Job Searching Mobile Application using Location Awareness

By

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FINAL YEAR RESEARCH PROJECT REPORT

Dissertation submitted in partial fulfillment
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Information and Communication Technology Programme
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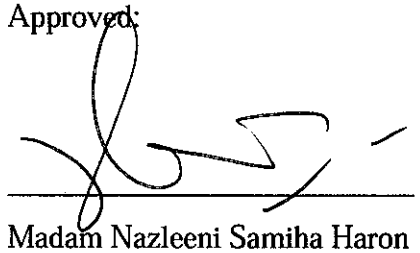
Approved:



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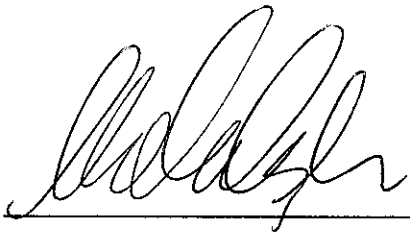
September, 2011

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



ADAM BIN AZHAR

ABSTRACT

This document provides the description for the FYP project titled "Job Searching Mobile Application using Location Awareness".Location awareness is an important feature that could help the user to know the availability of job vacancy at their current location. However, the current job searching websites does not equip with this feature. Therefore, the objective of the research paper is to study how location awareness feature can be applied in job searching application using mobile computing as the platform. This mobile application was developed for Android Operating System, which it could help the user to search for part time job vacancy using location awareness feature.

The location awareness features could be done in mobile application using the Global Positioning Technology (GPS) which it will detect the user's longitude and latitude. Subsequently, the longitude and latitude will be converted into strings and will be compared with the database. The data that match the database will be prompted to user. The mobile application has gone through the user acceptance test with 30 users has tested the software.Using Android, an open source operating system as the platform of the mobile application, it targeted the user with Android smart phone to benefit using this mobile application. As the conclusion, location awareness is a new feature that is relevant to job searching process and it has been proven with the development of this mobile application.

ACKNOWLEDGEMENT

All praises be to Allah the Almighty.

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Introduction

1.1 Background of Study

The background study is about developing a mobile computing application for "**Job Searching Mobile Application using Location Awareness**". As the rate of unemployment is increasing year by year, an effective mechanism for job searching is needed especially for peoples whom would like to enter the job market.

Considering the current trend, the project will be based on mobile computing application with the concern to reach the target user whom mainly the youngster. The usage of Smart Phone is getting great acceptance among the people especially among the new generation. The application of smart phone is really user friendly and time efficient reasoning many people prefer to use mobile application to ease their routine.

The location awareness application is a new trend in mobile computing that will help people to locate the desire location. It is the sub element of context-aware services, which utilize the location of the user to adapt the service accordingly. In the context of job searching application, the location awareness application would be useful for the user to find the specify job that suites the user at the desire location. The location awareness is often useful in mobile computing application, as most of people will bring along their mobile phone at everywhere they go.

The project will be based on android application. Android is a mobile operating system initially developed by Android Inc. Android was bought by Google in 2005. Android is based upon a modified version of the Linux kernel. Google and other members of the Open Handset Alliance collaborated on Android's development and release.

1.2 Problem Statement

In recent newspaper article (The Star, 13 Aug 2009); the domestic of unemployment rate may rise to 4.5% by year-end from 3.7% last year, according to International Trade and Industry Deputy Minister DatukMukhrizTun Mahathir.
Among the problems experienced by people when searching for job are; they hardly to find the job while on the go (mobile) and experienced difficulties in finding the job at the exact spot and desired location. For example, most of the users are lack of information about the vacancy of jobs in their preferable location, as the system does not alert the user.

Although there are several web based application for job searching, however, the conventional web based applications does not solve the problems above. The conventional job searching system mostly does not have ideal features that can ease the process of job hunting. For instance, the current job searching applications are not equip with location aware features which user will not be alert on the vacancy of jobs at the user current location. Subsequently the application does not support for mobile application which user cannot search for the jobs vacancy at mobile.

Therefore, there seems a need and demand for a development of "Job Searching Mobile Application using Location Awareness" which can ease people dealing with job hunting.

1.3 Significant of the Project

The research study of the project is focusing on the mobile computing development. The Objective of the project itself, which is to study how location awareness can be applied in job searching application using mobile computingas the platform will certainly give a significant impact to the development mobile computing application.

The current system of job searching does not equip with context awareness element. Dealing with the current conservative job searching software, the users need to deal with hassle of finding the suitable job, as the information is not push to them.

