

## **CSE 535 : Mobile Computing - Group 24**

### **Literature Scribe on Group 23's Literature Review**

Title: MotionAuth: Motion-based Authentication for Wrist Worn Smart Devices

#### **Scribe Authors:**

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#### **Summary:**

The paper talks about how smart wearable electronics such as smartwatches and fitness-trackers can be used for authentication purpose. The paper has coined a new term “MotionAuth” which deals with authenticating users based on the data of Accelerometer and Gyrometer values generated when the device owner performs certain actions. The authors do not employ any machine learning techniques. Rather the researchers have simply modelled these data into a template which is used for verification purpose at a later stage of testing. However, the experimentation of MotionAuth has been extremely poor as neither the sample-size nor the gestures have been adequately experimented upon. Moreover, there were glaring grammatical mistakes on both, the paper and its review. We also find that the review is not technically complete as the reviewers have missed out on some key observations.

#### **Pros:**

1. The reviewer correctly pointed out that there are no machine learning classifiers involved in designing templates. Any robust authentication mechanism uses various machine learning techniques for detecting anomalies and predicting them accurately.
2. The reviewer correctly predicts that the testing is performed on 30 people using simple gestures like Circle, Rotation, Hand Down, Hand up. As the number of users increases, the number of attempts for the attacker to invade in the system trying different possible gestures are very less. If a complex gesture was chosen, the time and the effort taken to break through the system would be comparatively more.
3. Reviewer understands the concept proposed in the paper. Additional behavioural biometric based authentication mechanisms used in real worlds can be mentioned to prove their claim.
4. Reviewer correctly analyses the cost of implementing this authentication in the wearable devices. But the disadvantages of using only two sensors is skipped.
5. Reviewer has spotted the problem with verification accuracy when using only 4 gestures for authentication.

#### **Cons:**

1. The reviewer failed to notice the disadvantages of “leave-one-out cross validation” error method used in the paper. With this method, the model developed is susceptible to high variability as only one instance was used for validation. Also, the method is computationally expensive due to large number of iterations in case of large dataset.

2. The reviewer fails to point out the quality of features used in template generation phase using Histogram based method. Out of the 30 features, half of them are derived features due to which the primitive features needed for accurate building of the template are scarce.
3. The reviewer has stated that 2 verification methods are used in the paper- DTW and Histogram method, but he missed to observe that the paper lacks explanation about which of the two methods is chosen for validation in different cases.
4. The reviewer states that the system is vulnerable to impersonation attacks. They fail to mention that the paper has not provided any countermeasure for such an attack.
5. The need for better validation techniques is stated by the reviewer but no suggestions are made.
6. In the sixth point of cons section, the reviewer is unsure about the quality of data analysis and comments it to be good.
7. The paper does not provide an alternative when there is no secure connection for computation between the wearable device and the external PC. Reviewer has not mentioned this.
8. The reviewer fails to mention the additional case that the paper considers where if the wearable device does not have any visual interaction interface, the paper suggests to use vibration or sound for notifying the user about the verification result.

#### **Feasibility and Importance of the recommendations:**

1. The reviewer believes the computation which is done on the backend PC and the storing needs to be done entirely on the smartwatch rather than using an external PC. This will be more difficult and consume a lot of power and time.
2. The reviewer contradicts his opinion about the data quantity. In pros, reviewer says that the data collected is a lot but contradicts his opinion by mentioning to use larger samples in the cons section.
3. The reviewer rightly points towards the paper's focus on only simple gestures and recommends implementation of complex gestures.

#### **Reference:**

1. Junshuang Yang, Yanyan Li, Mengjun Xie, "*MotionAuth: Motion-based Authentication for Wrist Worn Smart Devices*" Workshop on Sensing Systems and Applications Using Wrist Worn Smart Devices, 2015