

# Towards Quantitative Eye-tracking User Studies of Mobile Applications

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## Motivation

- ▶ Nowadays usability testing of mobile applications is performed more frequently
- ▶ Execution of quantitative mobile usability studies is very difficult and their evaluation is very time consuming
- ▶ Quality of mobile eye-tracking data is very low



## Eye-tracking on mobile devices



## Study 1

- ▶ 18 participants performed set of tasks on mobile device and set of tasks on emulator (same mobile application)

### Results

- ▶ 19 unique usability problems were identified (17 emulator, 16 mobile, 14 both devices)
- ▶ Emulation revealed 87.5% of problems revealed on mobile

## Study 2

- ▶ Bulk testing of two mobile applications - 24 participants
- ▶ Additional 14 generic usability problems were manually injected into tested applications with intention to verify our defined lists of generic usability problems

### Results

- ▶ 21 unique usability problems were identified (76% by emulation)

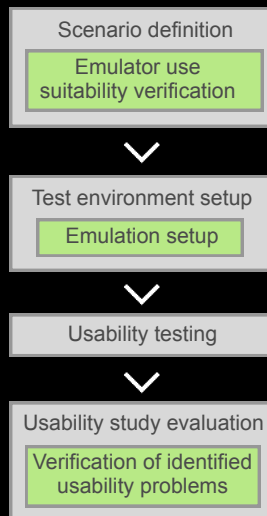
## Our method

Our method add steps defined by us as extension of steps for regular usability study. Thanks to these steps quantitative usability testing of mobile applications with use of emulation is possible.

Scenario definition is extended with step of emulator use suitability verification. In this step we verify whether planned study can be realised with use of emulation.

In step of test environment setup we define steps required for correct emulation setup. This includes also inserting of loggers for user activity monitoring.

Usability study evaluation is extended with step of verification of identified usability problems. We need to verify validity of identified problems thanks to our lists of generic usability problems.



## Loggers

Implemented libraries for support of user activities logging in mobile applications (clicks, scroll, target elements identification)



## Example generic usability problems

Created list of 46 generic usability problems of mobile applications (31 identifiable + 15 unidentifiable by emulation)

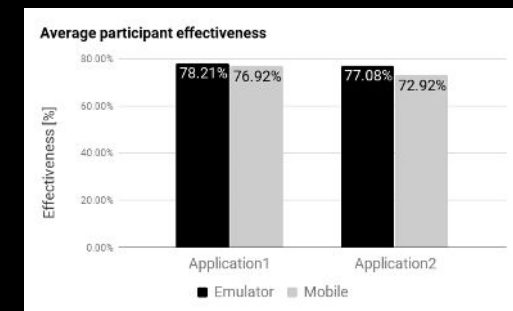
### Identifiable by emulation

- ▶ Findability
- ▶ Functionality misunderstanding
- ▶ Content misunderstanding

### Unidentifiable by emulation

- ▶ Small clickable areas
- ▶ Speed related problems
- ▶ Mobile context related problems

- ▶ From 14 injected generic problems 13 were proved to be correctly defined as identifiable/unidentifiable by emulation
- ▶ Experiment showed that participant effectiveness is not significantly influenced by type of used device



### Participant effectiveness based on device type:

Application 1: difference 1.29%  
Welch's t-test: p-value: 0.913002  
95% CI: (-10.34 ; 12.9)

Application 2: difference 4.16%  
Welch's t-test: p-value: 0.720414  
95% CI: (-7.24 ; 15.5)