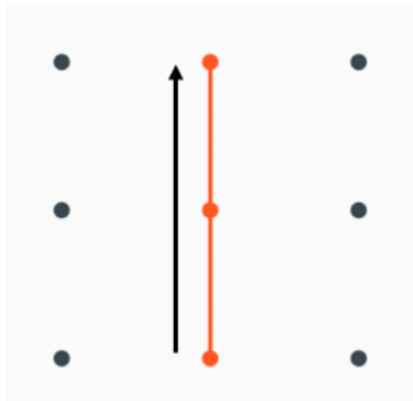
Experimental Setup

Step 3: Data visualization



How to read a movement plot

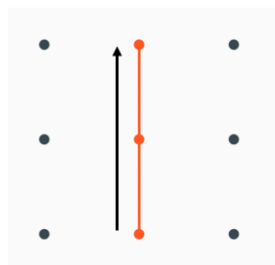
Gesture performed:



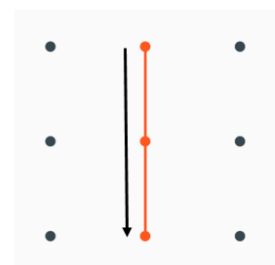
Simple patterns

Pattern performed	Direction of wrist motion	Direction of elbow motion
Up	up-right	down-right
Down	down-left	up-left
Left	up-right	down-right
Right	down-left	up-left

