附件 1：外文资料翻译译文

个人移动相册/日记应用开发

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摘要——移动计算设备，如智能手机和个人媒体播放器，正面临着其固有特性带来的挑战。这些固有特性包括电池容量，无线网络的限制，和设备局限性。 首先，一个基本挑战与位置感知功能的电源效率有关。 基于位置的应用程序是智能手机的杀手级应用，它们长时间操作时需消耗大量电量。 因此，节能型的基于位置的服务被提出。 第二，另一个来源于移动云计算的低效。所以，所提出的框架指出：智能电话处于静止状态（比如静置于办公室的桌子上）时，可以通过用较少的功率密集型传感器来降低功耗。 这种取代是由一个有限状态机和用户移动检测策略来控制的。提出的架构所采用的核心技术是基于 web 服务和 SOAP 的，因为 web 服务是一个框架，它不依赖于特定的智能手机 OS 平台。 提出的框架结构采用了基于 PI 值应用程序评估策略。 结果表明，该移动云计算平台通过增加云节点的数目提供了更好的性能，同时资源管理策略降低了功率消耗。

关键词：组件； HTML5； 移动相册； 框架管理； 移动云；

I 导论

移动计算呈现不断增长的趋势，微处理器嵌入到日常用品使之实现信息交流。 移动计算设备相互连接，并不断提供服务[1]，这依赖于无线技术、先进电子设备，和互联网的融合。 当前移动电子消费不是简单的移动通信设备，因

为它们可以改变人们的生活方式并且创造新文化。 因此，任何数据都可能是用户所需要的。 事实上，以前不可想象的事情现在可以通过移动计算实现[2][3][4]。 本研究中介绍了智能手机的移动应用框架。 这种移动应用框架应该是低功率的，基于位置的服务（LBS）。 在移动计算中，移动性是一切的基础。 因此，有必要关注能量守恒在移动设备的LBS服务上的应用。

实际上，所提出的移动应用框架是针对移动计算的，其中涉及大量的移动设备。 智能电话处于静止状态时，该框架通过用较少的功率密集传感器来降低功耗。 此外，移动云计算代表了移动计算领域的范式转变。 在几十年的时间里，我们可以期望传统移动应用程序转变为移动云计算程序。 将复杂和耗时性任务转移至强大的云平台上，这可以提高应用程序的性能和效率。 仅运行移动设备上的简单任务，将使电池寿命延长，并提高处理效率。 基于平行度的转移是很快的，它也可以被用来解决有关涉及非本地资源的大数据集问题。 当一组计算机被连接到网络时，CPU和资源池是可用的，它可以访问云中的文件。 本研究提出了一种新方法，用透明的和平台无关的方式实现了移动云融合。 用户不需要知道他们的工作在分布式环境中的实际执行，因此不必考虑他们的移动平台上是否有部iPhone或Android。 这是因为该框架的核心技术是基于通过HTTP80端口的Web服务和SOAP。 因此，这是一个与平台无关的智能手机应用开发框架，其中所述结构不依赖于智能手机平台。 它包括一个Web服务和移动网络（HTML5）设备API标准。 在云计算作为一种Web服务上运行复杂的任务，降低了计算时间要求和电池电量。 此外，复杂的业务逻辑和计算转移到云计算平台。 这种移动云计算框架允许所有应用程序通过智能手机的网络进行访问。

背景

由于市场的异质性，智能手机、无线宽带和基于网络的云计算通过将应用程序开发者的注意力转向新的平台从而为他们提供了机会。

COMSOL [7]大幅度降低设备和专业技术能力，减少高性能计算，现在已经为进军主流做好了准备。 6’和11’在高度平行的COMSOL多重物理量计算背景下的探索加速因素是Windows HPC一个强大的商业理由。按内存大小划分处理能力将使异常问题得到解决。

Dandelion[9]提供了一个实施在 Maemo Linux 智能手机平台和赖斯轨道体传感器平台上的系统。 Dandelion 已经被现实世界的应用所评估，结果表明 Dandelion 有效地消除了编程间隙，显著减少了开发工作量。 此外，Dandelion 费用非常低。

某些方法可能对复杂移动应用是有用的，但这些编程样式不同于智能电话应用程序开发，从而很难让智能手机开发者采用这些方法。 相比之下，Dandelion 利用了智能手机为中心的传感器网络并且专注于支持传感器数据处理的任务。 在此基础上权衡，Dandelion 可以支持透明的编程风格。

一些系统以成一体的操作系统抽象或一个分布式 runtime 系统支持程序透明度，但它们大多是基于虚拟机的方法，隐藏了 ISA 的变化。然而，这种使用资源受限的传感器的方法是无用的 。与此相反，Dandelion 通过限制传感器数据处理功能，引入一个额外的编译阶段实现透明度。

智能手机发展策略

目前的智能手机应用程序的开发方法高度依赖于特定的移动框架，如 Android 或 iPhone 手机。因此，一个新的智能手机应用程序只能运行在一个平台上。 这种限制导致了开发成本的浪费，因为“一源多用”是不允许的，于是有必要为每个平台开发或编译相同的应用程序。 然而，智能应用开发的未来趋势是平台独立性。 这是因为设备存在不同，即使在 Android 平台上，从市场上众多的安卓设备可见一斑。

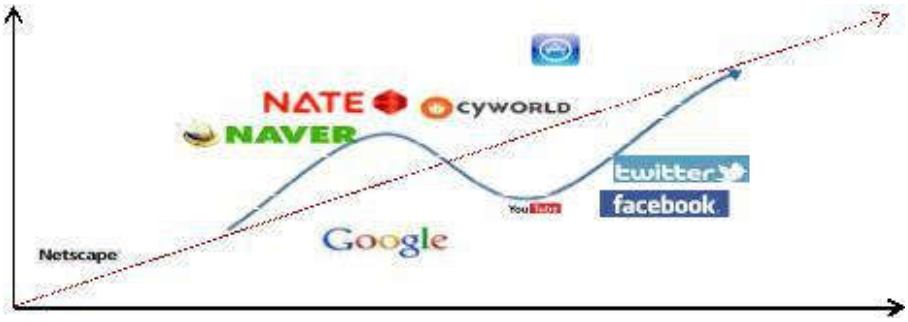

图 1 应用程序商店和社区门户上的 Web 用户

图 1 说明了智能 IT 应用范式的转变。 最初，图 1 的左侧可为几乎所有开发人员所用。 目前，我们已经开始在我们的智能手机上看到 Web 3.0 技术。 这有利于消费者，但一个大问题是如何将 Web 3.0 技术提供给企业并且企业将如何接