As contrast to this research project application, it is built for mobile computing user whereby the mobility of user will be useful for the application to search the job. Job Searching Mobile Application using context awareness indeed will ease the user more in searching for jobs especially for ad-hoc and part time job.

Last but not least, with the occurrence of this mobile application, it can contribute to the reduction of unemployment rate in Malaysia in directly and contribute to the growth and development of the mobile computing itself.

1.4 Objectives

- To study how Location Awareness can be applied in job searching application using mobile computing as the platform.
- To develop a mobile computing application for job searching application with location-aware feature.

1.5 Scope of Study

- *User:* People who are in searching of part time or ad-hoc jobs using mobile phone application.
- *Platform*: The platform for the application will be developed using Android platform, which is an open source mobile computing platform.
- *Device*: The devices that can run this application is the mobile phone that using Android as the operating system.

Chapter 2
Literature Review

Basically this literature review will start with the definition of Context Awareness computing which is the core concept of the application that will be developed later. Under Context Awareness computing topic, the definition of the context aware computing will be defined and three basic functionalities of context awareness will be briefed. Next the literature review will brief about the sub element of Context Awareness, which is the Location Awareness.

Under this topic, the definition of Location Awareness will also be defined plus the requirement and the architecture of Location Awareness will be elaborated. Subsequently, the literature review will elaborate about Context Awareness in Android platform framework, which will be used for building the application.Last but not least, the review of the other mobile application software which having the similar features will also be stated at the last part of the literature review.

2.1 Context Awareness Computing

Context is a key issue in interaction between human and computer, describing the surrounding facts that add meaning. A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task (Eija Kaasinen, 2008). In other definition, context-aware computing was first discussed by Schilit and Theimer (1994), to be software that "adapts according to its location of use, the collection of nearby people and objects, as well as changes to those objects over time."

A context-aware pervasive system can be viewed as having three basic functionalities, which are sensing, thinking (metaphorically) and acting. System can vary in sophistication in each of these functionalities. Some system might include complex sensors but perform much deliberation before acting. Others might utilize little sensing but perform much deliberation before acting. Below is the brief description of the three basic functionalities of context awareness (Seng Loke, 2007).

2.11 Sensing

Sensors, biological or nonbiological, provide a means to acquire data or information about the physical world or some aspect of the physical world. Such knowledge can be used by a computer system to determine actions most appropriate to the physical situation at hand (Klein, 2002). A combination of multiple sensors can give even more information for the computer system to reason with, providing a more comprehensive view of the physical world. A computer program can only normally compute with the inputs it is given and traditionally, users provide such inputs manually.

2.12 Thinking

General technique for building context-aware systems involves acquiring sensor information and then reasoning together with other knowledge can be used to interpret further knowledge, in particular, knowledge about the context or situation of entities. Once data is obtained using a collection of sensors, the task is to utilize such data and to make sense of it. The data can come in many different forms and can be discrete values or continuous series of values.

With hardware sensors of the kind mentioned by Klein (1999), various techniques have been used to make sense of the sensor data for detection, classification, and identification of objects using sensors, including the following

- Physical mathematical models such as Kalman filtering
- Feature –based inference techniques, such as cluster algorithms, correlation measures, pattern recognition, neural networks, and Dempster-Shafer and Bayesian reasoning to deal with uncertainties
- Cognitive-based models such as logical templates, knowledge based and fuzzy logic.

2.13 Acting

Once context information has been gathered or situations have been recognized, actions are taken. Effectors and the actions to be taken are application specific, and the action itself might be to perform further sensing. Performance is a consideration. Actions might need to be performed in time for it to be use to the users, and before the situation that triggered the action changes. Another consideration is control. Ideally, the user should retain control and be able to override actions, cancel actions, stop actions or reverse the effect of actions.

2.2 Location Awareness mobile services

One of the sub elements of context awareness computing is the location awareness computing. The location of the user is an element of the context that currently can be measured more or less accurately depending on the positioning system in use. In mobile computing itself, location awareness can be best define as context-aware services that utilize the location of the user to adapt the service accordingly (EijaKaasinen, 2008).

2.2.1 Requirement of Location Awareness

Based on the article of Supporting Location Awareness by Ulf Leonhard (1998), several recruitment and criteria should be considered and comply with regards to the location awareness architecture model.

2.2.1.1 Location model

The location model should provide an expressive, flexible and efficient representation for the locations of mobile objects. Only essential knowledge of spatial properties of locations should be represented. Further, the model must be independent of application domain and location sensor technology. Also, the model must be suitable for graphical representation.

2.2.1.2 Architecture

Heterogeneous sensor system and heterogeneous applications are the two main things that the platform of the location awareness should be open to. The platform should be to scale in term of the number of applications, the geographical scope and in the number of mobile objects. It is also desirable to compose the architecture.

