University of Hradec Králové
Faculty of Informatics and Management
Department of Information Technologies

# MASTER'S THESIS

## Radio Fingerprint Acquisition Using a Smartwatch

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**Study programme:** Applied Informatics

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## Prohlášení

Prohlašuji, že jsem diplomovou práci vypracoval samostatně a uvedl jsem všechny použité prameny a literaturu.

## Declaration

I declare that I have elaborated this thesis independently and listed all the sources and literature.

Hradec Králové day 26th of April 2018 Bc. David Sucharda

## Poděkování

Rád bych zde poděkoval Ing. Pavlu Kříži, Ph.D. za odborné vedení práce, podnětné rady a čas, který mi věnoval.

## Thanks

I would like to thank to Ing. Pavel Kříž, Ph.D. for professional guidance, incentive advices, and the time he gave me.

## Anotace

**Název práce: Sběr rádiových fingerprintů pomocí chytrých hodinek**

Diplomová práce se zabývá možnostmi sběru rádiových otisků (fingerprintů) za pomoci chytrých hodinek. Tyto otisky se používají k lokalizaci uvnitř budovy. Hlavním cílem této práce je prozkoumat možnosti sběru otisků a návrh aplikace která bude tento sběr umožňovat. V první části práce je potřeba zjistit, jestli je tento sběr na hodinkách vůbec možný. V další části je zpracování aplikace na mobil a hodinky. A jako poslední část této práce je sběr otisků a jejich analýza. Jeden z osobních cílů je zpracovat tuto aplikaci aby byla co nejvíce uživatelky přívětivá.

## Annotation

The Master's thesis deals with possibilities of collecting radio fingerprints with the help of smart watches. These prints are used in indoor localization. Main aim of this thesis is to explore possibilities of fingerprint collection and creation of application that will allow it. First part is to figure out if this collection is even possible using smart watch. Next part deals with creation of such application not only for watch but also for the phone. And at the end part there is testing of fingerprint collection and data analysis. One of the personal goal is to make this application as user friendly as possible.

# Content

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# 1 Introduction

As the technology evolves it unlocks more and more possibilities. Just few years back there were no such things as smart phones or smart watches but now they are important part of our lives. And as they evolve there is the need for them to have more functions. One of them is to locate it's position on the map. This is possible using Global Navigation Satellite System (GNSS). There is multiple implementation of this system like GPS, GLONASS or Galileo. All of these systems provide location using sufficient number (at least 4) of satellites. GNSS solution requires clear path between satellites and the device so It cannot be used indoor because the signal is not able to pass through buildings.
That is why

## 1.1 Reason for selection of this theme

# 2 Indoor localization using RSS Fingerprints

Text

## 2.1 How does it work

## 2.2 Localization methods

# 3 Android Wear 2.0

Text

# 4 Analysis, design and implementation

Text

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## 4.2 Software

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#### Android Wear

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### 4.2.3 SQLite database

### 4.2.4 Couchbase database

### 4.2.5 TileView

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#### Model

#### Utilities

### 4.3.2 Wear application

# 5 Testing and data analysis

## 5.1 Data collection

## 5.2 Analysis

# 6 Conclusion

## 6.1 Application improvements

# Literature

[1] KOMÁREK, Aleš a SOBĚSLAV, Vladimír. *OpenSource Automation in Cloud Computing*. In *Proceedings of the 4th International Conference on Computer Engineering and Networks*. Springer International Publishing, 2015, s. 805-812, ISBN 978-3-319-11103-2.

[2] HEDENGREN, Thord Daniel. *Smashing WordPress: Beyond the Blog, 4th Edition*. John Wiley and Sons, 2012, ISBN 978-1-118-60075-7.