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# Gesture Ads for Mobile Applications

Bachelor Thesis (6 EAP)

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# Abstract

## **Gesture Ads for Mobile Applications**

Mobile advertising is an inseparable part in today's mobile application development. However, more often than not, in-application advertisements prove to be distracting to the user and, in extreme cases, even degrade the user experience to a point where the user decides to stop using the application. In addition, the content of the advertisements is based on unreliable profiling algorithms and might not reflect the user's actual interests.

A proposed solution to this problem is to display in-application advertisements to the user in a more dynamic way, in a way that would feel like the advertisement is part of the application rather than an unwelcome addition, and allowing users themselves to provide feedback on the topics of advertisements they like and dislike.

To validate the hypothesis, a mechanism is developed in the form of an Android library and an accompanying server application. As a use case it is integrated into an Android application to demonstrate the feasibility of the proposed approach.

According to the results, 64% of the users that tried out the application found this mechanism to be less intrusive than conventional advertising methods. 52% of the users reported being more interested in the advertised product.

These results show the ineffectiveness of conventional mobile advertisements and encourage exploring new directions for displaying advertisements in mobile applications.

**Keywords:** Mobile, Android, Advertising, Gestures

# Abstract

## Dünaamilised Reklaamid Mobiilirakendustele

Tänapäeval on reklaamid lahutamatu osa mobiilirakenduste arendusest. Paljudel juhtudel lasevad reklaamid arendajal oma rakendust kasutajatele tasuta pakkuda. Siiski, reklaamid mobiilirakendustes segavad sageli kasutajat ning sageli muudavad rakenduse kasutamise nii ebamugavaks, et kasutaja otsustab rakenduse kasutamise sootuks lõpetada. Lisaks baseerub reklaamide sisu ebausaldusväärsete algoritmide tulemustel ning ei pruugi kajastada kasutaja tegelikke huve.

Väljapakutud lahendus sellele probleemile on näidata rekandusesisest reklaami kasutajale dünaamilisemal kujul; sellisel moel, et reklaam tunduks nagu osa rakendusest, mitte selle ebaameeldiv lisa; ning lasta kasutajatel endil anda tagasisidet selle kohta, millised reklaamid neile huvi pakuvad ning millised mitte.

Hüpoteesi kontrollimiseks arendatakse selline mehhanism Androidi teegi, ning kaasaskäiva serverirakenduse, kujul. Kasutusloona lisatakse see ühele mobiilirakendusele, et demonstreerida sellise lähenemise kasulikkust.

64% rakendust proovinud kasutajatest arvas, et see mehhanism on vähem häiriv kui klassikalised meetodid reklaami näitamiseks. 52% kasutajatest väitis end olevat reklaami sisust rohkem huvitatud.

Need tulemust näitavad, kui ebaefektiivsed on klassikalised reklaamid mobiilirakendustes ning julgustavad uurima uusi suundi mobiilse reklaami näitamiseks.

**Võtmesõnad:** Mobiilne, Android, Reklaam, Käeliigutused

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# 1

## Introduction

Mobile advertising is an inseparable part in today's mobile application development. In many cases advertising enables the developer to offer their application to users for free. The most common way advertisements are displayed to the user is taking up a big part, if not all, of the device's screen real estate. Also commonly, the developer has little control of the content of the advertisements, which often trick users into clicking the link within the advertisement instead of closing it.

### 1.1 Motivation

More often than not, in-application advertisements prove to be distracting to the user and, in extreme cases, even degrade the user experience to a point where the user decides to stop using the application. In addition, usually the user tends to just ignore the advertisements. This makes the advertising model ineffective and compromises the reputation of the application, as well as the developer, without significant gain for any party.

Advertisements influence people's attitude towards advertising by a great deal. When advertisements employ techniques that irritate or bother the user, then the user is likely to perceive them as an unwanted influence(2). A less intrusive and more intuitive, user feedback based method of displaying advertisements would improve the user experience of the application with the added benefit of users being more likely to see the content of the advertisement.

## 1.2 Contributions

The goal of this thesis is to describe current advertisement models for mobile applications and explore new mechanisms to integrate advertisements into the flow of an application more seamlessly.

As a result, a new mechanism, namely *Gesture Ads*, will be designed and implemented. This mechanism will display advertisements in a way that is less distracting for the user and has less noticeable of an impact on using the application. It will also give the user a chance to give honest feedback on advertisement topics they like and dislike, which allows providing more relevant advertising to the user, without relying on ineffective or overly intrusive profiling algorithms(8).

The objectives of the new mechanism are the following:

- To make the application more enjoyable for the user, by offering less intrusive advertising and advertisements more relevant to the individual user.
- To ease the integration of mobile advertisements into the applications and give the developer more freedom to focus on user experience, without having to worry about advertising mechanics.
- To enable the advertiser to offer content relevant to the user, thereby increasing the user's perception of the product as well as the likelihood of the user choosing to learn more about the offer.

To integrate *Gesture Ads* into an application, a Java library for Android <sup>1</sup>, was created. Application developers can use the library, which would integrate advertisements more seamlessly into the flow of the application. It would allow the application to receive all the necessary data via a push notification from the server and then display a very minimalist form of it to the user, without taking up too much of the very limited screen space of the device. The application should still retain usability for any time-critical activities with the advertisement being movable if necessary.

The user can focus their attention on the advertisement when the time is most suitable. They can then use a spread or a tap gesture to view a more detailed description of the advertisement. If they have finished reading the advertisement they can flick it

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<sup>1</sup><http://www.android.com/>, 14.05.15

either left to show disinterest or right to show interest. Data will then be sent back to the server to be processed and stored. The server application can then take into account, among other things, the user's preferred topics and location to send advertisements more relevant to the user.

The new mechanism was evaluated and compared to conventional mobile advertising based on the opinions of a set of 25 people. According to the results, the proposed mechanism is more effective than conventional methods of advertising. It is more user-friendly, less intrusive and draws more attention to the advertisement from the user.

## 1.3 Outline

**Chapter 2:** describes the most popular mobile advertising frameworks used today and discusses the advantages and drawbacks of each. It also takes a closer look at some of the more unorthodox advertising frameworks that do not follow the most common patterns of mobile advertising and take user experience regarding mobile advertisements to the next level.

**Chapter 3:** describes the research question that this thesis focuses on and its necessity.

**Chapter 4:** describes in detail the development process and the final proposed mechanism. The developed front-end library as well as the server application used to test the library.

**Chapter 5:** explains the evaluation of the proposed solution as well as takes a closer look at user feedback regarding the advertising method as well as mobile advertisements in general.

**Chapter 6:** concludes the thesis with a summary and future research directions.



## 2

# State of the Art

## 2.1 Industrial Advertising Frameworks

According to a 2012 article by Matt Marshall, the most reliable companies in mobile advertising, that directly offer a monetization service for the mobile platform, are AdMob, Millennial Media, iAd, Flurry, InMobi, Chartboost, MoPub and Amobee <sup>2</sup>. Following is a short overview of these eight platforms.

AdMob was founded in 2006 and acquired by Google in 2010 <sup>3</sup>. According to research firm eMarketer Google is, by a large margin, the leader of the global digital ad market <sup>4</sup>. At the time of Google acquiring AdMob it was one of the market leaders in mobile advertising <sup>5</sup>. In 2011 it was merged with their existing AdSense platform, which was a solution for web advertising <sup>6</sup>. AdSense has software development kits (SDKs) for Android, iOS and Windows Phone <sup>7</sup> and supports displaying in-application advertisements as a rectangle, a banner <sup>8</sup> or a full screen interstitial <sup>9</sup>.