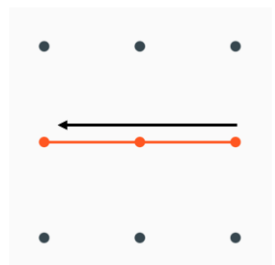
Up



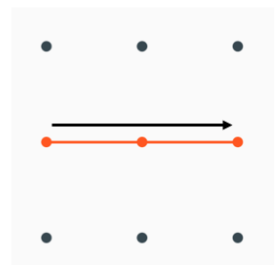
Down



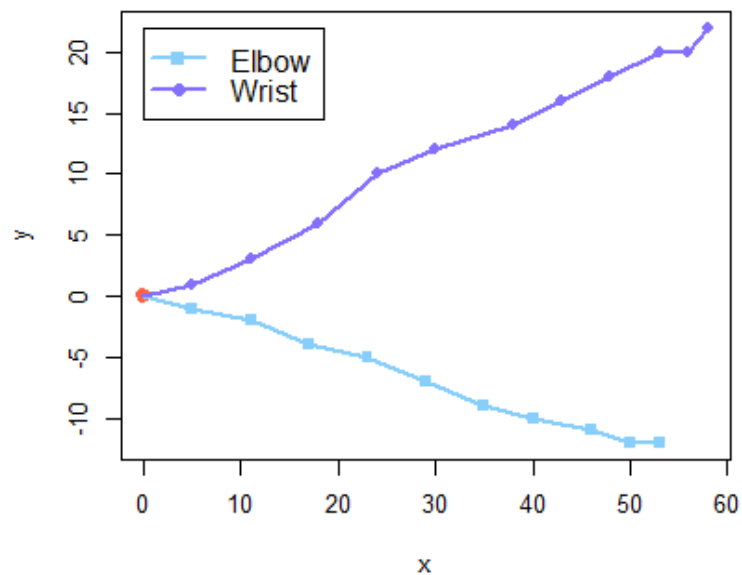
Left



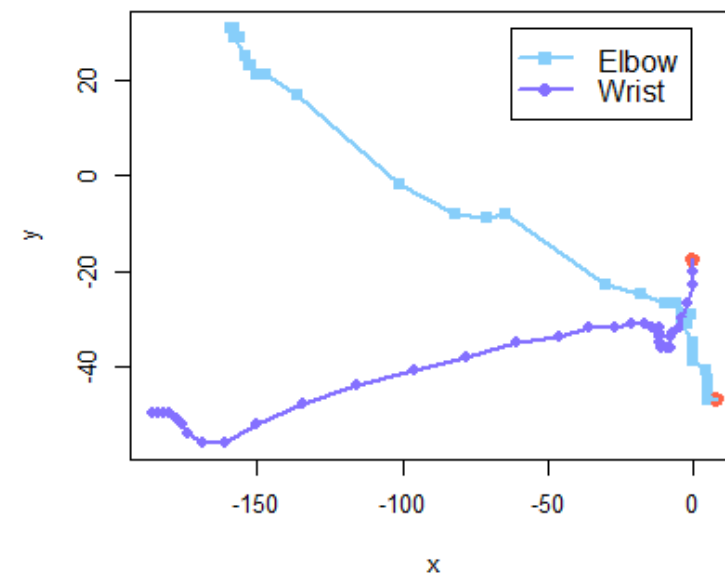
Right



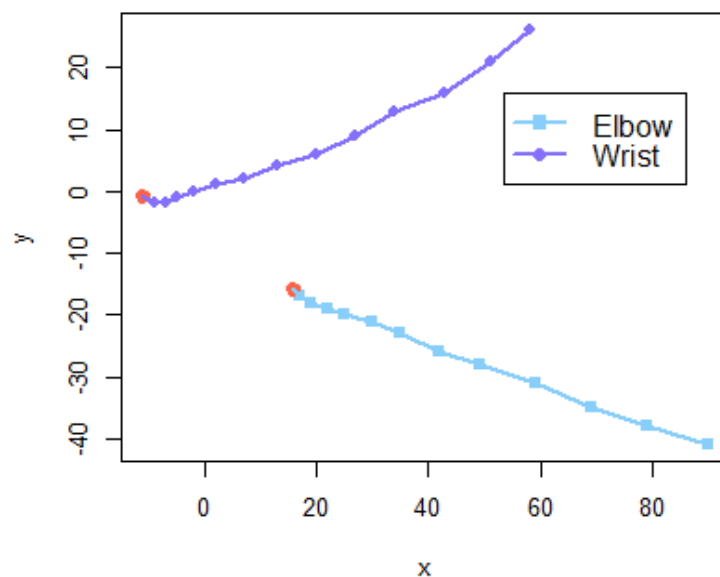
Up (Side View)



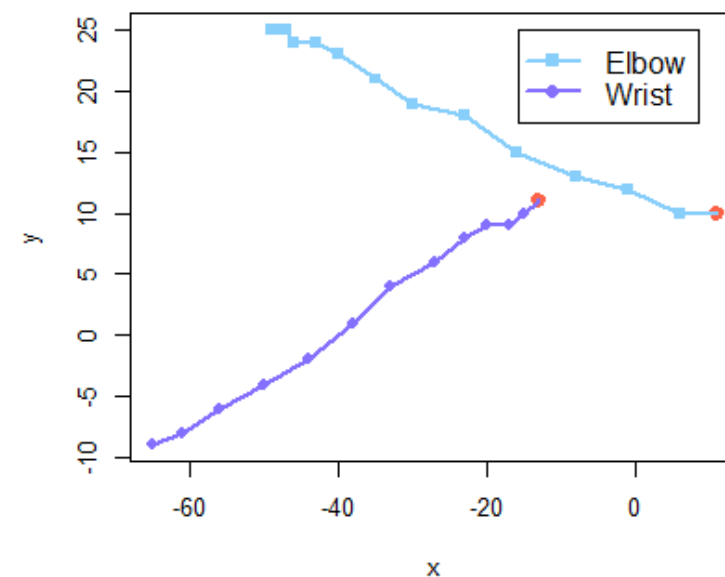
Down (Side View)



Left (Side View)