受它们。如果技术是必须的，那就需要有一个公平的竞争环境。 因此，本研究中提出的框架的核心技术是基于通过 HTTP80 端口的 Web 服务和 SOAP。

图 2 “一源多用”平台

这代表一个独立于操作系统的智能手机应用程序开发框架。 独立于操作系统的平台意味着结构不依赖于智能手机平台。 该框架包括网络服务和移动网络（如 HTML5）设备 API 标准。在云计算的 Web 服务上运行复杂的任务减少了计算时间要求和电池电量要求。 此外，复杂的业务逻辑和计算将转移到云平台上。 目前的智能手机应用程序开发平台包括 Andr oid、 iOS 和 Windows Mobile。 每个平台都有其自己的应用程序开发环境，并且不与其他平台兼容。 iOS 应用程序需要 iOS 开发环境，而黑莓手机的一些应用程序需要黑莓开发环境。 独立于平台的智能手机应用程序开发环境正在变得越来越流行。 因此，所提议的移动云计算框架允许所有应用程序通过使用智能手机的网络进行访问。 这种类型的架构提供了一个通用的与平台无关的访问层，例如，W3C 移动网络标准。 所提出的方法通过 W3C 移动网络标准层使用 Web 服务架构。 智能设备的进步带来可用内容和服务的变化，从而为开发者创造新的机遇。为各类智能设备所共享的需求也在不断增加。 然而，这需要智能设备之间的兼容性。 图 2 显示了“一源多用”的发展模式。 “一源多用”的主要推动者是 WAC，HTML5，智能电视，和二进制翻译。 HTML5 是用于实现独立于平台的智能手机应用的关

键技术。 二进制翻译是将某一具体目标平台的二进制代码翻译成另一目标平台可用的二进制文件。 智能电视是互联网电视，它可以通过互联网运行智能应用。

移动云是移动和并行计算领域的范式转变。在未来几十年的时间里，我们可以期望传统移动应用程序转变为移动云计算程序。 将复杂和耗时性任务转移至强大的云平台上，这可以提高应用程序的性能和效率。 仅运行移动设备上的简单任务，将使电池寿命延长，并提高处理效率。 基于平行度的转移是很快的，它也可以被用来解决有关涉及非本地资源的大数据集问题。 当一组计算机被连接到网络时，CPU 和资源池是可用的，它可以访问云中的文件。这种移动云可以被任何平台使用。

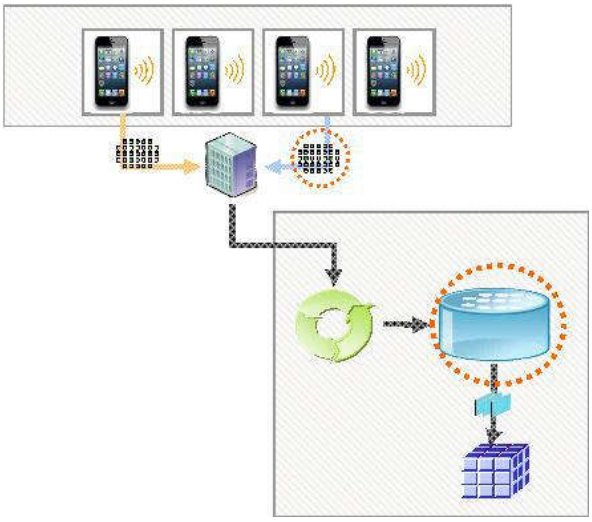

图 3 移动云智能手机应用程序体系结构

第三方可以利用云计算设施使用开放的 API。 目前，很容易综合使用高级功能来创建一个新程序，而且不需要从零开始。 因此，创业公司可以无需花费任何金钱来开发小的行业软件以 拓展公司的用户群，当然他们仍然保留其源代码的所有权。 因为发布 API 的公司拥有绝对的所有权，所以，开放的 API 可能会给开发者带来一些问题。 如果 API 公司决定更改使用条款，例如，他们决定收取一定的费用，第三方别无选择，只能接受。 虽然它的品牌密切反映了谷歌安卓市场的部分特性，但是谷歌游戏的重点依然是谷歌功能的其他服务，因为大多数人都在谷歌的网络商店寻找音乐，电影或书籍。 最近，对谷歌最大的批评是其对内容生态系统所采取的手段，当然他们已经通过谷歌应用推出了解决方案。Google 显

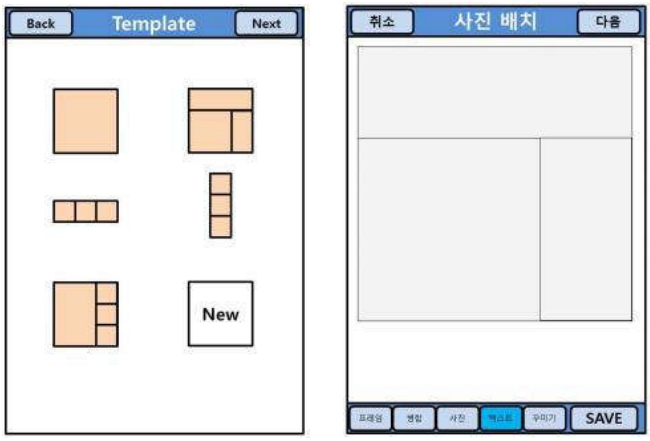

图 4　提出的应用程序的模板库

而易见希望集成生态系统将允许公司确保其电影和乐谱服务更广泛地被采用，虽然前者没有完全达到预期效果。　单一集成的谷歌播放使谷歌能够更好地与 iTunes 竞争，这是苹果的单一解决方案策略，提供 MAC 和 iOS 用户一个完整的音乐库，电影电视节目，并提供购买这些设备的应用。