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<sup>2</sup>Matt Marshall, The top 10 mobile advertising companies, <http://venturebeat.com/2013/06/12/the-top-10-mobile-advertising-companies/>, 14.05.15

<sup>3</sup><https://www.crunchbase.com/organization/admob>, 14.05.15

<sup>4</sup>Microsoft to Surpass Yahoo in Global Digital Ad Market Share This Year, <http://www.emarketer.com/Article/Microsoft-Surpass-Yahoo-Global-Digital-Ad-Market-Share-This-Year/1011012>, 14.05.15

<sup>5</sup>Weve officially acquired AdMob!, <http://googleblog.blogspot.com/2010/05/weve-officially-acquired-admob.html>, 14.05.15

<sup>6</sup>Narender Singh, Admob for mobile web merging with Adsense, <https://www.techmesto.com/admob-mobile-web-merging-with-adsense/>, 14.05.15

<sup>7</sup><https://developers.google.com/mobile-ads-sdk/docs/admob/android/banner>, 14.05.15

<sup>8</sup><https://developers.google.com/mobile-ads-sdk/docs/admob/android/banner>, 14.05.15

<sup>9</sup><https://developers.google.com/mobile-ads-sdk/docs/admob/android/interstitial>, 14.05.15

## 2.1 Industrial Advertising Frameworks

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Millennial Media was founded in 2006 <sup>10</sup>. Apart from Google, it is the only other mobile advertising company in the eMarketer list of top ten global digital advertising companies <sup>11</sup>. They offer an end-to-end technology stack with SDKs for Android, iOS, BlackBerry and Symbian <sup>12</sup>. Ads can be displayed as a rectangle, banner or interstitial <sup>13</sup>.

Like Google, in 2010 Apple acquired a mobile advertising company – Quattro, founded in 2006 <sup>14</sup>. It was then rebranded as iAd <sup>15</sup>, which has not seen much success to date and, according to an article posted on Forbes, only accounts for 2.5% of mobile advertising revenues in the United States <sup>16</sup>. iAd only supports iOS and the advertisements are native, meaning that the developer can define the bounds of the advertisement with x and y coordinates, width and height <sup>17</sup>.

Flurry was founded in 2005 and acquired by Yahoo in July of 2014 <sup>18</sup>. The main selling point of Flurry is its analytics tool with the largest data-set on application usage <sup>19</sup>. Flurry supports Android and iOS and the advertisements can be displayed as either a banner or full screen.

InMobi was founded in 2007 <sup>20</sup>. They claim to be the first advertising platform with 1 billion unique users <sup>21</sup>. InMobi supports Android, iOS and Windows Phone <sup>22</sup>

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<sup>10</sup><https://www.crunchbase.com/organization/millennial-media>, 14.05.15

<sup>11</sup>Microsoft to Surpass Yahoo in Global Digital Ad Market Share This Year, <http://www.emarketer.com/Article/Microsoft-Surpass-Yahoo-Global-Digital-Ad-Market-Share-This-Year/1011012>, 14.05.15

<sup>12</sup><http://docs.millennialmedia.com/>, 14.05.15

<sup>13</sup><http://docs.millennialmedia.com/android-SDK/>, 14.05.15

<sup>14</sup><https://www.crunchbase.com/organization/quattro-wireless>, 14.05.15

<sup>15</sup>Eric Jackson, What Is Next For Apple's iAd?, <http://www.forbes.com/sites/ericjackson/2011/11/11/what-is-next-for-apples-iad/>, 14.05.15

<sup>16</sup>How Apple Is Revamping Its iAd Platform, <http://www.forbes.com/sites/greatspeculations/2014/12/18/how-apple-is-revamping-its-iad-platform/>, 14.05.15

<sup>17</sup>Chris Ching, iAd Tutorial How To Integrate iAd Banners Into Your App, <http://codewithchris.com/iad-tutorial/>, 14.05.15

<sup>18</sup><https://www.crunchbase.com/organization/flurry>, 14.05.15

<sup>19</sup>Ral Castan, Yahoo Agrees To Buy Mobile Ad Analytics Firm Flurry, <http://maps.yankeegroup.com/ygapp/content/f47515e9c15c4eac90bab1ced3582bdf/50/DAILYINSIGHT/0>, 14.05.15

<sup>20</sup><https://www.crunchbase.com/organization/inmobi>, 14.05.15

<sup>21</sup><http://www.inmobi.com/>, 14.05.15

<sup>22</sup><http://www.inmobi.com/monetize/>, 14.05.15

## 2.1 Industrial Advertising Frameworks

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and the advertisements can be displayed as a banner, full screen or native <sup>23</sup>.

Chartboost was founded in 2011 <sup>24</sup>. It is a mobile games-only advertisement network and focuses on cross promotion of mobile games, meaning that most of the advertisements are about downloading other games. According to their own words it only takes ten lines of code to integrate Chartboost into an application <sup>25</sup>. It supports Android and iOS and the advertisements can only be displayed full screen <sup>26</sup>.

MoPub was founded in 2010 and acquired by Twitter in 2013 <sup>27</sup>. Their main selling point is a large real-time bidding exchange for in-application advertisements. This means that there is no sales person between the advertiser and the developer. Advertisers bid directly for the opportunity to have their advertisements displayed in an application and developers have control and transparency over the ads that are delivered into the application <sup>28</sup>. Supported platforms are Android and iOS. Supported formats are banner, full screen and native <sup>29</sup>.

Amobee was founded in 2005 and acquired by SingTel in 2012 <sup>30</sup>. They have SDKs for Android, iOS, Windows Phone and BlackBerry. Possible formats are banners and full screen video.

Common for all these advertising platforms is the fact that none of them offer a format where the user can interact with the advertisement apart from tapping on it and, in the case of full screen advertisements, close it. That is not to say that attempts have not been made to make advertisements interactable and more fun for the user. Such frameworks will be described in the following section.

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<sup>23</sup><https://www.inmobi.com/support/integration/23817448/22051163/android-sdk-integration-guide/>, 14.05.15

<sup>24</sup><https://www.crunchbase.com/organization/chartboost>, 14.05.15

<sup>25</sup><https://www.chartboost.com/>, 14.05.15

<sup>26</sup>Alvaris Falcon, 20 Advertising Networks to Monetize Your Mobile App, <http://www.hongkiat.com/blog/mobile-app-monetizing-networks/>, 14.05.15

<sup>27</sup><https://www.crunchbase.com/organization/mopub>, 14.05.15

<sup>28</sup><http://www.mopub.com/platform/marketplace/>, 14.05.15

<sup>29</sup><http://www.mopub.com/resources/>, 14.05.15

<sup>30</sup><https://www.crunchbase.com/organization/amobee>, 14.05.15

## 2.2 Related Works

Some advertisement providers have taken to using push notifications to deliver their advertisements <sup>31</sup>, however the delivery of the advertisements is static as with all conventional frameworks. Moreover, they are not concerned with the quality of the advertisements as much as the quantity <sup>32</sup>.

In 2009 apparel maker Dockers San Francisco launched an advertisement for iPhone, which used the phone's accelerometer to respond to the user shaking their phone, which would then make a dancer, appearing on the screen, perform his moves. Dockers themselves believe that it was the first motion sensitive mobile advertisement. It was featured in iPhone games iBasketball, iGolf and iBowl <sup>33</sup>.

Since then many advertisers have taken to offering advertisements using a phones sensors to make them more interesting to the user. Most notable perhaps is Adtile, which uses advertisements built with standard web technologies, using a JavaScript Motion Framework which gives access, among other things, to the devices sensors and GPS, to make their advertisements fully interactable. Adtile supports Android and iOS devices <sup>34</sup>.

Multiple research works have proposed different strategies to overcome the issues that mobile advertisements and advertising mechanisms have.

Several articles discuss mechanisms for providing advertisements to the user based on their location, which would make the content of advertisements more relevant due to the proximity of advertised locations to the user (7)(1). However, the user might not have location tracking enabled on their mobile device, which reduces the usefulness of such mechanisms.