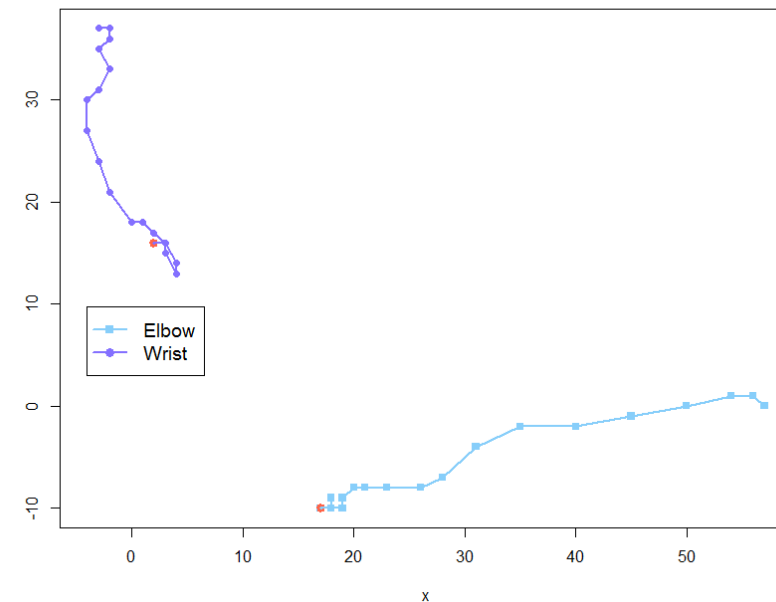
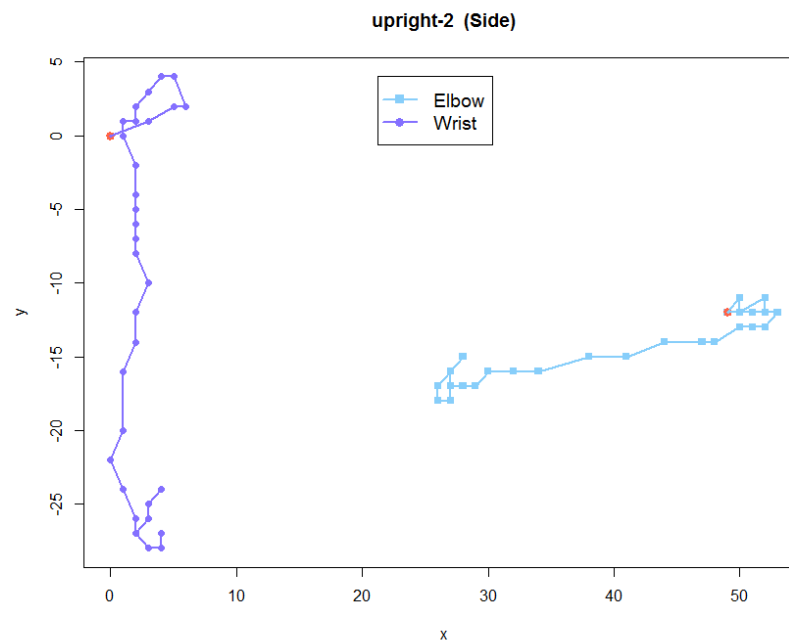
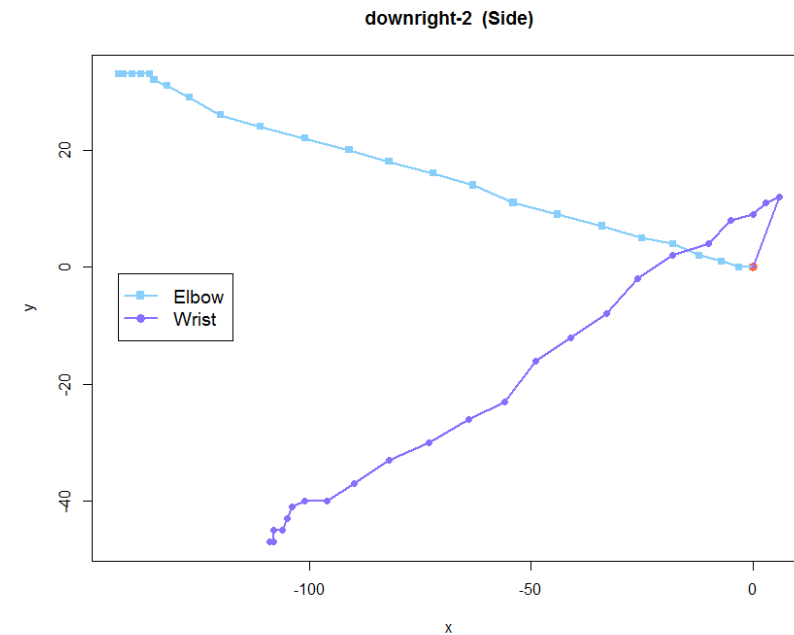
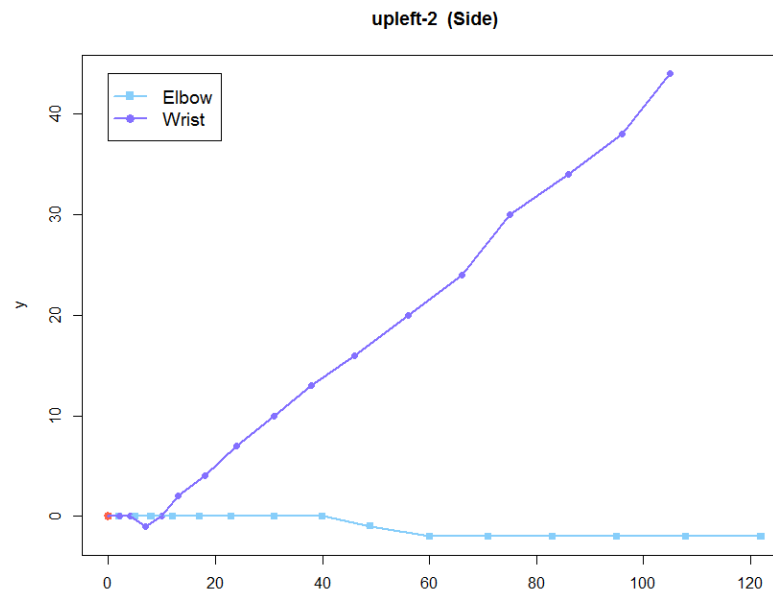
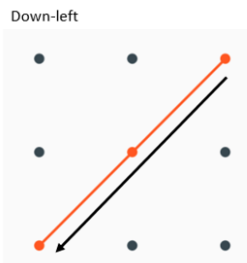
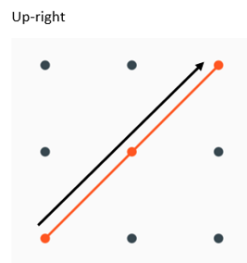
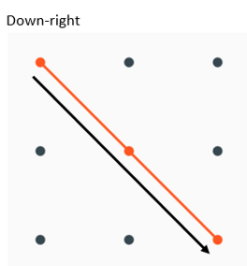
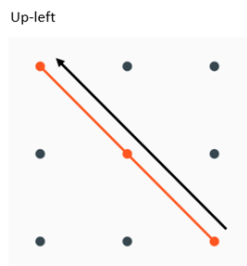


