Midterm Presentation: Same-body Authentication

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Overall Project Goals and Specific Aims

- Address data security and privacy due to the pervasive and shared uses of mobile phones and wearables/hearables
- Investigate the case of unwanted sensitive data leakage when the user cannot initiate physical interaction with the phone and wearables
- Explore types of unique context data that can be collected by both the phone and the wearables
- Deliver an Android app that periodically verifies whether a sensor array (*i.e.* set of paired Android phone and wearable/hearable) is still in the same person's "possession"

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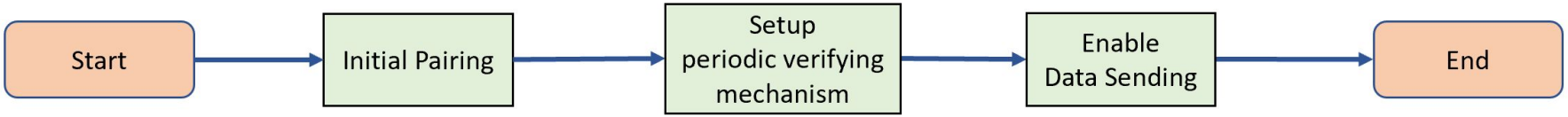
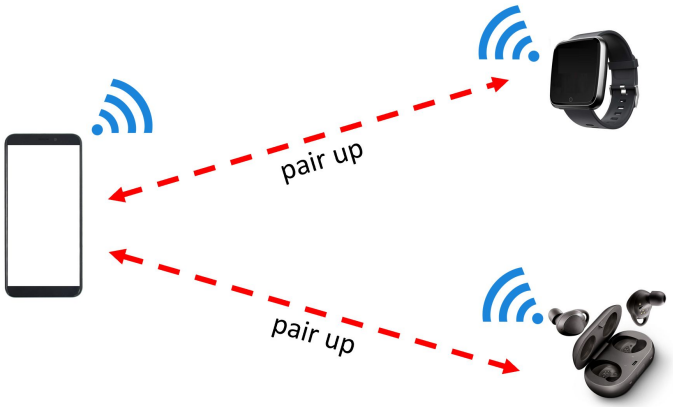
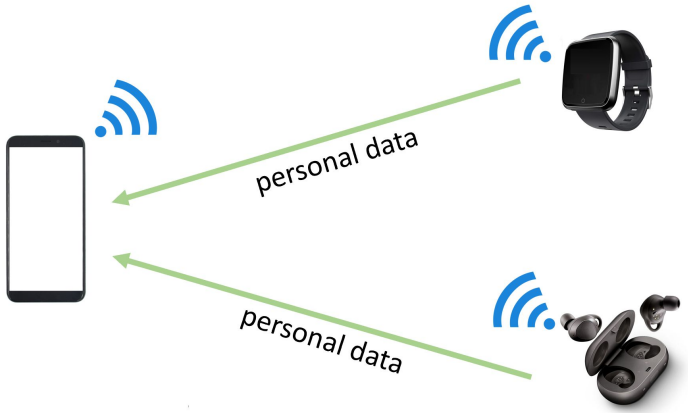
Technical Approach

- The authentication android app performs the following tasks:
  1. Perform initial pair-up between an android phone and a wearable/hearable
  2. Enables sensitive data communication for this device pair
  3. Tell the user what triggering event and context sensing are used for this device pair's periodic verification
  4. Conduct periodic verification for this pair by periodically "reminding" the user via the corresponding triggering event and context sensing
  5. Disable sensitive data communication if the user fails to make a response