In other fields a lot of research has been done on methods of sensing the user's mood and emotions(4)(5). There are also articles describing using such methods and sending advertisements based on that information (7)(9). However, the recognition of the user's emotions requires constant and intensive processing and computation. This quickly drains the mobile device's battery, hindering the practice quite ineffective.

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<sup>31</sup><http://www.airpush.com/>, 14.05.15

<sup>32</sup>Quentyn Kennemer, Spammy ads in the notification bar die this week as Googles latest Play Store changes take effect, <http://phandroid.com/2013/09/30/google-play-notification-ads-policy/>, 14.05.15

<sup>33</sup>Rita Chang, Dockers Introduces 'Shakeable' iPhone Ad, <http://adage.com/article/digital/iphone-marketing-dockers-introduces-shakeable-ad/135197/>, 14.05.15

<sup>34</sup><http://www.adtile.me/motion-ads/>, 14.05.15

A company called In-mobile proposes a framework that would split advertisements into smaller pieces and embed them into 2D objects, such as obstacles or collectable items, in a level of a mobile game. The advertisement would then be displayed to the user over a period of time, without taking away any extra screen real estate.

Based on experimental results, their proposed mechanism improved the users' perception of mobile advertisements by 60% and increased the effectiveness of an advertisement by 30%. Unfortunately, this method of displaying advertisements is only applicable for mobile games and no other kind of applications <sup>35</sup>.

## 2.3 Summary

The most commonly used mechanisms for displaying advertisements do so statically and are disruptive to the experience of using the application. Attempts have been made to counter the problems of these mechanisms, but such solutions are often difficult to integrate into an application or have other drawbacks. The next section describes the problem in more detail.

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<sup>35</sup><http://in-mobilelabs.com/>, 14.05.15

## 3

# Problem Statement

Conventional methods of displaying advertisements inside mobile applications usually feature a banner or full-screen interstitial, as seen on Figure 3.1 <sup>36 37</sup>.

A banner advertisement is static and throughout the usage of an application takes up screen space that could otherwise host content of the application itself. In addition, banner advertisements are often flashing or making sound, further distracting the user from using the application.

Interstitial advertisements pop up from time to time throughout the usage of an application and temporarily stop the user from using the application altogether. Full-screen advertisements can be closed but it is often not intuitive how to do so without tapping on the advertisement itself and being redirected to the advertiser's website. In addition, opening and closing an interstitial advertisement often takes too long. it distracts the user and might get them out of the mood of using the application.

### 3.1 Research Question

The proposed solution for the problems that conventional advertising methods have, is to display advertisements to the user in a way that the user could choose the location and size of the advertisement on the screen. This thesis aims to evaluate whether this sort of mechanism is more user-friendly than mechanisms currently in use.

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<sup>36</sup>[http://googleadsdeveloper.blogspot.com/2011\\_12\\_01\\_archive.html](http://googleadsdeveloper.blogspot.com/2011_12_01_archive.html), 14.05.15

<sup>37</sup><http://galleryhip.com/admob-ad.html>, 14.05.15



Figure 3.1: Examples of advertisements

To do so, such a mechanism is developed and implemented for a mobile application as a proof of concept. People are then asked to compare it to conventional mobile advertising in terms of intrusiveness and their interest in the advertised product.

Advertisements are an inseparable part of mobile applications, but, as it stands, they are doing more harm than good. Users should feel that advertisements are a part of an application rather than an unwelcome addition. Research suggests that a high rate of exposure to advertisements has a negative impact on perceived advertising value(6)(10). If an application is usable without noticeable interruptions then the user can choose the pace at which they use the application and might pay more attention to the advertisements, since they can choose the time to do so.

## 3.2 Summary

This thesis attempts to find a solution to many problems that conventional advertising mechanisms have. To counter the problems, a mechanism is developed that would allow displaying advertisements to the user in way that allows the user to choose the location and size of the advertisement on-screen. It is then implemented into a mobile application and users are asked to compare it to conventional advertising methods, to determine whether the proposed method makes the application better to use. The next describes the architecture of the created solution.



## 4

# Implementation

To demonstrate the feasibility of the proposed approach, a Java library for Android is developed. Also, a server application is developed for testing the library. The architecture is described on Figure 4.1. Code for both the library and the server application is available in the project’s repository <sup>38</sup>.

### 4.1 Application Library

The library is a lightweight API that consists mainly of two parts: communication with the server, and the ad view. The components of the server communication part are as follows:

**AdContentLoader** is the only class that the application developer should ever have the need to call. An instance of it is initialised in an activity’s *onCreate* method. It then adds the ad view to the activity’s content view, registers a broadcast receiver to receive messages from the server and registers the device to Google Cloud Messaging service (GCM).<sup>39</sup> The application developer should also call *onPause* and *destroy* methods in the activity’s corresponding methods, the first of which unregisters from GCM and the second unregisters the broadcast receiver and disposes the GCM connection. The developer can also set the position of the appearing advertisement through this class.

**GCMIntentService** is a subclass of *GCMBaseIntentService* and responsible for handling communication from GCM. It is based on Google Cloud Messaging, but could

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<sup>38</sup><https://github.com/huberflores/GestureMechanism>, 14.05.15

<sup>39</sup><http://developer.android.com/guide/google/gcm/>, 14.05.15

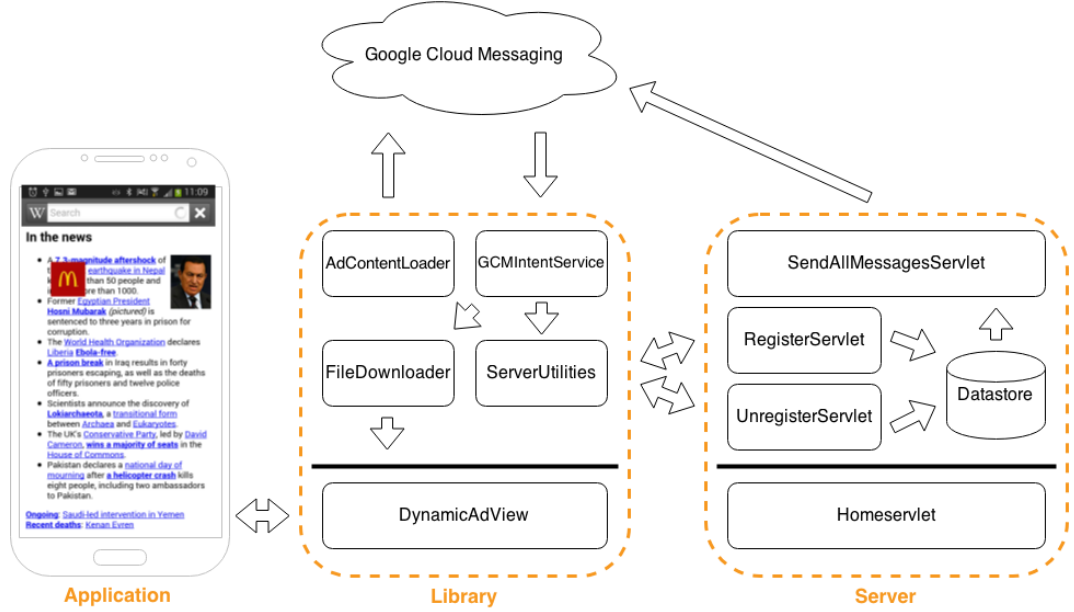


Figure 4.1: Architecture of the developed mechanism

easily be adapted to fit another push notification framework, for example XMPP (3). *onRegistered* method is called when the device is registered to GCM and makes a call to register to our back-end with the registration id from GCM. *onUnregistered* unregisters the device from our back-end once it was unregistered from GCM. *onMessage* receives and decodes the information about an advertisement that was sent from the server. There are also methods for receiving and handling server-side errors.

The **ServerUtilities** class is an abstraction layer for communicating with our server. It has methods for registering and unregistering the device that are called in *GCMIntentService* as discussed previously.

