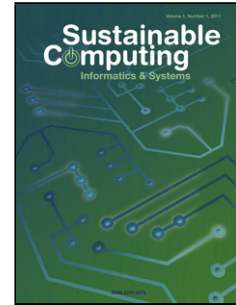


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An App Performance Optimization Advisor for Mobile Device App Marketplaces

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Abstract

On mobile phones, users and developers use apps official marketplaces serving as repositories of apps. The Google Play Store and Apple Store are the official marketplaces of Android and Apple products which offer more than a million apps. Although both repositories offer description of apps, information concerning performance is not available. Due to the constrained hardware of mobile devices, users and developers have to meticulously manage the resources available and they should be given access to performance information about apps. Even if this information was available, the selection of apps would still depend on user preferences and it would require a huge cognitive effort to make optimal decisions. Considering this fact we propose APOA, a recommendation system which can be implemented in any marketplace for helping users and developers to compare apps in terms of performance.

APOA uses as input metric values of apps and a set of metrics to optimize. It solves an optimization problem and it generates optimal sets of apps for different user's context. We show how APOA works over an Android case study. Out of 140 apps, we define typical usage scenarios and we collect measurements of power, CPU, memory, and network usages to demonstrate the benefit of using APOA.

Keywords: Android; iOS; Contexts of use; Performance metrics; Optimization; Decision Making;

1. Introduction

Typical users of mobile devices purchase and download apps using platform dependent repositories/marketplaces of apps, colloquially referred to as app-stores. Android is an open-source operating system for mobile devices. It is used by more than 1.4 billion users for a global market share of 53%¹. iOS is a mobile operating system created and developed by Apple for its hardware. It is the second most popular mobile operating system globally after Android². Both platforms offer apps belonging to different categories through their marketplaces; the Google Play Store³ and the Apple Store⁴ apps, for Android and iOS, respectively. For each app in any of these marketplaces, customer ratings are provided as a quality metric. The

rating is a number between one and five, which is calculated as the weighted average of user ratings in the marketplace. Mobile device users compare and select apps from marketplaces based on their rating and number of downloads (Gomes et al. (2016)). This fact results in users choosing apps that other users choose (popularity), even if the apps are less efficient than other apps offering similar functionalities (Saborido et al. (2016)).

Selecting a cost-effective app is a challenging task, because of the large number of apps that offer similar functionalities, and the lack of information about the performance of the apps. For example, there are a very large number of browsers, cameras, and music players available but the decision on which app to use lies more on subjective requirements, such as usability, features, cost, etc. Interestingly, as we found in our Android case study, apps with similar functionalities can have a different performance. For instance, to visit an article in Wikipedia, the browser Chrome uses more power and transmits more data over the network than the browser Opera (mini). However, the former uses less CPU. It means that there exist a trade-off in terms of performance between different apps. The same keeps for any category of apps in any

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¹<http://expandedramblings.com/index.php/android-statistics/>

²<http://www.kpcb.com/internet-trends>

³<https://play.google.com/store/apps>

⁴<https://itunes.apple.com/ca/genre/ios/id36?mt=8>

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