Initial Pairing Scheme







smartphone

IoT devices

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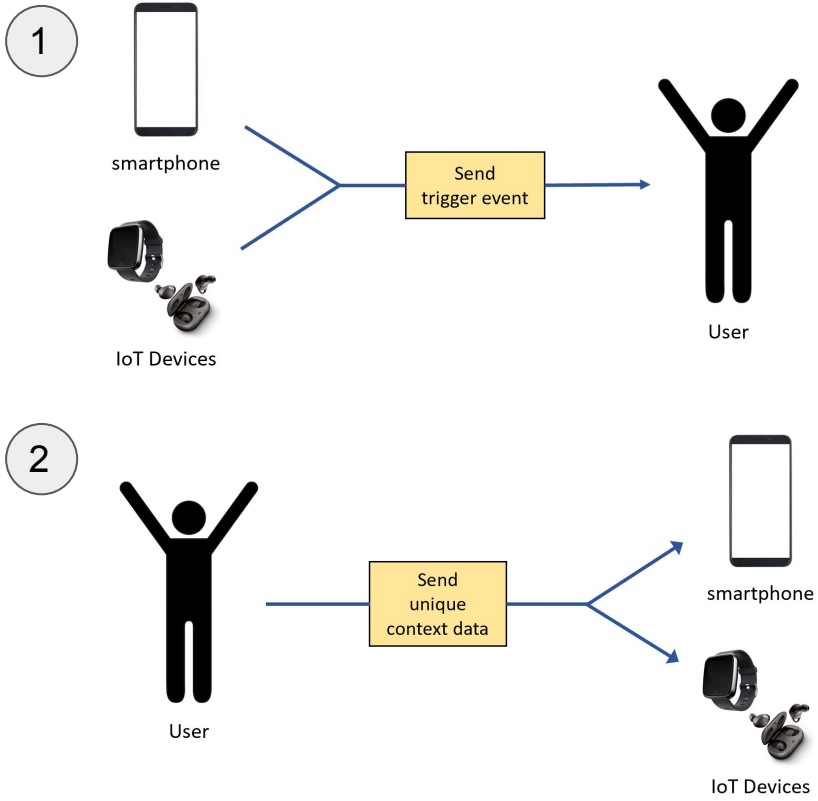
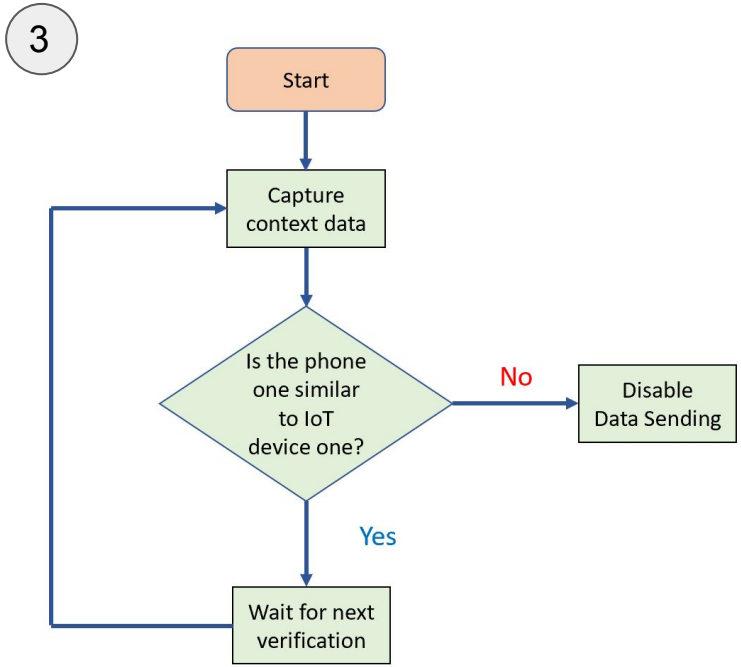
Periodic Verifying Scheme





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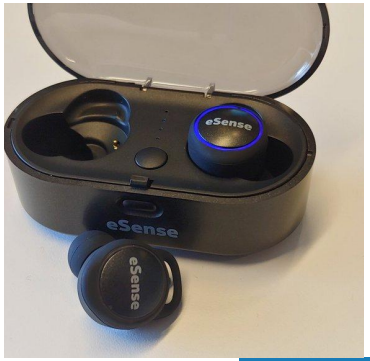
Current Status

- Developed the Android application for wearable, phone and hearable data streaming
- Integrated sensors for real time sensor data acquisition and plotting
- Implementing the pairing conditional for continuous authentication
- Investigating the interrupt detection algorithm for periodic check ups



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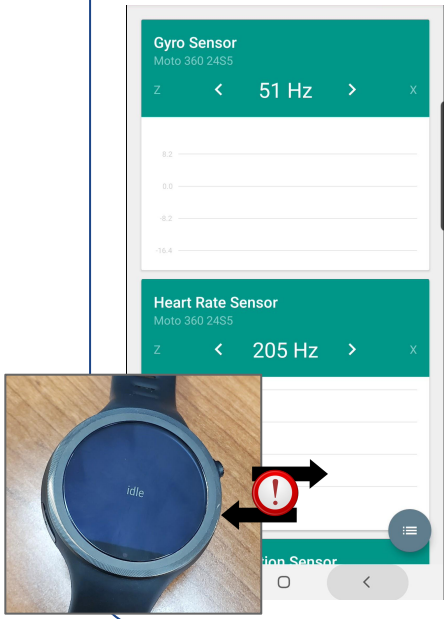
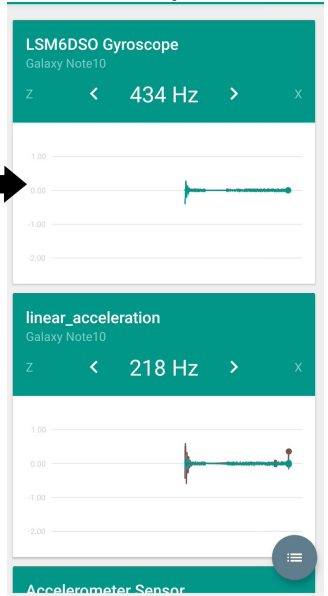
Establish Sensor Streaming Phone and Wearable