Finally, **FileDownloader** is responsible for downloading the image files for an advertisement once *GCMIntentService* receives and decodes them.

The user interface portion of the library is in a single class: **DynamicAdView**. It is responsible for the displaying the advertisement as well as handling the user's gestures. The view is invisible until *FileDownloader* notifies *AdContentLoader* that images for an advertisement have been downloaded. *AdContentLoader* then prompts the view to update itself with the new images. The view is capable of handling pan,

zoom and flick gestures. When the user moves the view out of the screen's bounds it remains invisible until another update notification.

## 4.2 Back-end Distributor

On the server-side there is a Java server application that handles the client's requests. The main components of the application are as follows:

**Datastore** is a simple implementation of a data store using standard Java collections. It is not persistent throughout redeloys, but its only purpose is to store the ids of registered devices.

**RegisterServlet** takes as a parameter the registration id from GCM and adds it to *Datastore*'s id list. Likewise, *UnregisterServlet* takes as a parameter the registration id from that a device is registered with and removes it from *Datastore*'s id list.

**HomeServlet** is the only servlet with a graphical user interface. It has a label displaying the amount of registered devices as well as buttons to send pre-determined advertisements to the registered devices.

**SendAllMessagesServlet** is responsible for sending a push notification to each of the registered devices once a button in *HomeServlet* is pressed. It takes as a parameter the id of an advertisement and based on that builds a GCM message which it then sends to all registered devices, tracking whether sending the message was successful or not and then returning to *HomeServlet*

## 4.3 API Integration into Mobile Lifecycle

The Application Programming Interface (API) to use in an Android application is very minimalist. Its usage is explained in the project's repository <sup>40</sup>. To add the functionality of the mechanism to an application the developer has to import the Java archive file into the project. The *AndroidManifest.xml* file of the application needs to be modified to include required permissions:

---

```
<permission
    android:name="your_package.permission.C2D_MESSAGE"
    android:protectionLevel="signature" />
```

---

<sup>40</sup><https://github.com/huberflores/GestureMechanism/blob/master/README.md>, 14.05.15

### 4.3 API Integration into Mobile Lifecycle

---

```
<uses-permission android:name="your_package.permission.C2D_MESSAGE" />
<uses-permission
    android:name="com.google.android.c2dm.permission.RECEIVE" />
<uses-permission android:name="android.permission.GET_ACCOUNTS" />
<uses-permission android:name="android.permission.WAKE_LOCK" />
<uses-permission android:name="android.permission.INTERNET" />
<uses-permission
    android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
<uses-permission
    android:name="android.permission.READ_EXTERNAL_STORAGE" />
<uses-permission
    android:name="android.permission.ACCESS_NETWORK_STATE" />
```

---

Also a broadcast receiver for Google Cloud Messaging notifications:

```
<receiver
    android:name="com.in.mobile.gesture.ad.BroadcastReceiver"
    android:permission="com.google.android.c2dm.permission.SEND" >
    <intent-filter>
        <action android:name="com.google.android.c2dm.intent.RECEIVE" />
        <action
            android:name="com.google.android.c2dm.intent.REGISTRATION" />
        <category android:name="your_package" />
    </intent-filter>
</receiver>
```

---

and an intent service for Google Cloud Messaging:

```
<service android:name="com.in.mobile.gesture.ad.GCMIntentService" />
```

---

Example usage of the mechanism in an activity would then look something like this:

```
import com.in.mobile.gesture.ad.AdContentLoader;
import com.in.mobile.gesture.ad.DynamicAdView.Position;

public class MyActivity extends Activity {
```

```
AdContentLoader adLoader;

@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    // View code

    adLoader = new AdContentLoader(this);
    adLoader.setPosition(Position.TOP_RIGHT);
}

@Override
public void onPause() {
    super.onPause();

    adLoader.onPause();
}

@Override
public void onDestroy() {
    super.onDestroy();

    adLoader.destroy();
}
}
```

---

## 4.4 Summary

A new mechanism which is less intrusive than conventional advertising frameworks was developed. As can be seen, the library is easy to use with any Android application. It relies on push notifications to display an advertisement on the device's screen. The simple back-end application can be used to demonstrate the proposed method of displaying advertisements to the user.

The next chapter discusses the method used for gathering user feedback and anal-

yses the results to support the hypothesis that the proposed method improves user experience over conventional advertising methods.

## 5

# Case Studies

An application's user is generally not happy about seeing advertisements in the application. They degrade the overall experience and distract from the contents of the application itself. However, for some developers, advertisements are the only way to monetize their application.

In this chapter we try to determine how the proposed advertising methods compares to the more conventional ones in terms of user experience.

### 5.1 Validation

**Setup and Methodology:** To validate the hypothesis, the proposed solution is compared to conventional advertisement frameworks in terms of intrusiveness and effectiveness. A use case based on a Wikipedia app <sup>41</sup> is developed, which implements the advertising library. This application is selected because the mechanism targets applications that present content to the user such as news, feeds, text and so on.

Initially, we integrate conventional advertisement mechanisms into the selected application as shown in Figure 5.1.

Next, we use the same Wikipedia application, but this time with our proposed solution implemented as seen in Figures 5.2 and 5.3.

To measure how users view the proposed method, a questionnaire was composed [Appendix A]. It consists of 14 questions. 10 of the questions are about day-to-day application usage and opinion on conventional mobile advertisements. The final four

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<sup>41</sup><https://github.com/wikimedia/WikipediaMobile>, 14.05.15

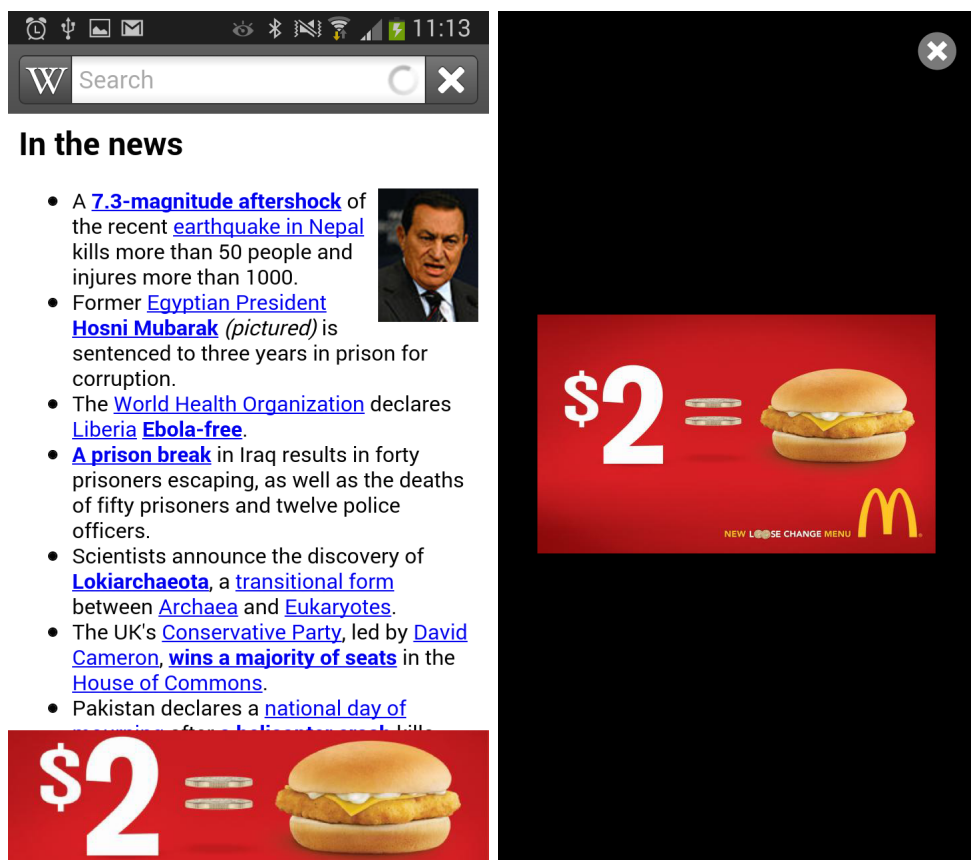


Figure 5.1: Examples of the application with a banner and a full screen advertisement