2.2.1.3 Security

Location secrecy and location-awareness are conflicting requirements. The acceptable tradeoffs depend on external constraints. Hence, the platform must allow fine-grained control of this balance in order to ensure privacy of individuals and organizations. The security model must not make assumptions about sensor technologies or the deployment that would limit its generality.

2.2.2 Architecture of enables Location Awareness

The architecture of location awareness is integrated with many types of wireless communication. The mobile devices will inherently connected to the Internet by wireless communication technologies such as GSM, GPRS, UMTS, WaveLAN, HiperLAN or

Bluetooth (James Nord, 2002). These Technologies can be used to position the mobile devices and thus enable position-based look up of services available in network.

It is vital of the occurrence of mobile positioning platform that not only encapsulates different positioning techniques but also offers addition combined positioning techniques. Briefly, the architecture of Location Awareness is divided into four sections which are; the **Positioning Platform**, the **Privacy and Security handler**, the **Map Service** and the **Service InfoBase**. The overview of the architecture is depicted from James Nord's research paper as below.

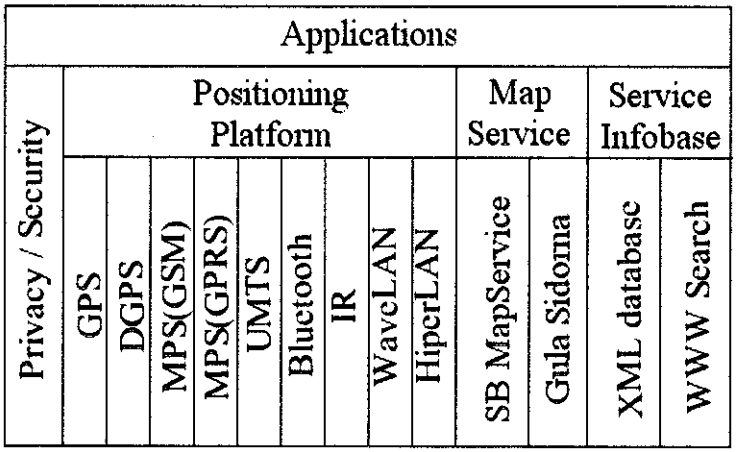


Figure 2.1: The Architectures of Location Awareness

2.2.2.1 Positioning Platform

The positioning platform collects the positioning data from the different positioning modules and merges the information to form one virtual device with additional qualities. The platform is capable of utilizing both push and pull. A GPS device that reports information back with certain time intervals is an example of a push device, whereas an Ericsson Mobile Positioning System (MPS) device is an example of a pull device that retrieves MPS information over the internet on request. For each physical positioning device used within the platform a simple software module needs to be implemented to communicate with the device and to translate the devices native

position format into a common format detailed by to the Generic Positioning Protocol (GPP) used by the platform.

As each device has different accuracy and position segment characteristics it is possible to find a new position area that is overlapped by each individual position and with a greater degree of confidence. In the example shown in Figure 2, a GPS device reports that it is within an area bounded by box A and an MPS device reports that it is within the area B which is bounded by two circles. With this knowledge, the positioning platform could calculate a more accurate position, for example the position bounded by the intersection of A and B.

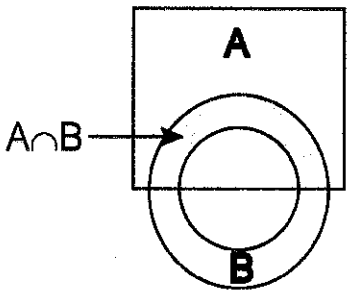


Figure 2.2: Calculating a more accurate position from two sources

Generic Positioning

The different positioning techniques have similar properties as they all report a position, but the protocols differ. A generic positioning protocol (GPP) should therefore support all positioning techniques and work as a common language for the positioning platform to communicate with external positioning sources.

A source could be internal to the mobile device but external to the platform, such as an extra instance of the platform. This protocol should also be used against these sources. The structure of the protocol should also be kept within the positioning platform for communication with positioning modules internal to the mobile device (such as a GPS or Bluetooth device). Required features for the protocol are:

- Structured and hierarchical format, for simple parser implementation.
- Humanly readable, to aid debugging.

2.2.2.2 Map Service

The generic map service is defined by a XML/HTTP interface that allows an application to retrieve maps for a certain position expressed in different geodetic datum planes and coordinate systems with additional parameters such as geodetic datum, coordinate system, map size, image type, scale and orientation. This scheme will help keep the service generic, as it is simple to change the underlying map database and retrieval system.