3.1 独立于平台的移动应用程序设计

目前，人们多次从 iPhone 或 Android 智能手机上传照片。　非基于 HTML5 的应用程序或方法不能启动专辑组或添加到现有相册。　相反，照片被放置在照片库（或墙上）。　因此，用户很难追踪他们的照片。　因此，专辑应该可以简单地创建一个相册，并添加照片。　iPhone 或 Android 自带几个创建相册的本地应用程序。　然而，基于 HTML5 的相册应用程序不允许添加照片或创造相册组。　因此，本研究中设计并实现了基于 HTML5 的相册应用。　本节描述了相册应用程序基于帧用户界面（UI）的设计。日记形式的　框架管理可以提供众多款式新颖的照片，如背景图像（主题），布局，框架，气球贴纸，和图案的形式。相册允许定制不同的布局，让人们可以按期望自由地编辑照片或镜框。

相册应用的模板制造组件被称为一个简单模板，因为它可以从不同的样品上选择一项布局使用。接下来，就可以将照片从智能手机的画廊添加到相册，并创建一个智能相册组。

图 4 示出了 HTML5 相册应用程序的模板库屏幕。　主屏幕显示在图的左侧。　四个按钮可以用来选择不同的功能：创建一个新的模板（简易模板），从模板数据

库搜索模板，在模板视图写模板，并在网格视图显示照片。 如果从这些功能中选择简易模板，模板选择器面板（模板库）将会示出。 模板库可以用来选择任何类型的布局。 如果用户不希望使用模板库，他们可以选择不基于模板的新模板。 这被称为帧模板。 相册允许各样式的定制，因为任何布局都可以使用帧模板来获得。 该框架的模板可以让用户根据需要进行编辑。

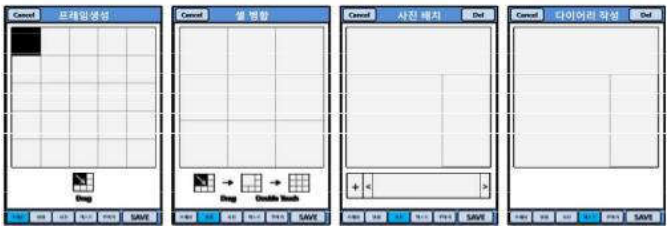

图 5 “框架”管理

图 5 显示了布局准备的自定义阶段。 无数小格板被提供，它们可以合并和分离成各种形式。 该定制程序支持触摸，拖拽，并且经由接口下降。 HTML5 标准支持拖放功能，但这高度依赖于 web 浏览器和平台。 因此，这个动作还不够完善。 触摸，拖动和下降接口用 JavaScript 语言编写以确保兼容于任何智能设备。

3.2 图像缩放实现

按压和扩张使得智能手机和平板电脑的用户能用两个手指在屏幕上缩小或放大图像。 这可以很好地处理可缩放内容，诸如网页，地图或图像。内容全屏幕显示时 ，用户可以用两个手指触摸屏幕并扩散手指来放大一个特定的目标。 放大的程度是无限的，它只取决于手指能扩张多远。 不过，这是苹果公司的专利，它试图保护这种方法以便和三星对抗。三星在其安卓设备也实现了图像无限缩放功能。

总之，有必要找到一种不侵犯知识产权的图像缩放处理技术。 因此，提出了一种解决方法：模仿按压和扩张，即使用图像裁剪和图像缩放实现。 最初，图像裁剪是去除的图像的外部部分，以改善取景，强调主题，或改变高宽比。 根据应用的不同，这可以用实物照片，艺术品，或录像，或数字图像编辑软件实现。该方法通常用于电影，广播，摄影，平面设计，印刷等行业。 在本研究中，这种技术作为按压和扩张的替代品被应用程序所使用。 一些库可以支持图像裁剪，如 Jcrop，这是一个快速简便的将图像裁剪功能添加到 Web 应用程序的库。

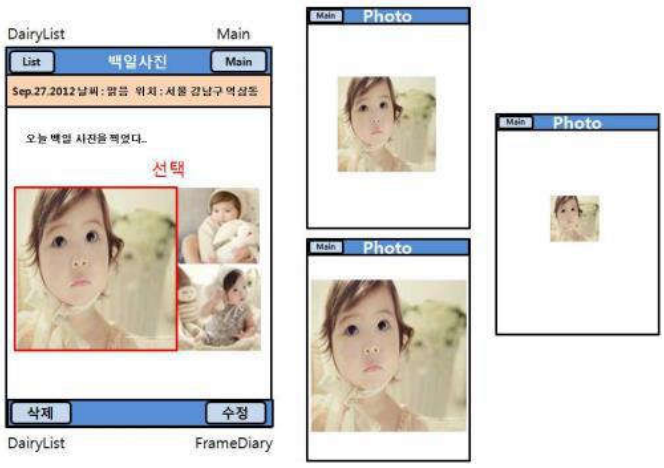

图 6　捏和传播实现该应用程序

Jcrop 结合了易于使用的典型的 jQuery 插件和强大的跨平台 DHTML 裁剪引擎，它忠于经典的桌面图形应用程序。　然而，正因为 jCrop 基于 jQuery，所以它不能被使用。　该方法使用 Sencha Touch 作为 HTML5 UI 框架，因此图像裁剪功能是史无前例的。