Data streaming is not established

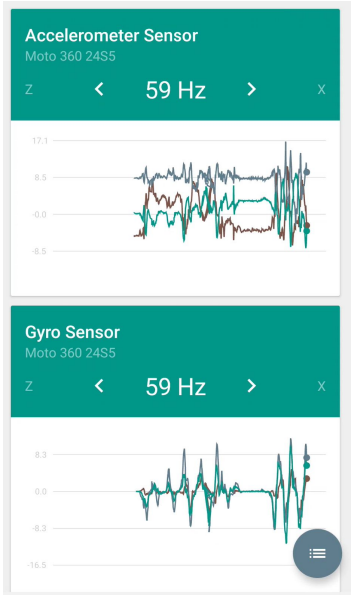


Watch is enabled to stream the data

Tracking the sensors on the phone



Tracking the sensors from the watch



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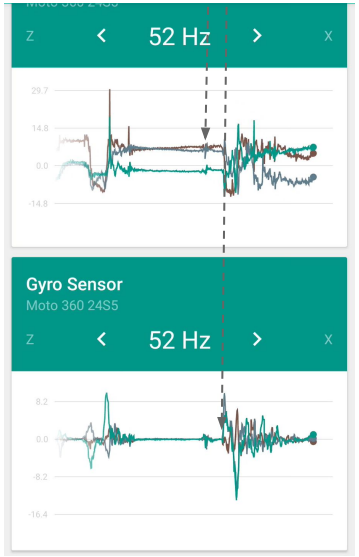
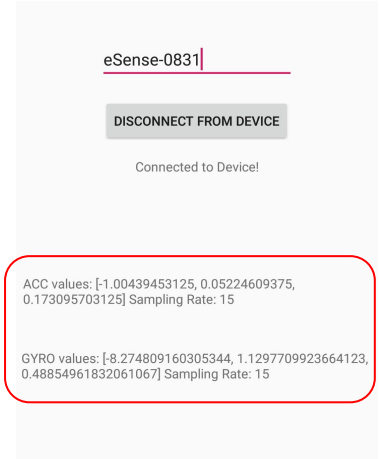
Initial and Periodic Authentication

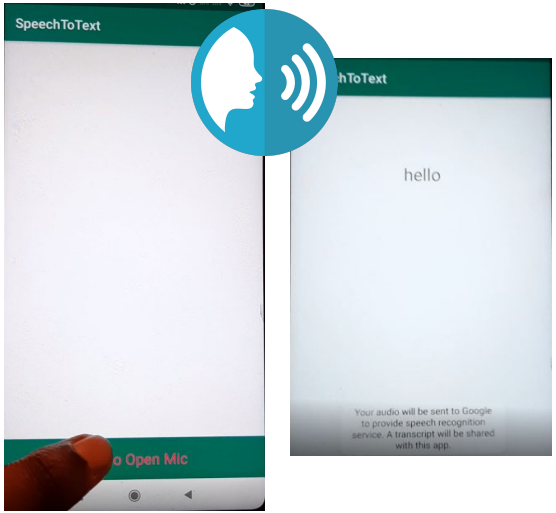
Wearable body disconnection event-gesture tracking



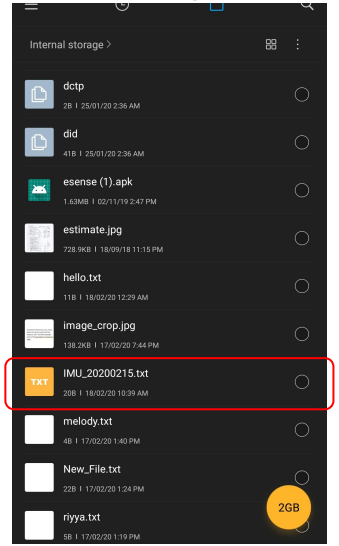
IMU data from the hearable (left hearable has an IMU) is visible on the app



Speech to text recognition for initial pairing



Local sensor data storage



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Next Steps

- Sync/group the current applications developed for the initial authentication of hearable and wearable
- Integrate grouped sensor pairing/unpairing for wearable and hearable (~1.5 weeks)
- Develop periodic authentication checkpoints (~2 weeks)
- Take demos and prepare the final report

References

[1] Zhang, Jiansong, et al. "Proximity-based IoT device authentication." IEEE INFOCOM 2017-IEEE Conference on Computer Communications. IEEE, 2017.

[2] Cornelius, Cory T., and David F. Kotz. "Recognizing whether sensors are on the same body." Pervasive and Mobile Computing 8.6 (2012): 822-836.

[3] Han, Jun, et al. "Do you feel what I hear? Enabling autonomous IoT device pairing using different sensor types." 2018 IEEE Symposium on Security and Privacy (SP). IEEE, 2018.

[4] Anand, S. Abhishek, and Nitesh Saxena. "Noisy Vibrational Pairing of IoT Devices." IEEE Transactions on Dependable and Secure Computing 16.3 (2018): 530-545.

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Q&A Time!

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