2.2.2.3 Service InfoBase

The service InfoBase provides methods for finding published services by searching a database or the Internet for information that matches the criteria. The service descriptions can be represented as XML documents, where the criteria are represented as fields in the XML document. Similar ideas have been expressed in (J. Hjelm and M. Nilsson, 2006) which use the Resource Description Framework (RDF) as a basis for service description .An example could be that a user searches for all the restaurants in the immediate vicinity that serve Italian food. The application would look in the service InfoBase for services that match and then present the location of each restaurant on a map. The user could then access additional information about the matches, such as if there is a 'how to-get-there-guide' or even if the menu is available.

2.3 Location Based Service Component

LBSs contain a number of components including maps and Geographic Information System (GIS) information, location collection services, and LBS application-specific subcomponents.

2.3.1 Description of LBS component

Component	Description
LBS Application	This represents a specific application such as a "find my friends" application. This consists of a smart phone component, which has a number of sensors, and potentially a server component that includes application-specific data (such as location-tagged information).
LBS Middleware	This wraps access to Core LBS Features (Location Tracking, GIS Provider and Location Collection Services) to provide a consistent interface to LBS applications. The OpenLS specification represents one standard for LBS middleware.
Location Tracking	This component stores the location trace of individual users. This represents a fundamental component in next-generation LBS as it contains the data that allows a user's route to be determined and potentially predicted. In particular, this component would typically support the following functionality: Keep records on user's current and past locations. Notify other components when a specific user has moved, or when they move in or out of an area. This supports location-based

	notifications being sent to users. Determine which users are within a defined location. This supports geocasting features. Queries of location trace to generate user movement models.
GIS Provider	This component provides geospatial functionality for many LBSs including map information, map visualization and directory services. Google Maps with its API can be considered a GIS provider. Other examples include deCarta3 (commercial) and OpenRouteService.org4 (open source).
Location Collection Service (LCS)	This component performs location collection to get a latitude and longitude for a specific user. Depending on the technology, this component may be accessed via the LBS Middleware (e.g., mobile network triangulation via a service provider) or directly (e.g., via GPS receiver in the smartphone).

2.4 Technical Capability

LBSs can also be differentiated based on technical features as follows;

2.4.1 Network- versus device-centric

Prior to GPS-enabled phones, mobile network providers could deliver LBSs to users by triangulating their position based on the signals sent to mobile base stations. This "network-centric" focus was obviously dependent on mobile network providers and how they exposed location information to LBS developers. New devices are now capable of

determining their location via GPS and digital compasses. This "device-centric" situation reduces the dependency on mobile network providers and hence has allowed more freedom in LBS application development, resulting in the explosion of applications available to date. Assisted GPS, where GPS is combined with information from mobile networks, is also common. This reduces initial synchronization time. However the location information is still available and controlled by the mobile device rather than the mobile network provider.

2.4.2 Reactive versus proactive

Reactive LBSs are those that require a request from the user, whereas a proactive LBS sends pertinent information to users when they reach certain locations. Most LBSs are reactive, such as the common "find me the closest restaurant"-style applications. With Research In Motion and Apple supporting push notifications to their devices, it is possible to develop new LBSs that proactively send information to users without the LBS application running.

2.4.3 Location versus route/trace information

LBSs commonly store or process a user's current or previously recorded location, which represents a single data point. Now systems are starting to record more than a single data point. Route or location trace information, along with speed and direction, are being stored [Brilingaite, Jensen and Zokaite, 2004]. This extra information allows systems to "predict" the future location of users to support proactive LBS, as well as provide historical information that may be useful to the service provider such as for traffic modeling [Estrin, 2009].

2.4.4 Single target versus multi-target

Single target LBSs represent "single user request" applications such as "find my nearest train station." Multi-target applications are those that involve multiple users such as "find my nearest friends"-type applications. This is in line with moves towards more collaborative computing as part of Web 2.0 and social networking. Another example of multi-target LBS is "geocasting," where location-based notifications are sent to users within an area and not just to a single user [Kim, et al. Efficient Geocast, 2008].

2.4.5 Central versus distributed knowledge

Many current LBSs are based on client-server architecture, where location and map information is stored in a somewhat central location. One possible step is to move towards distributed knowledge sharing. A simple example may be location-based searches that combine results for "nearby restaurants for dinner," "hotels for accommodation" and "rental car providers for next-day travelling." By using Bluetooth for peer-to-peer computing, mobile devices themselves may store and share location-based information.