图 6 显示了图像裁剪在相册应用程序中的执行。此功能是为了使开发人员能够整合优秀的图像，而不会牺牲劳动力和灵活性 （或数周的编码、 测试和调试） 裁剪直接进入任何基于 web 的应用程序的功能。在该方法中，六个额外的参数被添加到图像数据结构中以便使用 HTML5 画布裁切图像：sourcex，sourcey，sourcewidth sourceheight destwidth destheight。　这些参数定义图像被切割矩形的位置和大小。滚动面板包含这图像数据，它被初始化为为 400′400 的大小。高度和宽度调整为每个面板的大小，它可以更大或更小，这取决于它是否与其他面板合并。　CLS 的属性代表了层叠样式表（CSS）文件中的类定义。　CSS 被用来控制网页的样式和布局。　CSS3 是 CSS 的最新标准。CSS 样式表语言用于描述表示语义(外观和格式)的标记语言编写的文档　。CSS 的设计主要是为了使文档内容（写在 HTML 或类似的标记语言）与文件显示分离，包括的元素如布局，色彩，字体。这种分离可以改善内容可访问性，提供更大的灵活性，和规范表示特征，从而允许多个页面共享格式,这降低了结构的复杂性，减少了重复内容。　因此，它是简单的，在任何时候通过设置值为一个特定的属性，以改变在一个 HTML5 网页对象的值。　图像裁剪可以通过在滚动面板视图组件中分配值到属性 scrollx 和 scrolly，因为原始图像只有一部分显示在滚动面板区域。

3.2 日记/日历实现

许多方法可用于实现所提出的 HTML5 应用日历功能。 日记功能是在提出 MVC 应用程序的手动实现。

日记是主应用程序的部分功能（这是整个程序的一个子集），因此，它必须从原始日记应用改变。 例如，图 7 示出了原始的日历界面。 然而,日记需要连接到当天的日记相册功能页面，这就是为什么日历是手动执行的原因。

3.3 实验结果

所有的商品/服务基本实现和部署为同一类型的 Web 服务，这是平台无关的，让智能手机应用程序的开发过程中能够快速交付。 为了确保智能手机应用程序

图 7 日历原型设计

开发的便捷，以下通用/基本服务是可取的：增强现实技术，HPC，语音/图像处理，普适计算和电子学习。然而，在本研究中，有限的时间和预算意味着只有一个 PI 值计算 Web 服务可以作为原型。

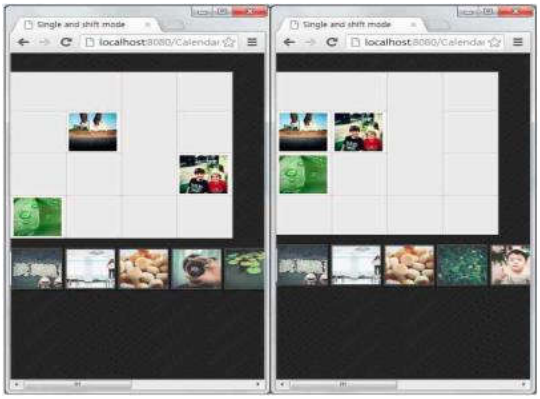

图 8　系统架构

图 2 显示了移动设备的应用程序需要找到他们所需的服务。为了实现这一目标，该 Web 服务架构包括通用描述，发现和集成（UDDI），这是一个便于搜索 web 应用程序的平台独立性的基于 xml 的网上注册。

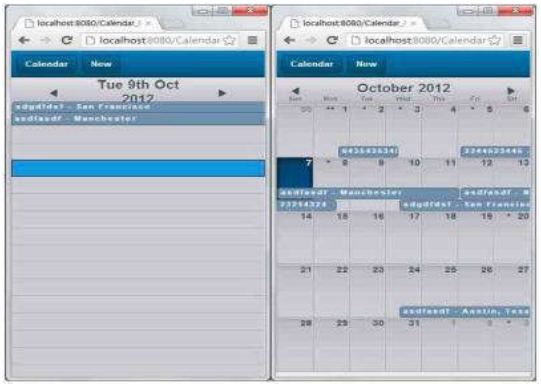

图 9　日历的实现

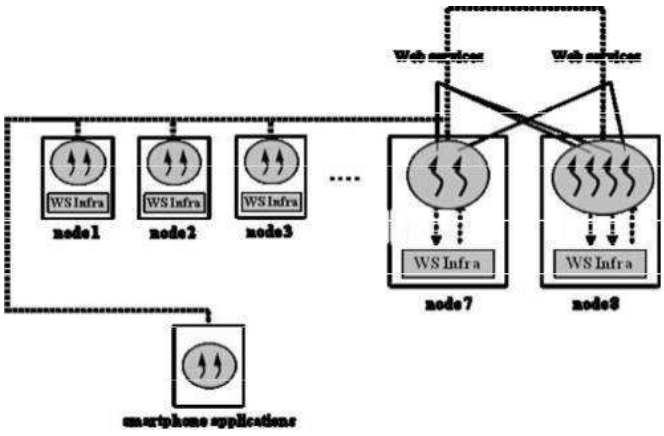

图 10　框架管理实现

图 3 显示了 Web 服务所提出的独立于平台的智能手机应用程序开发框架，用于 PI 值计算任务分布策略。　在此框架中，计算型进程作为 Web 服务在远程云节

点上运行，而剩余进程则运行在移动设备上。 这个框架可以提高性能并延长移动设备 的电池寿命。

智能手机应用程序开发参考的一个重要方面是快速实施和交付。 因此，如果一个想法是通过开发智能手机应用程序实现的，那它的原型成为该地区公认的标准。 快速开发和部署，利用组件，而不是从头开始实现。 利用可重用和可组合基本组件有利于促进新服务和应用程序的快速生产。 在该方法中，移动云架构基于 Web 服务和公共服务，从而提供了一个 Web 服务的形式。 该应用程序是由从一个云服务使用 Core 2 GHz 的八个节点构成，，每个都有 2 GB RAM 。该机器是通过 1 Gbps 以太网连接。 图 2 提供了移动云聚合框架，由三阶段组成：网络服务型基础设施，商品/初级 Web 服务和操作环境。 样品解决方案安装在三星 Galaxy S 上，这是一款 Android2.2 手机。 Java 的四个设计原则在 Android 框架得以实现。 原型是一个允许用户启用，禁用和精细配置的图形用户界面。 在当前 Android api,GPS 通过一个主要的函数调用，调用 requestLocationUpdates(),这需要至少四个输入参数 LocationProvider, reporting frequencies in term of the time and distance, 和 PendingIntent 、 LocationListener。 原型内捕捉到这个函数调用和嵌入式智能功能,以及其他相关的功能。实验配置包括：（1）电源，（二）数字万用表（真有效值万用表），（三）智能手机（三星 Galaxy S），以及（d）笔记本电脑。 三星 Galaxy S 的额定输入电压/电流范围为 3.7 V /1500 毫安。假设的电压差在 3.7 V 无波动的稳定，测定电流变化与数字万用表功耗相同。