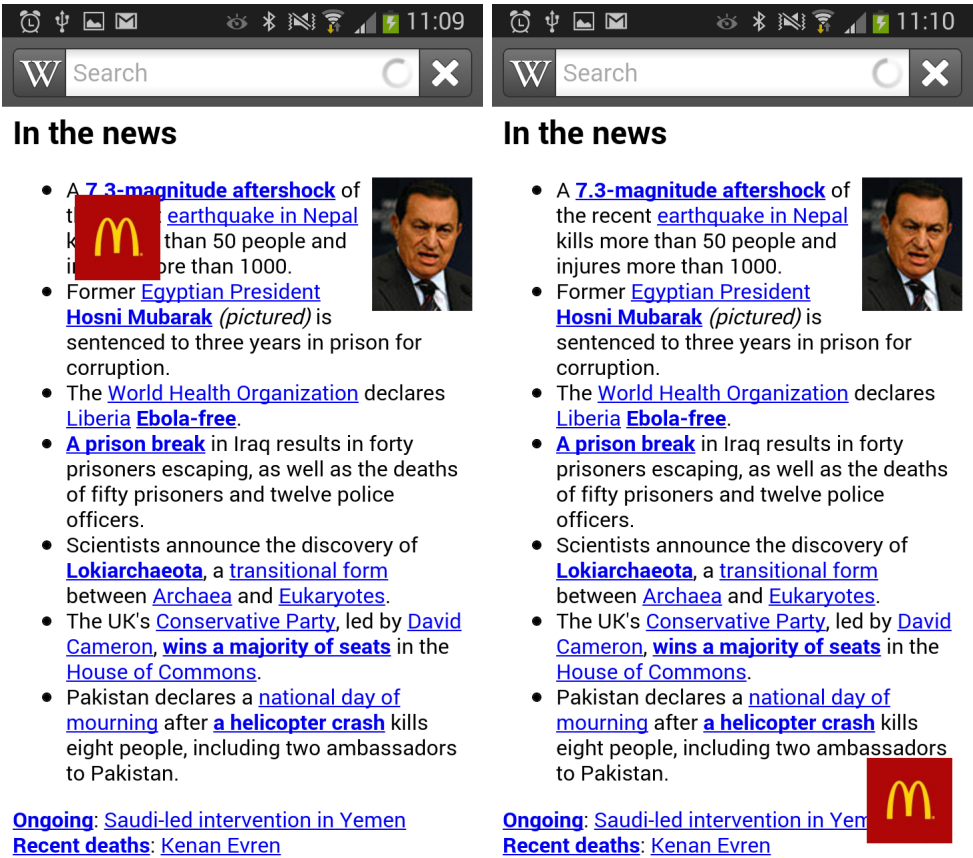
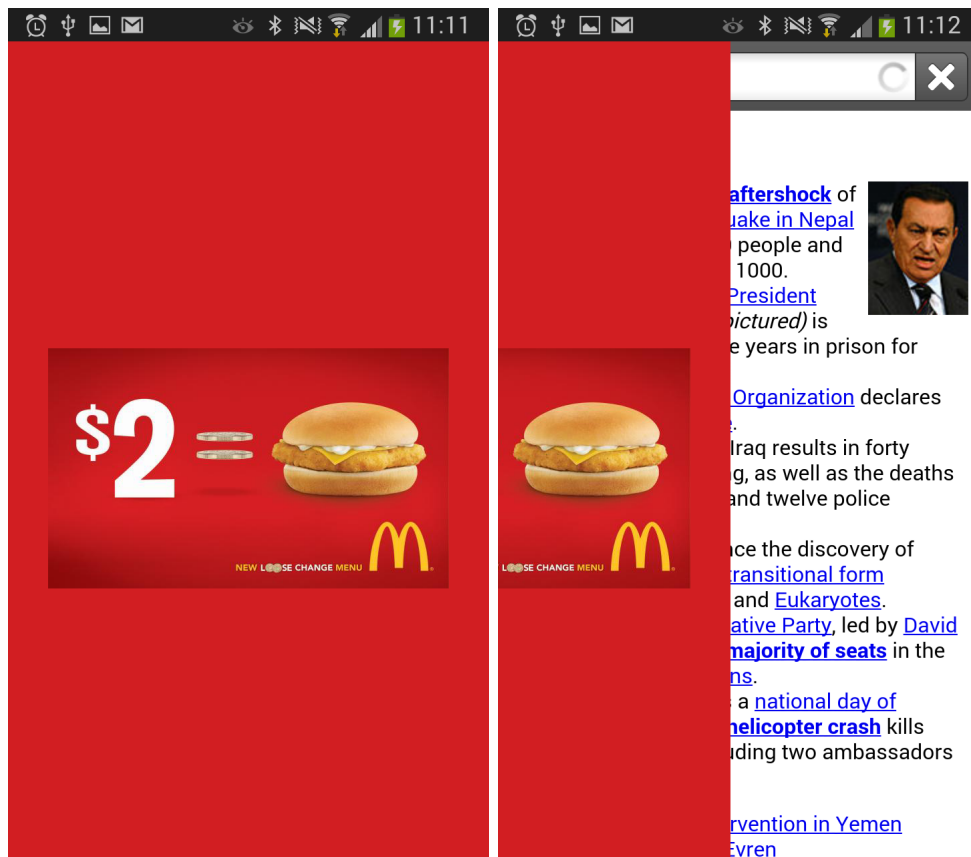
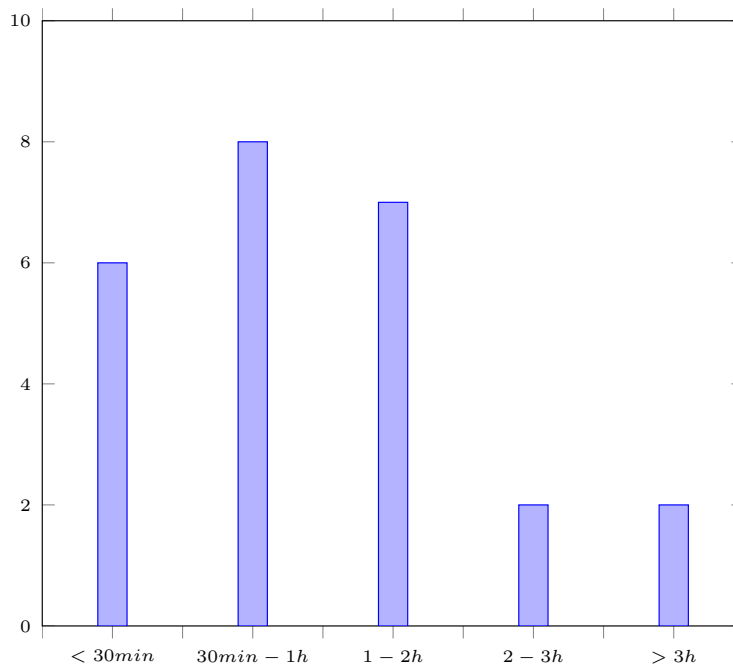


Figure 5.2: Examples of the application with a *Gestrure Ad* in minimised form displayed



**Figure 5.3:** Examples of the application with a *Gestrure Ad* in maximised form displayed



**Figure 5.4:** Participants' mobile device usage

questions are pertaining to the dynamic nature of the advertisement and how it compares to advertisements the participants are used to seeing in applications.