2.4.6 Indoor versus outdoor

Different types of location collection technologies have different accuracies, and some do not work indoors (e.g., standard GPS, which needs a view of satellites). For LBSs that require low precision indoors, it is possible to use other technologies such as mobile network or Wi-Fi triangulation. For higher precision, custom-made devices may be required and standard location collection APIs may not suffice (e.g., Bluetooth or Wi-Fi access points may be added with custom logic to determine a user"s location based on the access point they are connected to or perhaps even based on distance calculations determined from packet round trip times)

2.5 Example of Mobile Operating System

2.5.1 Ios

iOS is Apple's mobile operating system. Originally developed for the iPhone, it has since been extended to support other Apple devices such as the iPod touch, iPad and Apple TV. Apple does not license iOS for installation on third-party hardware. As of January 14, 2011, Apple's App Store contains more than 300,000 iOS applications, which have collectively been downloaded more than 10 billion times.

The user interface of iOS is based on the concept of direct manipulation, using multi-touch gestures. Interface control elements consist of sliders, switches, and buttons. The response to user input is immediate and provides a fluid interface. Interaction with the OS includes gestures such as *swipe*, *tap*, *pinch*, and *reverse pinch*, all of which have specific definitions within the context of the iOS operating system and its multitouch interface.

2.5.2 Blackberry OS

BlackBerryOS is a proprietary mobile operating system, developed by Research In Motion for its BlackBerry line of smart phone handheld devices. The operating system provides multitasking and supports specialized input devices that have been adopted by RIM for use in its handhelds, particularly the track-wheel, trackball, and most recently, the track pad and touch screen.

The BlackBerry platform is perhaps best known for its native support for corporate email, through MIDP 1.0 and, more recently, a subset of MIDP 2.0, which allows complete wireless activation and synchronization with Microsoft Exchange, Lotus Domino, or Novell GroupWise email, calendar, tasks, notes, and contacts, when used in conjunction with BlackBerry Enterprise Server. The operating system also supports

WAP 1.2. Updates to the operating system may be automatically available from wireless carriers that support the BlackBerry OTASL (over the air software loading) service.

2.5.3 Symbian OS

Symbian is an open source operating system (OS) and software platform designed for smart phones and currently maintained by Nokia. The Symbian platform is the successor to Symbian OS and Nokia Series 60; unlike Symbian OS, which needed an additional user interface system, Symbian includes a user interface component based on S60 5th Edition.

Symbian OS was originally developed by Symbian Ltd.It is a descendant of Psion's EPOC and runs exclusively on ARM processors, although an unreleased x86 port existed. Devices based on Symbian accounted for 43.5% of worldwide smart phone sales in 2010 Q2. Some estimates indicate that the cumulative number of mobile devices shipped with the Symbian OS up to the end of Q2 2010 is 385 million.

2.6 Context Awareness in Android

As cited earlier, the Job Searching Mobile Application will be developed using Android. Therefore studies and research has been made on Android framework. In general, there are several reasons why the application is to be developed using Android platform .The Android platform was preferred to other platform is mainly because it uses Java as the main programming language and there were several machine learning frameworks available for Java, it provides access to more core Operating System functionality. In addition, it does not require any certification or developer registration to deploy the software to hardware and the Android SDK is available on multiple platforms (S.P Hall, 2009).

The context support in Android application framework consists of two main parts: Raw contextdata sources and Context processing (M. Baldauf, 2007). The support for raw context data sources contains several packages and classes such as for the camera, Bluetooth scanning of nearby devices, sensor manager for controlling interaction with physical sensors on the Android device, geographical location, time, and sound recording. The sensor manager enables Android applications to access a wide range of sensors; accelerometer, light, magnetic field, orientation, pressure, proximity, and temperature.

The context processing support in Android contains functionality for processing raw context data into more useful contextual data and includes face recognition, speech recognition, text-to-speech, location proximity, and a Google Maps API. The Android application framework provides a very good starting-point for development of context aware applications, but it lacks a generalized interface for context management and a discovery component for adaption. Further, if proactive context-aware applications are to be developed, machine learning is necessary to recognize previous context patterns.

Separation between context acquisition and usage is very important for context-aware system architectures (M. Miraoui, 2008). Such separation of concern is well supported in the Android application framework through the broker architecture that provides an intent-based communication between components. The Android application framework uses a middleware infrastructure for context acquisition providing interfaces for various sensors in such a way that no data is accessed directly from the hardware. Further, access to remote context servers are supported in Android through various network APIs as well as specific APIs such as for Google Maps.