结论

本研究分析了节能 LBS 和移动的融合，并提出了智能手机应用程序开发的框架。 智能手机通常没其它移动计算设备那么 强大。 因此，有必要通过仔细分割，将应用程序的计算密集型任务转移至移动云上。 Web 服务是一个框架，它不依赖于特定的智能手机操作系统。 因此，拟议的框架结构采用了 PI 值的应用程序评估策略。 结果表明，该移动云计算平台通过增加云节点的数目提供了更好的性能，同时资源管理策略降低了功率消耗。所提出的框架指出：智能电话处于静止状态（比如静置于办公室的桌子上）时，可以通过用较少的功率密集型传感器来降低了功耗。 这个框架的核心元件是一个运动检测算法，这是检测

用户的动作来降低功率的策略，这是由一个有限状态机（FSM）来控制。 FSM 的状态转换由运动检测或定时器触发。

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后记

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附件 2：外文原文

Journal of Convergence *Volume 5, Number 1, March 2014*

Personal Mobile Album/Diary Application Development

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***Abstract*—Mobile computing devices such as smartphones and personal media players are challenging because of their intrinsic features, such as their battery capacity, the constraints of wireless networks, and device limitations. First, a fundamental challenge is related to the power inefficiency of location-aware functions. Location-based applications are killer applications on smartphones, but they consume large amounts of power when operated for a long period. Thus, an energy-efficient location-based service is proposed. Second, another challenge is related to the power inefficiency with respect to mobile cloud computing. Thus, the proposed framework reduces power dissipation by substituting less power-intensive sensors when the smartphone is in a static state, such as on a table in an office. This substitution is controlled by a finite state machine with a user movement detection strategy. The core technique employed by the proposed framework is based on a web service and SOAP because a web service is the best fit for a framework that does not depend on a specific smartphone OS platform. Thus, the proposed framework architecture was evaluated using an application for PI value computation. The results demonstrated that the mobile cloud computing platform delivered better performance by increasing the number of cloud nodes and the resource management strategy improved the power consumption.**

Keywords-component; HTML5; Mobile Photo Album; Frame Management; Mobile Cloud;

I. INTRODUCTION

Mobile computing is a growing trend where microprocessors are embedded in everyday objects to allow them to communicate information. Mobile computing devices are completely connected and constantly available [1], which relies on the convergence of wireless technologies, advanced electronics, and the Internet. Current mobile consumer electronics are not simply mobile communication devices, because they can change the lifestyles of people and create new cultures. Thus, data exists anywhere that the user requires. Indeed, things that were previously unimaginable can now be achieved by mobile computing [2][3][4]. The present study introduces a mobile application framework for smartphones. A mobile application framework should be a low-power, location-based service (LBS). In mobile computing, mobility is the basis of everything. Thus, it is necessary to focus on the conservation of energy for LBS services on mobile devices. Therefore, the proposed mobile application framework is targeted at mobile computing, which involves numerous mobile devices. The proposed framework reduces power dissipation by substituting less power-intensive sensors when the smartphone is in a static state, such as on a table in an office.

In addition, mobile-cloud computing represents a paradigm shift in the field of mobile computing. Within the space of a few years, we can expect a major shift from traditional mobile applications to mobile cloud computing. This will improve the application performance and efficiency by offloading complex and time-consuming tasks to powerful computing platforms. Only running simple tasks on mobile devices will extend the battery lifetime and improve the processing efficiency. Offloading based on parallelism is faster, but it can also be used to solve problems related to large datasets that involve non-local resources. If a set of computers is connected to a network, a vast pool of CPUs and resources is available, which can access files in the cloud. The present study proposes a novel approach that achieves mobile cloud convergence in a transparent and platform-independent manner. Users do not need to know how their jobs are actually executed in a distributed environment, thus it is not necessary to consider whether their mobile platforms are iPhones or Android. This is because the core technology used by the proposed framework is based on a web service and SOAP via the HTTP 80 port. Thus, this is a platform-independent smartphone application development framework, where the structure does not depend on the smartphone platform. It comprises a web service and a mobile web (HTML5-like) device API standard. Running complex tasks in the cloud as a web service reduces computational time requirements and the battery power usage. In addition, complex business logics and computations are offloaded to cloud computing platforms. This mobile cloud computing framework allows all applications to be accessed over the web via a smartphone.

BACKGROUND

Despite the market's heterogeneity, the nexus of smartphones, wireless broadband, and network-based cloud computing presents an opportunity for application developers by drawing their attention toward new platforms.

COMSOL [7] reduces the upfront investment in equipment and technical expertise dramatically and high-performance computing is now ready for the mainstream. Exploratory speedup factors of 6× and 11× in the context of embarrassingly parallel COMSOL Multiphysics computations are a powerful business justification for Windows HPC. The ability to divide and conquer by distributing the memory

requirements for any problem size will allow the solution of novel problems.

Dandelion [9] provides a system implementation on the Maemo Linux smartphone platform and the Rice Orbit body sensor platform. Dandelion has been evaluated by implementing real-world applications, which showed that Dandelion effectively eliminates the programming gap and significantly reduces the development effort required. Furthermore, Dandelion incurs very low overheads.

Certain approaches may be useful for complex mobile applications, but these programming styles differ significantly from those used in smartphone application development, thereby making it difficult for smartphone developers to adopt these approaches. By contrast, Dandelion exploits the simplicity of smartphone-centered body sensor networks and focuses on supporting in-sensor data processing tasks. Based on this trade-off, Dandelion can support a transparent programming style.