Right (Side View)



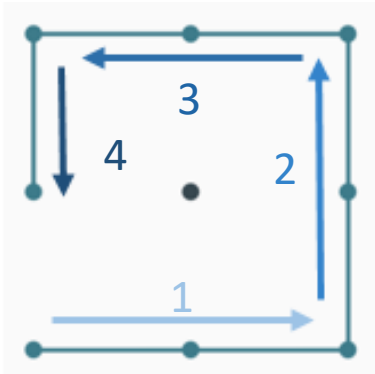
Simple patterns

- Side orientation
- Four diagonal movements (upleft downright, upright, downleft)

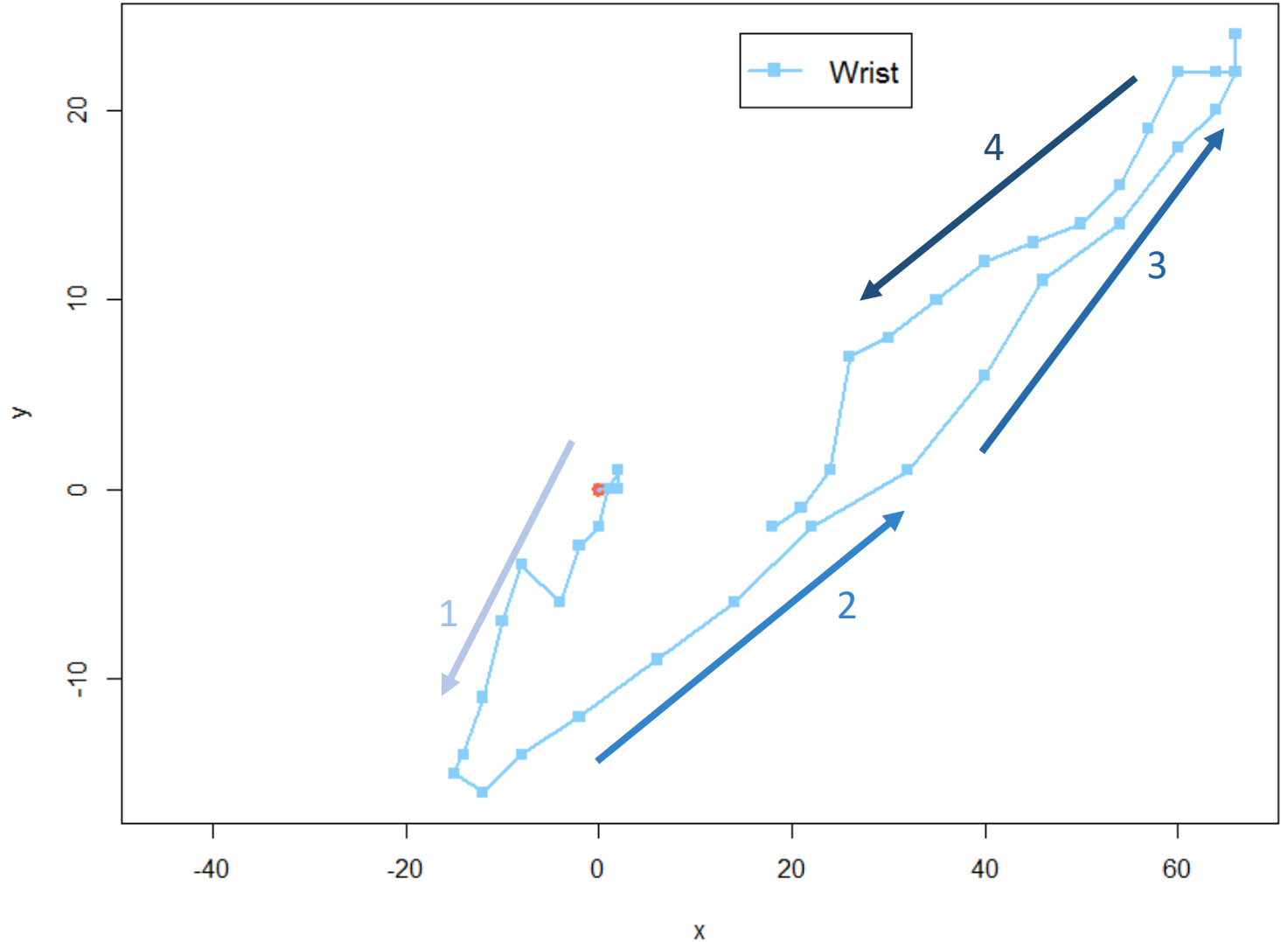


Moving on to more complex patterns

Complex_1 (Side View)



Pattern performed	Direction of wrist movement
Up	up-right
Down	down-left
Left	up-right
Right	down-left



Next steps

- 3D depth sensing using Project Tango tablet or Kinect
 - Differentiate more clearly between “up” vs. “left” and “down” vs. “right”
- Analyze data from back orientation
- Expand dataset to include a more diverse group of subjects
- Create movement classifier



DIMACS

*Center for Discrete Mathematics and Theoretical Computer Science
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Acknowledgements

References

1. Owusu, E., Han, J., Das, S., Perrig, A., & Zhang, J. (2012, February). ACCessory: password inference using accelerometers on smartphones. In *Proceedings of the Twelfth Workshop on Mobile Computing Systems & Applications* (p. 9). ACM.
2. Ye, G., Tang, Z., Fang, D., Chen, X., Kim, K. I., Taylor, B., & Wang, Z. (2017, January). Cracking Android pattern lock in five attempts. In *The Network and Distributed System Security Symposium*.