2.7 Other project involving Location Awareness

Listed below is the overview and the functionalities of the other mobile application software which using the similar features (Location Awareness) as "Job Searching Mobile Application"

2.7.1 *comMotion*

comMotion is a location-aware computing environment which linkspersonal information to locations in its user's life; for example, *commotion*reminds one person on her shopping list when she nears a grocery store. Using satellite based GPS position sensing, *commotion* gradually learns about the locations inits user's daily life based on travel patterns. The full set of *commotion* functionality, including map display, requires a graphical user interface.However, because it is intended primarily for mobile use, including driving, thecore set of reminder creation and retrieval can be managed completely byspeech.

comMotion knows its latitude and longitude from the satellite-based Global Positioning System (GPS). *ComMotion* learns salient locations by observing its user's travel over time, and periodically inviting him to name or classify a frequented coordinate. However coordinates must be translated into positions that are relevant to the user and these obviously vary greatly from person to person. *comMotion* can have predefined content associated to locations, however its main feature is user-defined content and the possibility to subscribe to Web content based on location.

2.7.1.1 Overview

A user's interaction with *commotion* begins with the location-learning agent. It observes the user's frequented locations over time and allows them to be labeled. Once a location has been defined, a to-do list is associated with it. A to-do list is a set of text

items or digital audio recordings; these may be ticked off once completed. When the user is in the relevant location, he will hear an auditory cue alerting him that he has items on the associated to-do list.

In addition, other users can also send him reminders to his virtual locations. These reminders resemble the common 3M Postsits™ and can be sent via regular e-mail. The user can also subscribe to information services, such as headline news, weather reports and current movie listings; the subscription is per location and different schedules can be made for different days. For example, the user could request to receive a list of the movies showing at the local cinemas when leaving work on Fridays. In addition, *comMotion* can provide maps showing the user's current position together with neighborhood locales, such as banks, movie theatres or grocery stores.

2.7.1.2 The Architecture of commotion

The hardware includes a portable PC, a GPS receiver, a CDPD modem and a Jabra earphone speaker with a bone conductive microphone. The human-computer interface, on the client side, is composed of both speech and graphical user interfaces. The former includes speech recognition and text-to-speech synthesis and was developed using AT&T's Watson SDK (software development kit). The Watson product is an integrated, Automatic Speech Recognition (ASR) and Text to-Speech (TTS) synthesis system that complies with the Microsoft Speech API (SAPI). The ASR engine uses phoneme-based sub-word analysis and, therefore, supports speaker-independence and continuous speech recognition. The commotion speech server, developed with the Watson SDK, operates on the client device.

