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Project Title: Behavioural Biometric Phone lock

Summary

The project objective is to create an application that runs on a smartphone that can distinguish between users based on their interaction with the device so that it can be used for security / user authentication.

Lots research has been conducted in recent decades about Behavioural Biometrics and it has been observed that each user has a unique way of interacting with a device. By observing style peculiarities typical to a user, a verification can be accomplished to see if that user is who he/she claims to be.

User authentication will be verified at the initial interaction with the device (E.g. when password is entered) and it will continue the authentication testing in the background to ensure that the authorised identity is still who they claim to be after initial login procedure. This will be done using behavioural biometrics to supplement password security login and continuous authentication. When it is found that the user is not genuine, the system should lock to avoid any damage done by the impostor.

The goal of this project is to increase the security of a smartphone using behavioural biometrics. The application will be deployed to an Android smartphone and the identification will be made via dynamic behavioural biometrics interactions (E.g. keystroke, touch and movement).

Background (and References)

The core aspects of the project are the different types of behavioural biometrics that are going to be looked at: keystroke dynamics, touch dynamics and behavioural dynamics.

References and Links

Behavioural Biometrics:

Roman V. Yampolskyi and Venu Govindaraju. Behavioural biometrics: a survey and classification -> <http://cecs.louisville.edu/ry/Behavioral.pdf>

Keystroke Dynamics:

Sail P. Banerjee and Damon L. Woodard. Biometric authentication and identification using keystroke dynamics: A Survey -> <http://lsia.fi.uba.ar/papers/banerjee12.pdf>

Soumik Modal and Patrick Bours. Context Independent Continuous Authentication using Behavioural Biometrics ->

<https://www.researchgate.net/publication/257932362> Continuous authentication using mouse dynamics

Touch and Movement dynamics:

Cheng Bo, Lan Zhang, Xiang-Yang Li. Silent Sense: Silent User Identification via Dynamics of Touch and Movement Behavioural Biometrics -> <http://arxiv.org/pdf/1309.0073.pdf>

Mario Frank, Ralf Biedert, Eugene Ma, Ivan Martinovic and Dawn Song. Touchalytics: On the applicability of touchscreen Input as a Behavioural Biometric for Continuous Authentication -> <http://arxiv.org/abs/1207.6231>

Proposed Approach

My project will have the following stages through completion:

1. Research previous work done with behavioural biometrics for identification and authentication.
2. Design and Implement the Android application
3. Evaluation and testing.

The generalised Algorithm needed for my research and implementation, based on Roman V. Yampolsky and Venu Govindaraju research, will incorporate these steps:

- Pick behaviour
- Break up behaviour into component actions
- Determine frequencies of component actions for each user
- Combine results into a feature vector profile
- Apply similarity measures function to the stored template and current behaviour
- Experimentally determine a threshold value
- Verify or reject user based on the similarity score comparison to the threshold value.

The above steps will be used for the implementation of a few prototypes, each using a different algorithm for finding the similarities and dissimilarities of behavioural biometrics in order to identify the genuine users and intruders. After testing the prototypes with real users, the results will be compared to determine what approach worked best.

Deliverables

- Project Dissertation
- User Guide
- A functional android application for demonstration

Priority features:

- Ability to continuously monitor the smartphone and check if user is genuine
- Ability to identify users through initial interaction with the device
- The ability to choose applications to be protected when a guest/attacker uses the phone

Secondary features:

- Nice user interface
- Encrypt the biometric data during gathering and verification

Technical Requirements

- Laptop
- Android smartphone 4.0 Ice Cream Sandwich or greater

Technologies used:

- Java
- Android Studio / IntelliJ IDEA
- Android SDK
- Machine learning algorithms

Project Reviews

Project 1

Title: Activity Recommendation For Android

Student: Lee Murray

Description:

The goal of that project was to make some recommendations to users of what activities they can do when they found themselves they do not have anything to do. An android application, which can be downloaded from Google Play store. A user profile can be created where the users can indicate their gender how "Active, Adventurous, Sporty, Daring or Cultural they would like the activity to be". In order to make the recommendations, factors like user location, weather conditions and current time are taken into consideration.

What is complex in this project?

In my opinion, the complexity of this project consists in the variety of technologies used. In order to make recommendations, whether details were retrieved to the Web server from an Open Weather App based on user's location and user details were stored in MySQL database along with the settings used for more specific recommendations that could be changed and remembered for that particular user. Google Places API and Google Maps API were also integrated in this application so that the recommendations are made close enough to the user location or in a location that the user specifies.

Another aspect that increases the complexity, in my opinion, is that the project has been tested using unit testing and user testing.

What technical architecture was used?

The methodology for this project was Rapid Application Development (RAD) and the technologies used were: Android Studio, Android SDK, Java, MySQL, PHP, Google Places API, Google Maps API and Open Weather App.

Explain key strengths and weaknesses of this project, as you see it.

One key strength of this project, in my opinion, is that it is letting the user customize settings and make recommendations based on that. I would not be any good if the recommendations were done in the same way for all users. I think it is good to have an app like this when I really don't know what to do. It is quite good way to meet new people that are passionate for the same activities.

Project 2

Title: Space Light Hardware and Software system to monitor power consumption of various household appliances

Student: Sanita Tifentale

Description:

The objective of this project was to create a system that would monitor the power consumption of a household. The data was gathered with special sensors, transmitted to Arduino Uno and then to a MQTT server. Data was represented in various graphs and statistics and it can be used to indicate what appliances cost more to run and which could be considered for replacement.

The focus of the project was to monitor household electricity consumption and lower it as much as possible by setting targets, observe where the most energy is lost and try to do something about it.

What is complex in this project?

The complexity of this project consists in the large number of technologies used and on the combination of hardware and software to achieve the desired functionality. Very good research was done in both areas and all the features are well explained.

What technical architecture was used?

The approach used for this project the "Evolutionary" approach and the technologies included: Python, Arduino Language, MQTT Protocol, MQTT Message Log Plug-In, Amazon AWS, PostgreSQL, Flask, AngularJS, HTML 5, CSS3, Yeoman, GitHub, Mendeley, ShareLatex, Nginx and Unicorn.

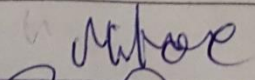
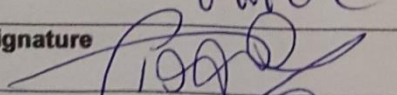
Explain key strengths and weaknesses of this project, as you see it.

A very good work was done in implementing the software using both hardware and software technologies to achieve the final product. I think that the combination of all the technologies listed above made the project really complex and stable. The idea behind the project was also very good and I think it could help people to reduce energy consumption. Just by setting a target of how much electricity to consume per month and deciding to do the best to achieve that, could reduce consumption. It is always good to have a target and decide to achieve it.

In my opinion, the weakness of this project is that it would take a bit of time to install all the components in a household in order to work.

Proposal Sign off:

Lecturer Comments

Student Signature		Date	1/10/15
Lecturer Signature		Date	1/10/15