Some systems support programming transparency with unified OS abstraction or a distributed runtime system, but they are mostly based on a virtual-machine approach that hides ISA variation. However, this approach is inefficient with resource-constrained sensors. By contrast, Dandelion achieves transparency by limiting the sensor functions to data processing and by introducing an extra compilation phase.

SMARTPHONE DEVELOPMENT METHOD

The current smartphone application development approach is highly dependent on specific mobile frameworks such as Android or iPhones. Thus, a new smartphone application can only run on one platform. This limitation results in the waste of development costs because "one source multi-use" is not allowed, although it is necessary to develop or compile the same applications for each platform. However, the future trend for smart application development is platform-independence. This is because device fragmentation exists even within the Android platform, where there are numerous Android devices on the market.

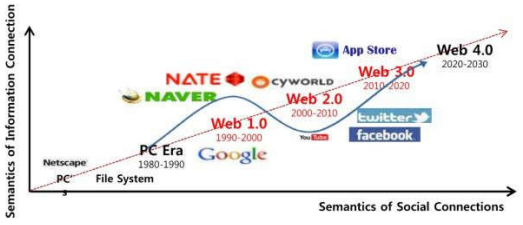

Figure 1. Web User Paradigm Based on App Store and Community Portals

Figure 1 illustrates the paradigm shift in smart IT applications. Initially, the left-hand side of Figure 1 is available to almost all developers. At present, we are beginning to see Web 3.0 technology on our smartphones. This is beneficial for consumers (although it may give them a sense that Big Brother really is looking over their shoulder), but one of the big questions is how Web 3.0 technologies will be made available to businesses and how businesses will then be able to embrace them. If technology is required, there must be the potential for a level playing field. Thus, the core technology of the framework proposed in the present study is based on a web service and SOAP via the HTTP 80 port.

Figure 2. "One Source Multi-Use" Platforms

This represents an OS-independent smartphone application development framework. The OS-independent platform means that the structure is not dependent on the smartphone platform. The framework comprises a web service and a mobile web (HTML5-like) device API standard. Running complex tasks in the cloud as web services reduces the computational time requirements and the battery power usage. In addition, complex business logics and computations are offloaded to cloud computing platforms. Current smartphone application development platforms include Android, iOS, and Windows Mobile. Each platform has its own application development environment, which is not compatible with others. Thus, an iOS application requires iOS and some Blackberry applications require a Blackberry. However, platform-independent smartphone application development environments are becoming popular. Thus, the proposed mobile cloud computing framework allows all applications to be accessed via the web using a smartphone. This type of framework provides a common accessible layer that is platform-independent, e.g., W3C mobile web standard. The proposed approach uses the web service architecture via the W3C mobile web standard layer. The advances in smart

devices have led to changes in the attributes of the available contents and services, thereby creating new opportunities for developers. The demand for content sharing among all types of smart devices is also increasing. However, this requires compatibility between smart devices. Figure 2 illustrates the "one source multi-use" development paradigm. The key enablers of "one source multi-use" are WAC, HTML5, smart TV, and binary translation. HTML5 is a key technique for implementing platform-independent smartphone applications. Binary translation is required to translate the binaries needed by a specific target platform to the binaries used by another target platform. Smart TV is internet-enabled TV, which can run smart applications via the Internet.

Mobile cloud convergence is a paradigm shift in the field of mobile and parallel computing. In the next few years, we can expect a major shift from traditional mobile application technology to mobile cloud computing. This will improve the application performance and efficiency by offloading complex and time-consuming tasks to powerful computing platforms. Only running simple tasks on mobile devices will increase the battery lifetime and improve the processing efficiency. Offloading using parallelism is faster, but it can also be used to resolve the problems related to large datasets of non-local resources. If a set of computers is connected in a network, a vast pool of CPUs and resources is available, which can access files in the cloud. This mobile cloud can be exploited using any platform.

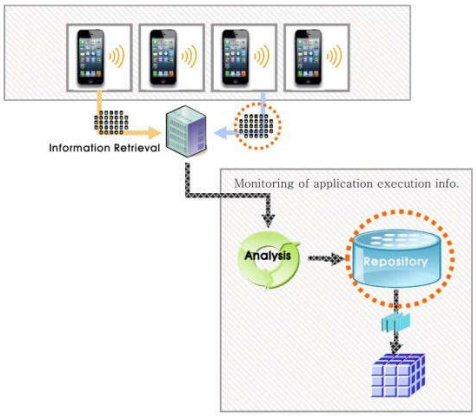

Figure 3. Mobile Cloud Smartphone Application Architecture

Third-party developers can exploit cloud computing facilities using Open API. Currently, it is easy to produce a new program by mashing up advanced functionalities, which would be almost impossible to create from scratch. Thus, startups can expand their company's user base without having to spend any money to develop niche industry software and they still retain their source code proprietary. Open APIs can be problematic for developers, however, because the company that publishes the API has all the power. If the startup ever decides to change the terms of use for its API, for example, or if they decide to charge a fee to license the API, the third-party developer has no choice but to accept it and deal with it. Although its branding closely mirrors what is found currently on Google's Android Market web front, the new Google Play focuses on the other services of Google features because most people who visit Google's web store are there to search for music, movies, or books. One of the biggest recent criticisms of Google has been that Google's approach to a content ecosystem appears fragmented to the casual observer, which they have addressed by the major launch of Google Play. Google obviously hopes that an integrated ecosystem will allow the company to ensure that its Movies and Music services are adopted more widely, although the former has not quite lived up to expectations. The move to a single integrated Google Play puts Google in a better position to compete with iTunes, which is Apple's single solution strategy that offers Mac and iOS users a full library of music, movies/TV shows, and application content to be purchased for these devices.

3.1 Platform-independent Mobile Application Design

At present, people post photos multiple times from their iPhones or Android-like smartphones. No HTML5-based application or methods are available for starting an album group or adding to an existing album. Instead, photos are placed in the photo gallery (or on the wall). Thus, users have difficulty keeping track of their photos. Therefore, albums are desirable feature and it should be simple to create an album, and to add to it. There are several native applications for creating photo albums on iPhones or Android. However, HTML5-based photo album applications do not allow additions to albums or the creation of an album group from smartphones. Therefore, a working version of an HTML5-based photo album application was designed and implemented in the present study. This section describes the design of the user interface (UI) of the photo album application, which is based on the perspective of a frame diary. Frame management in the form of a simple diary can provide numerous attractive designs for photos, such as background images (themes), layouts, frames, balloon stickers, and patterns. The proposed photo album allows virtually limitless customization with different layouts, so photos can be edited and framed as desired.