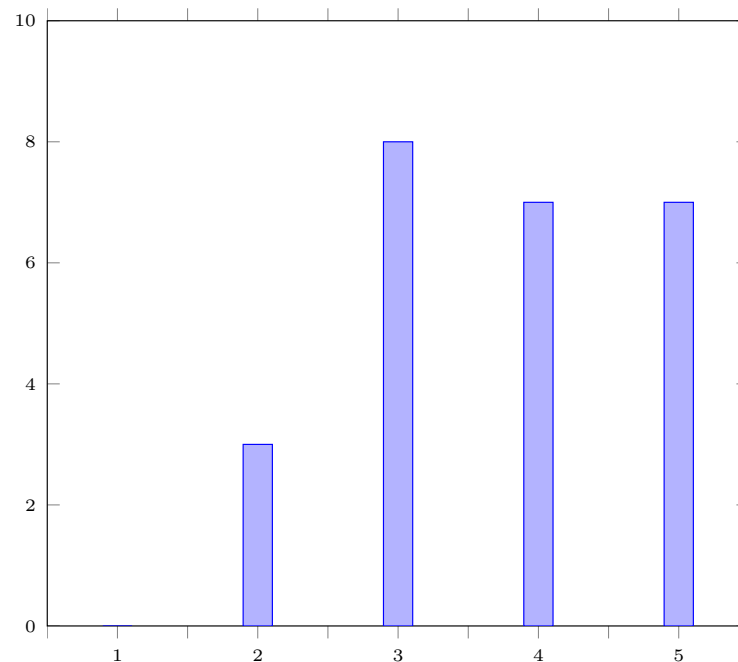
There were 25 participants between the ages of 20 and 35, all day-to-day smartphone users. 64% of the participants were male.

They were asked to first use the application with conventional advertisements and based on that answer the first ten questions. Then they were asked to read an article of their choice from the Wikipedia application, half way through which a *Gesture Ad* appeared, and asked to answer the final four questions.

## 5.2 Results

### 5.2.1 Participants' Opinion on Conventional Mobile Advertising

The participants claimed to be using their mobile devices anywhere between less than 30 minutes and more than 3 hours, however more than half of the participants use their mobile device 30 minutes to 1 hour each day as seen on Figure 5.4.

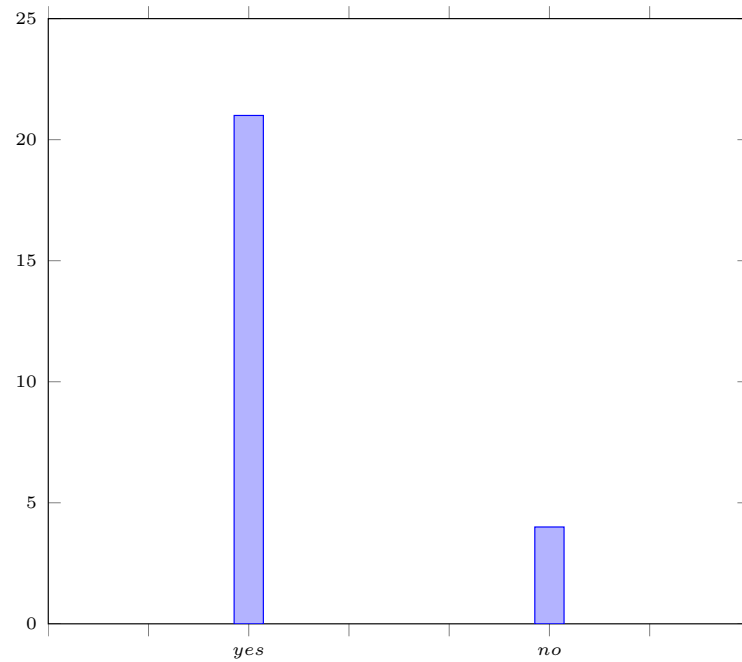


**Figure 5.5:** How much participants are bothered by advertisements in mobile applications

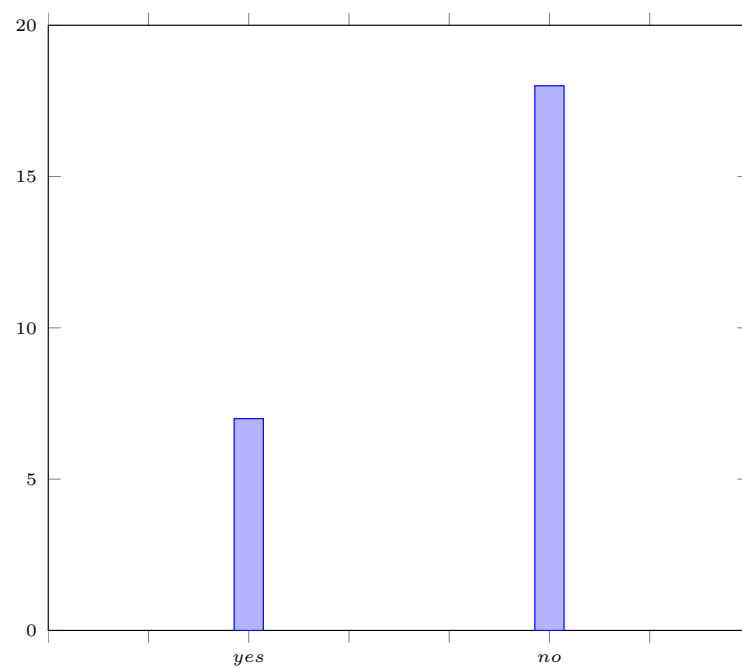
The average rating the participants gave to conventional mobile advertisements bothering them is 3.72 on a scale from 1 to 5, 1 meaning not at all and 5 meaning very much. None of the participants claimed that mobile advertisements did not bother them at all as seen on Figure 5.5. Many reasons were pointed out why advertisements are bothersome. The main ones being that the advertisements are distracting from using the application (flashing, sounds), take up a lot of screen space and are sometimes difficult or even impossible to get rid of.

Furthermore, 84% of the participants claim to have uninstalled a mobile application just because of the intrusiveness of its advertisements as seen on Figure 5.6, while only 28% claim to have looked up a product or service because of an advertisement in an application as seen on Figure 5.7 and only 8% to have actually paid for a product or service they saw in an advertisement as seen on Figure 5.8.

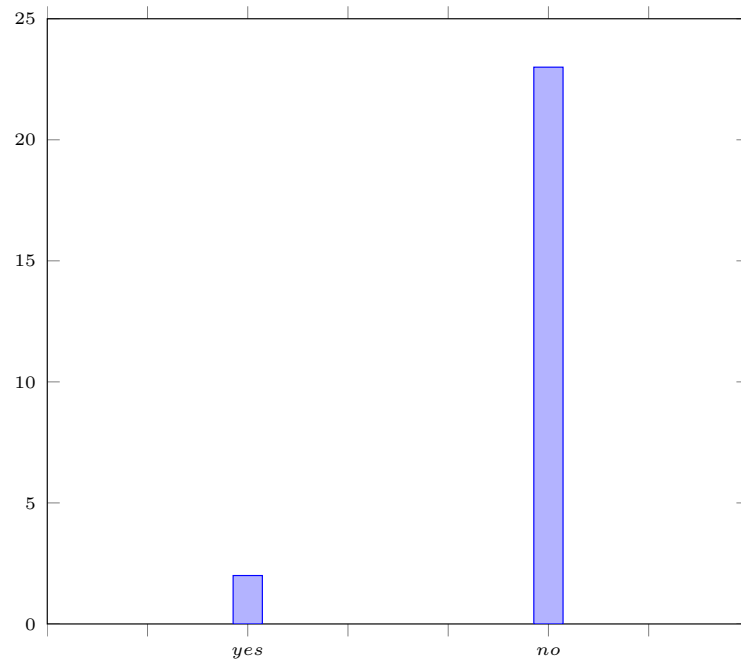
This shows how ineffective conventional advertising methods are and that people are quite easily willing to stop using an application that has intrusive adverts. Conventional advertising methods are often quantity-over-quality and developers can easily damage their reputation without significant gain.