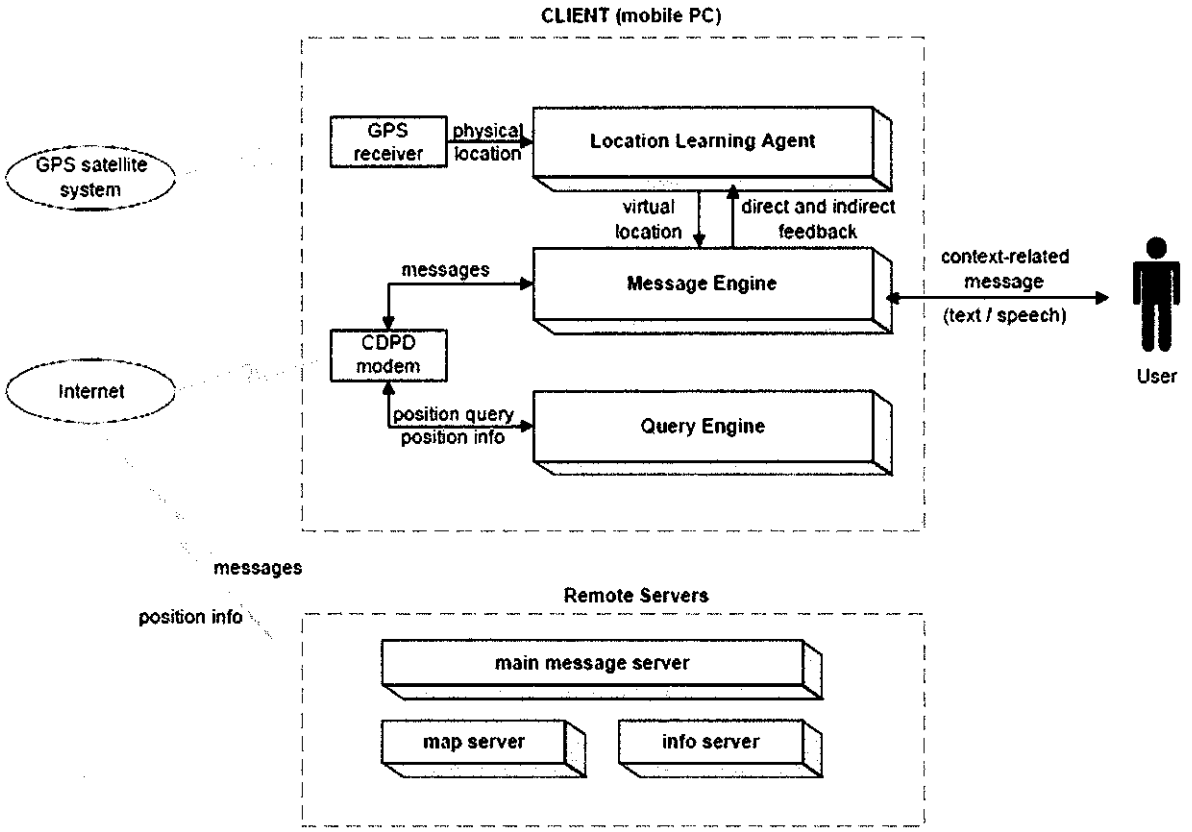


Figure 2.3: The architecture of comMotion showing the three main modules of the client application and its connection to the remote servers

The client application communicates via TCP/IP sockets to all the different server processes, hence, these processes could easily be transported to the client device or to any other computer with Web-server capabilities. In the current setup, with only the speech server on the client device and all other servers on a remote station (Figure 3), even if connectivity were lost the user would still have full access to his to-do lists and any reminders, which had previously been downloaded.

Furthermore, since all position tracking and analysis are done on the client device, these would not suffer from lack of connectivity. Reminders sent from other users are immediately downloaded to the client device where they are stored until delivery time. If

the server cannot access the client, these new reminders are saved until connectivity is re-established and they can be downloaded. Lack of Internet connectivity means information from on-line sources will not be accessible; likewise, no maps or related information can be downloaded.

2.7.2 Layar

Layar is often brought up when it comes to location aware apps, and it's a good example, indeed. It is basically an augmented reality app, which displays a lot of information about the world around the user. User can see information about buildings, restaurants and other points of interest, as well as other people who choose to participate. The app uses the GPS, camera, accelerometer and magnetometer to work, which is pretty much every sensor today's devices have.

2.7.3 Cab4Me

Cab4Me is a pretty useful app to have when one person travel to any United State city and does not know any local addresses and numbers. It basically takes the person's location and feeds it into a big database of cab companies near the person, so that person can select one, get the number and call himself a cab to wherever the person want to go. In addition, user can see the areas of the city where they can easily get a cab using Google Maps and your GPS transceiver.

Chapter 3
METHODOLOGY

3.1 Research Methodology

For software development of this project, it adopts an agile system development life cycle. Agile development is the best methodology for the development of the software as this project can be consider as a short term project and this methodology is suitable as agile methods break tasks into small increments with minimal planning, and do not directly involve long-term planning. Agile processes use feedback, rather than planning, as their primary control mechanism. The feedback is driven by regular tests and releases of the evolving software.

In addition, the project's methodology is based on iterative development, prevalent in the development stage. This stage covers feasibility study, planning, analysis, design and implementation. Agile development is chosen to accommodate requirements changes and frequent adaptation to alternative designs and revised models. The developed modules from the iterations will be evaluated, inspected and further enhancements will be made, if needed. The agile methods could align the development of the proposed optimization technique with academic standards.

