



Danmarks Tekniske Universitet

TERM PAPER

COURSE:
02238: Biometric Systems

AUTHOR(S):
Stephan Thordal Larsen (s146907)

DTU Compute
Institut for Matematik og Computer Science

02238: Biometric Systems

16 May 2016

Contents

1 Introduction

The minimization of computing hardware which spawned the smartphone era, has also allowed for the development of powerful smartwatches filled with sensors. These sensors can continuously observe the wearers bodily functions, which in theory can be utilized for biometric identification of the wearer. This could allow for a strong link between the user and smartwatch, resulting in unobtrusive and ubiquitous user authentication.

This paper will analyse the first generation of smartwatches, more specifically the *Apple Watch*, to find which biometric capabilities that can be utilized for user identification and authentication. The analysis will look into the available sensors and the *Software Development Kit (SDK)* provided by Apple, in order to find which biometric observations can be performed. The paper will try to identify both possibilities and limitations of the system, and try to utilize the possibilities in a prototype, to see how this in practice could be implemented. The prototype will include feature extraction from biometric measurements and a comparison of these, in order to identify the wearing individuals. Lastly the prototype will be tested on 10 subjects, to evaluate the prototypes performance.

2 Analysis

This section will analyze the potential for biometric measurements on the *Apple Watch*. The analysis will cover both the hardware and software, i.e. which sensors are included in the watch and how they are utilized by the SDK. The sensors will also be evaluated on their usefulness for biometric identification. Finally the analysis should result in a selection of sensors found appropriate for the prototype.

2.1 Sensors

The *Apple Watch* includes a multitude of sensors [?], which are used mainly for activity, fitness and health tracking, but they are also used for some security functionalities.

2.1.1 Heart rate sensor

2.1.2 Accelerometer

2.1.3 Gyroscope

2.1.4 Microphone

2.1.5 NFC

The potential of an NFC chip in the watch seems promising for access control, as it could allow for interaction with third-party devices, i.e. NFC readers. This could be utilized for doors which rely on NFC key cards, where the watch could function as a secure device containing the NFC key cards. Unfortunately This is simply not possible, as Apple has restricted developer access to the NFC chip, only allowing it to be used with their own *Apple Pay* service.

2.2 Limitations

The SDK does not allow for full control of all aspects of the watch.

References

- [1] Apple Inc. Apple watch - technical specifications, 2016. URL: https://support.apple.com/kb/SP735?locale=en_US.