**Figure 5.6:** How many participants have uninstalled an application because of ads



**Figure 5.7:** How many participants have looked up a product because of an advertisement



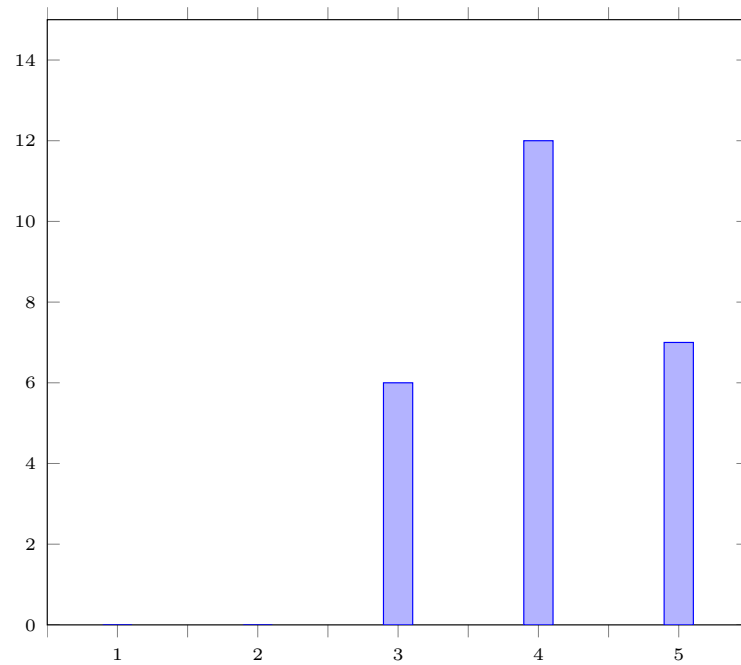
**Figure 5.8:** How many participants have paid for a product because of an advertisement

### 5.2.2 Participants' Willingness to Adapt to New Methods of Advertising

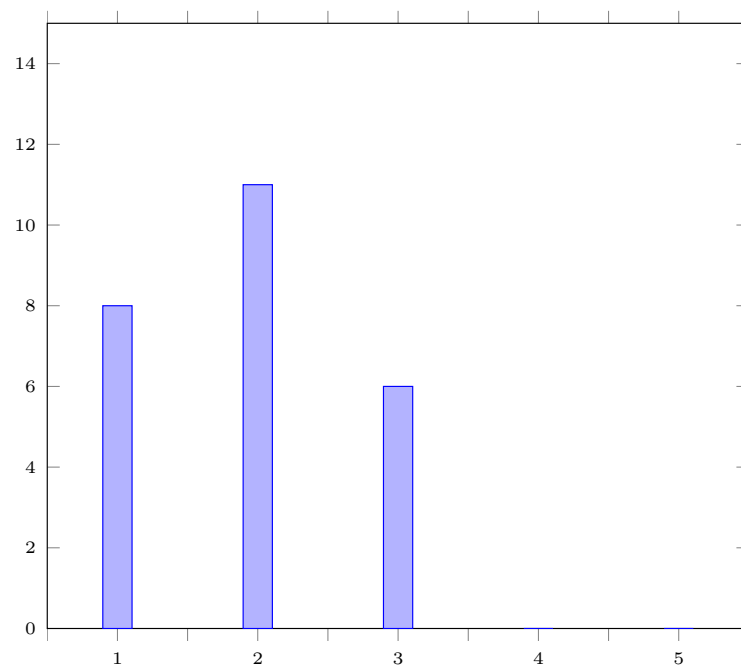
The participants were asked questions about their willingness to use functionality that this library provides without having used it before, to see whether they would be willing to adapt to dynamic advertisements in the applications they use.

All the participants thought they would get rid of an advertisement as soon as it appeared at least half the time as seen on Figure 5.9, but 44% of participants thought they would move an advertisement for later viewing at least some of the times and 24% that they would want to view an advertisement later about half the times as seen on Figure 5.10. 76% of participants would at least half of the times give honest feedback about liking or disliking certain advertisement topics as seen on Figure 5.11

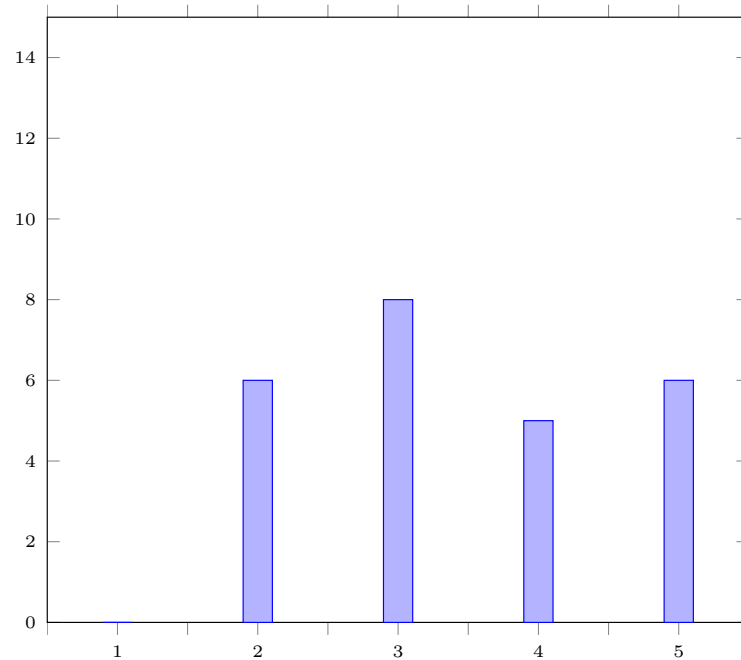
When asked how they themselves think advertisements should be displayed in applications to make them less disruptive, the most common answers were that the advertisements should be smaller, blend in with the surroundings more and not be on top of content.



**Figure 5.9:** How likely participants would move an advertisement for later viewing



**Figure 5.10:** How likely participants would get rid of an advertisement right away



**Figure 5.11:** How likely participants would give honest feedback about their preferences

As seen from this feedback, the users would, at least some of the time, be willing to use the functionality this library provides for advertisements. Also, it has many of the features the users themselves proposed for making adverts more user friendly, like being smaller and not being on top of content the users wishes to interact with.

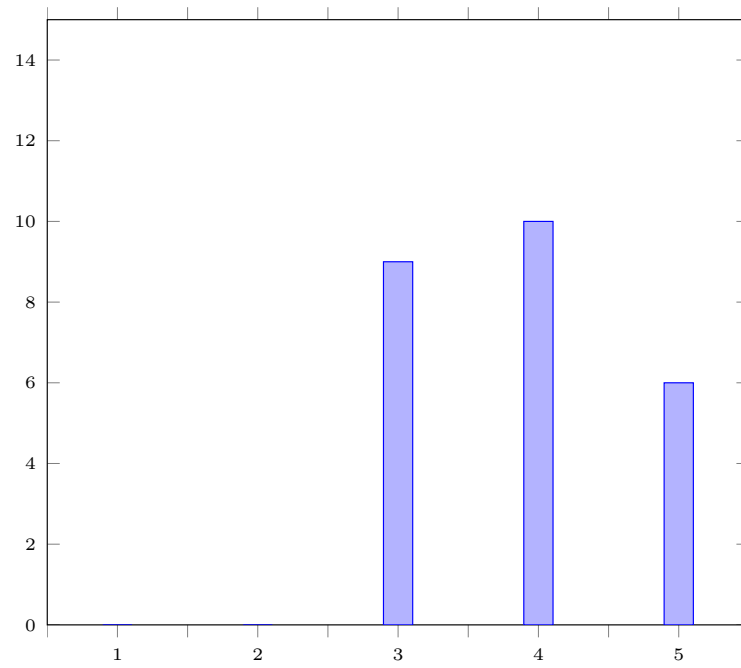
### 5.2.3 Participants' Opinion of Dynamic Advertisements

In terms of intrusiveness, all participants thought that the proposed method is less or just as intrusive as the conventional method of advertisement delivery. 24% thought that it is considerably less intrusive and 36% that is just as intrusive as seen on Figure 5.12.