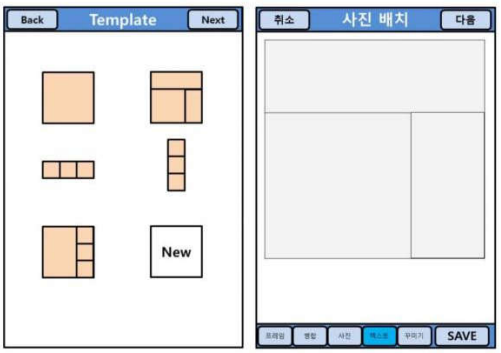

Figure 4. Template Library for the Proposed Application

The diary maker component of the photo album application is referred to as an easy diary because it is simple to select a layout from various samples. Next, it is possible to add photos to the album from a smartphone gallery and to create an album group from a smartphone.

Figure 4 shows the template library screen of the HTML5 photo album application. The main screen is shown on the left-hand side of Figure . Four buttons can be used to select different functions: creating a new diary (the easy diary), searching a diary from the diary database, showing a diary in a calendar view, and showing photos in a grid view. If the easy diary is selected from these functions, the template chooser panel (template library) is shown, i.e., the top of Figure . The template library can be used to select any type of layout for the photos. If the user does not want to make a selection from the template library, they can select a new diary that is not based on a template. This feature is referred to as the frame diary. The photo album allows virtually limitless customization because any layouts can be obtained using the frame diary. The frame diary allows users to edit the frames as required.

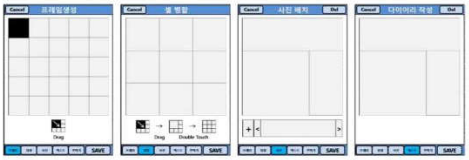

Figure 5. Frame Management (Merge, Placement, etc.)

Figure 5 shows the customization phase where a layout is prepared without any limitations. Numerous sets of small grid panels are provided, which can be merged and separated into various forms. This customization procedure supports touch, drag, and drop via the interface. The HTML5 standards state that the drag and drop feature is supported but this is highly dependent on the web browser and the platform. Thus, this action is still not perfect for use. Therefore, the touch, drag, and drop interfaces were implemented manually using the Javascript language in the photo album application to ensure compatibility with any smart device.

3.2 Image Scaling Implementation

Pinch and spread allows the users of smartphones and tablets to enlarge an image by placing two fingers onto the screen and spreading them slightly apart. This can be used to enlarge (zoom in) or shrink (zoom out) an object. This works well with content that can be zoomed, such as a web page, map, or an image, as in the present study. A user can touch the screen with two fingers and spread the fingers to magnify a specific target, assuming that the content is usually displayed at full screen. The level of magnification is stepless and it depends only on how far the fingers can be spread. However, Apple has a patent and this is a key example of proprietary IT because it is trying to protect this method in its current case against Samsung, which also includes a “pinch-to-zoom” feature in its Android mobile devices.

Thus, it was necessary to find an alternative technique for pinch and spread without violating intellectual property rights. Therefore, a workaround technique is proposed that imitates pinch and spread, which is achieved using image cropping and image scaling. Originally, image cropping referred to the removal of the outer parts of an image to improve framing, to accentuate the subject matter, or to change the aspect ratio. Depending on the application, this may be performed with a physical photograph, artwork, or film footage, or achieved digitally using image editing software. The term is used commonly in the film, broadcasting, photographic, graphic design, and printing industries. In the present study, this technique is used by application in the same manner as pinch and spread. Some libraries are available to support image cropping, such as Jcrop, which is a quick and easy way to add an image cropping functionality to web applications.

Figure 6. Pinch and Spread Implementation in the Proposed Application

Jcrop combines the ease of use of a typical jQuery plugin with a powerful cross-platform DHTML cropping engine, which is faithful to familiar desktop graphics applications. However, it was not possible to use the jCrop library because it is based on the jQuery library. The proposed method uses Sencha Touch as the HTML5 UI Framework, thus the image cropping functionality was developed from scratch.

Figure 6 shows the implementation of image cropping in the photo album application. This function was designed to allow developers to integrate an advanced image cropping functionality directly into any web-based application without sacrificing power and flexibility (or weeks of coding, testing and debugging). In the proposed method, six additional arguments are added to the image data structure to crop an image using HTML5 Canvas: sourceX, sourceY, sourceWidth, sourceHeight, destWidth, and destHeight. These arguments define the location and size of a rectangle that can be cut from an image. The scrollable panel contains the image data, which is initialized to a size of 400 × 400. However, the height and width are adjusted to each panel size, which might be larger or smaller depending on whether it is merged with other panels or not. The cls property represents the class definition in a cascading style sheet (CSS) file. CSS is used to control the style and layout of web pages. CSS3 is the latest standard for

CSS. The CSS style sheet language is used to describe the presentation semantics (the look and formatting) of a document written in a markup language. CSS is designed primarily to allow the separation of document content (written in HTML or a similar markup language) from document presentation, including elements such as the layout, colors, and fonts. This separation can improve the content accessibility, provide more flexibility, and control the specification of presentation characteristics, thereby allowing multiple pages to share formatting, which reduces the complexity and repetition of the structural content. Thus, it is simple to change the values of objects in an HTML5 web page at any time by setting the value to a specific property. Image cropping can be implemented by assigning a value to the properties scrollx and scrolly in the scroll panel view component because a portion of the original image is shown in the scrollable panel area.

3.2 Diary/Calendar Implementation

Numerous methods can be used to implement the calendar functionality in the proposed HTML5 application. The diary functionality was implemented manually in the proposed MVC application.