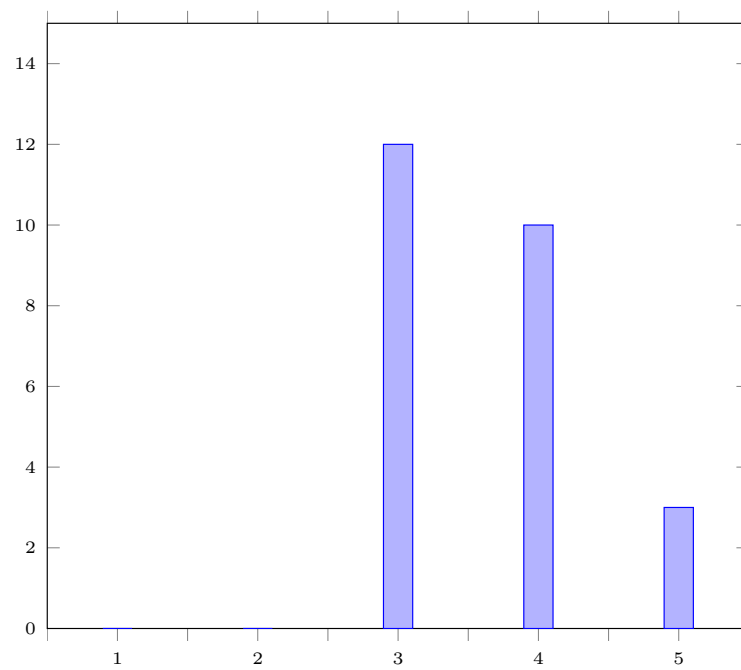
48% of participants were just as interested in the advertised product as they would have been with the conventional advertising method. 40% were a little bit more interested and the product. 12% were considerably more interested as seen on Figure 5.13.

The general rating participants gave to the method of advertisement delivery is 3.96 on a scale from 1 to 5 as seen on Figure 5.14.

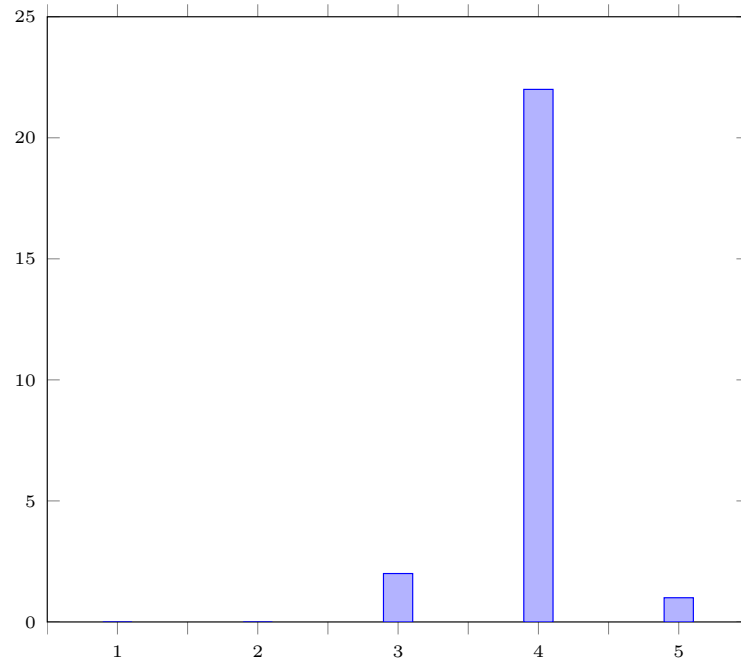




**Figure 5.12:** Intrusiveness comparison



**Figure 5.13:** Interest comparison



**Figure 5.14:** Overall rating to the proposed mechanism

## 5.3 Summary

In this chapter the usability of the proposed mechanism is validated. Based on the results, 64% of the participants found the mechanism to be less intrusive than conventional advertising. 52% of the participants reported being more interested in the advertised product.

Almost all users found that being able to move an advertisement around on the screen is something that they would like to do in mobile applications. Some found that, being used to conventional advertisements, the fact that the advertisement can be interacted with is not very intuitive and needs instructions on first application launch.

Some of the participants are application developers and were more than happy to start using this method for application monetization if it ever became a feasible option.

## 6

# Conclusions and Future Directions

Sending personalised advertisements to a user's smartphone is one the most intimate advertising channels. The excessive use of it, however, has become a serious problem. Excessive amount of advertisements in mobile applications degrade the user experience and make the user view the advertisements in a negative light. The effectiveness of such advertising questionable.

To mitigate this problem, a library was developed that presents advertisements in mobile applications in a more user friendly manner. It lets the user move it around on the screen according to need or move it off the screen altogether. If the user chooses to keep it on the screen for later viewing, the advertisement is small enough that it does not distract from using the application. In addition, users themselves can give feedback on the advertisements, which more accurately helps send more relevant advertisements in the future, instead of relying on profiling algorithms to decide the user's likes and dislikes.

However, the developed solution is just a proof of concept and has far a way to go for being usable in an actual real world solution. The client side of the library needs stability improvements and rigorous testing. The animations could be improved and the user interface made more intuitive to use.

The server-side needs to be built from scratch, with improvements in security and stability. Also, keeping in mind that an advertising framework needs to handle a large amount of users at any given time, which the current solution can not.

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In the future, this mechanism will be merged with a mood tracking framework to present advertisements to the user based on emotions. This coupled with feedback that the user provides, should very accurately describe the user's interests at any given time.

All in all, the feedback received from the control group was mainly positive. This gives hope that, in the future, a state can be reached, where mobile advertisements are construed as a useful and positive thing by an application user, rather than an annoyance, and encourages exploring new directions in mobile advertising.

# 7

## Appendices

### Appendix A

1. How much do you use applications on a mobile device on an average day?

1                      2                      3                      4                      5

2. Rate how much advertisements bother you when using mobile applications, where 5 is very much and 1 is not at all.

1                      2                      3                      4                      5

3. If you chose more than 1, explain quickly what bothers you most about mobile advertising?

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4. Have you even uninstalled an application just because of the intrusiveness of advertisements?

YES                      NO

5. Have you ever looked up a product or service because you saw an advertisement of it in a mobile application?

YES                      NO

- 
6. Have you ever bought a product or payed for a service because you saw an advertisement of it in a mobile application?

YES

NO

7. Given the chance, how often would you get rid of an advertisement as soon as it appeared on the screen, without paying any attention to its content, where 5 is always and 1 is never?

1

2

3

4

5

8. Given the chance, how often would you move an advertisement to a different location for later viewing, where 5 is always and 1 is never?

1

2

3

4

5

9. Given the chance, how often would you give honest feedback on whether you like an advertisement or not to, in the future, get advertisements based on your interests, where 5 is always and 1 is never?

1

2

3

4

5

10. How would you like advertisements in your mobile applications to be displayed to make their presence less disruptive?
- 
- 
- 

11. Rate how you would compare this method of advertisement delivery to the conventional one you see in mobile applications usually (banners, full-screen interstitials) in terms of intrusiveness, where 5 is considerably less intrusive and 1 is considerably more intrusive.

1

2

3

4

5

12. Rate how you would compare this method of advertisement delivery to the conventional one you see in mobile applications usually (banners, full-screen interstitials) in terms of your interest in the advertised product, where 5 is considerably more interested and 1 is considerably less interested.

1

2

3

4

5

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13. Give your general opinion about this method in a few sentences.

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14. Give a general rating about this method, where 5 is best and 1 is worst.

1                      2                      3                      4                      5

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Mina, Jaan Tohver (sünnikuupäev: 14.06.1991)

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