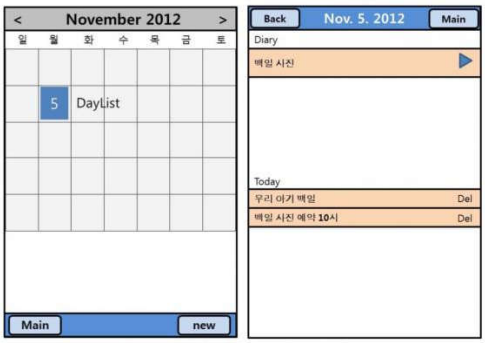

Figure 7. Calendar Prototype Design

The diary needs to function in the main application (it is only a subset of the entire program), thus it had to be changed from the original diary application. For example, Figure 7 shows the original calendar interface. However, the diary needed to be connected to the photo album functionality in the day diary page, which is why the calendar was implemented manually.

3.3 Experimental Results

All commodity/elementary services are implemented and deployed by a type of web service, which is platform-independent to allow rapid delivery during smartphone application development. To ensure the convenience of smartphone application development, the following common/elementary services are desirable: augmented reality, HPC, voice/image processing, ubiquitous computing, and E-learning. However, the limited time and budget in the present study meant that only a PI value computation web service could be produced as a prototype.

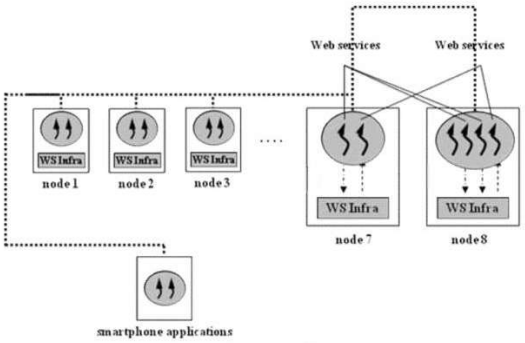

Figure 8. System Architecture

Figure 2 shows the applications that mobile devices need to locate their requisite services. To achieve this, the web service architecture includes Universal Description, Discovery and Integration (UDDI), which is a platform-independent XML-based registry for listing on the Internet that facilitates searches for web service applications. The proposed framework also uses UDDI to locate appropriate web services. Figure 3 shows the job distribution strategy used for PI value computation by the proposed platform-independent smartphone application development framework with a web service. In this offloading framework, the computation-oriented processes run on a remote cloud node as a web service whereas the remaining processes run on the mobile device. This framework improves the performance and extends the battery life of mobile devices.

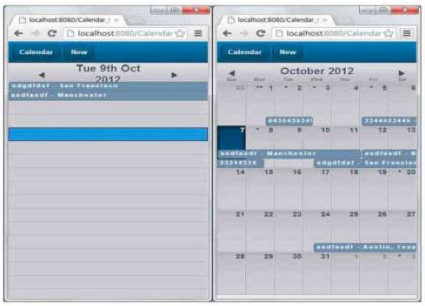

Figure 9. Calendar Implementation

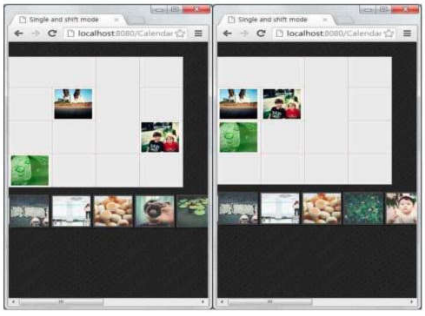

Figure 10. Frame Management Implementation

An important aspect of smartphone application development is rapid implementation and delivery. Thus, if an idea is implemented as a smartphone application by a developer, the initial development is recognized as the standard in the area. Rapid development and deployment demands a development method that utilizes common components rather than implementation from scratch. The utilization of reusable and composable elementary components facilitates the rapid production of new services and applications. In the proposed method, the mobile cloud architecture is based on a web service and common services and composable elements are provided as a form of web service. The proposed application was constructed with eight nodes from a cloud service using Core2 Duo 2 GHz machines, each with 2 GB RAM. The machines were connected via 1 Gbps Ethernet. Figure 2 provides an overview of the mobile cloud convergence framework, which was designed in three stages: the web service-oriented infrastructure, the commodity/elementary web services, and the operating environment. The prototype solution was installed on a Samsung Galaxy S, which is an Android phone with OS version 2.2. The four design principles implemented in Java are included in the Android framework. The prototype included a graphic user interface that allowed users to enable, disable, and finely configure the prototype. In current Android APIs, GPS is invoked through a major function call, requestLocationUpdates(), which requires at least four input parameters: LocationProvider, reporting frequencies in term of the time and distance, and PendingIntent or LocationListener. The prototype captured this function call and embedded intelligence inside the function, as well as other relevant functions. The experimental configuration comprised: (a) power supply, (b) digital multimeter (True RMS Multimeter), (c) smartphone (Samsung Galaxy S), and (d) laptop computer. The rated input voltage/current range of the Samsung Galaxy S was 1500 mA at 3.7 V. Assuming that the voltage difference was stable at 3.7 V without fluctuations, measuring the current change with a digital multi-meter equated to checking the power dissipation.

CONCLUSION

The present study considered energy-efficient LBS and mobile convergence, and a framework was proposed for smartphone application development. Smartphones are generally less powerful than other mobile computing devices. Therefore, it is necessary to offload computation-intensive processes by carefully partitioning the application functions that requires cloud computing. A web service is the best fit for a framework that does not depend on a specific smartphone OS platform. Thus, a novel framework architecture was proposed in this study and the system was evaluated by developing an application for PI value computation. The results showed that the proposed mobile cloud computing platform performed better by increasing the number of cloud nodes. This framework also reduced the power dissipation caused by LBS by substituting less power-intensive sensors when the smartphone was in static state, such as on a table in an office. The core elements of this framework are a movement detection algorithm that detects user movements and a power reduction strategy, which is controlled by a finite state machine (FSM). The state transitions of the FSM are triggered by movement detection or timer expiration.

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