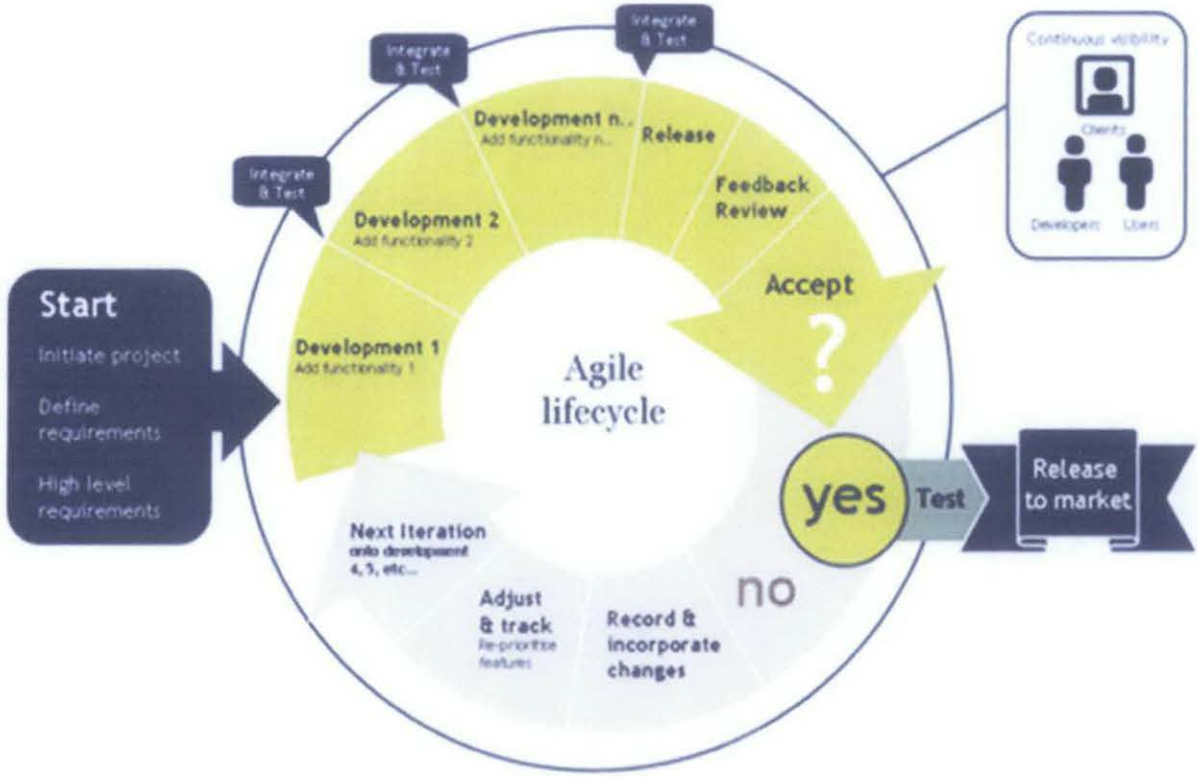


Figure 3.1: Agile system development framework

Phase 1: Critical Review of Related Works

The project is initiated with a detailed background study in the mobile computing area specifically in Context Awareness. In more precise research area, the project is based on Location Awareness. Therefore, a mechanism of enable the Location Awareness are identified and studied. The architecture of the other application based of Location Awareness will be review and study to be implemented in the project.

Phase 2: Analysis and design

During this phase, the design for the application has also been identified and the features also will be coordinate in the application. The analysis of the design will be gathered

from survey and research which to ensure the application developed is meeting the user expectation and requirement.

Phase 3: Design and Develop an Optimization Algorithm

In this phase, the mobile application will be start build and all the algorithm of the application will be start to code in the coding platform. The simulation will indicate how far the application has been develop and also to monitor the enhancement of the application.

Phase 4: Evaluation, Testing, and Further Enhancements

Results of the simulations will be evaluated against conventional parameters discussed in related works. Testing is conducted through simulations in Android SDK platform. This phase is vital to ensure the development of the application is in line with the benchmark and requirement gathered from the earlier phase. During the testing, the bug in the application will be identified and the enhancement of the application will be done from time to time until it reach the requirement specify earlier.

3.3 System Architecture of JOBRUN

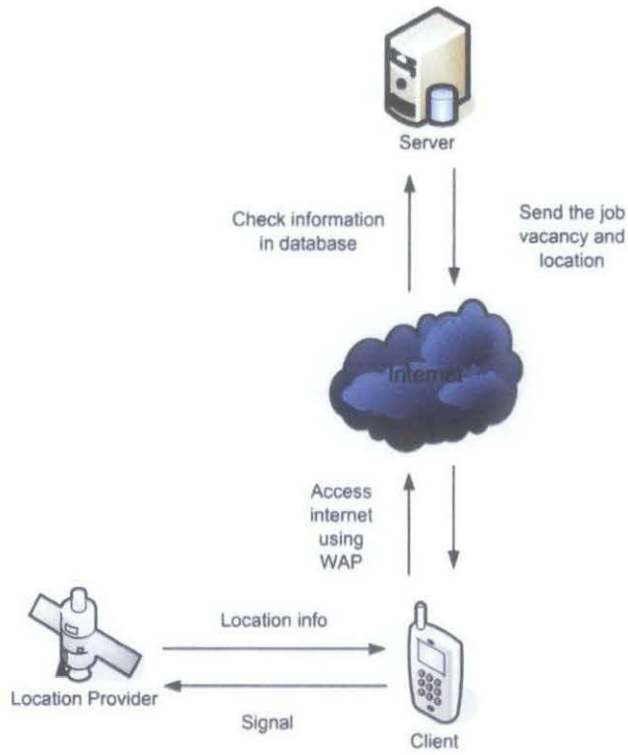
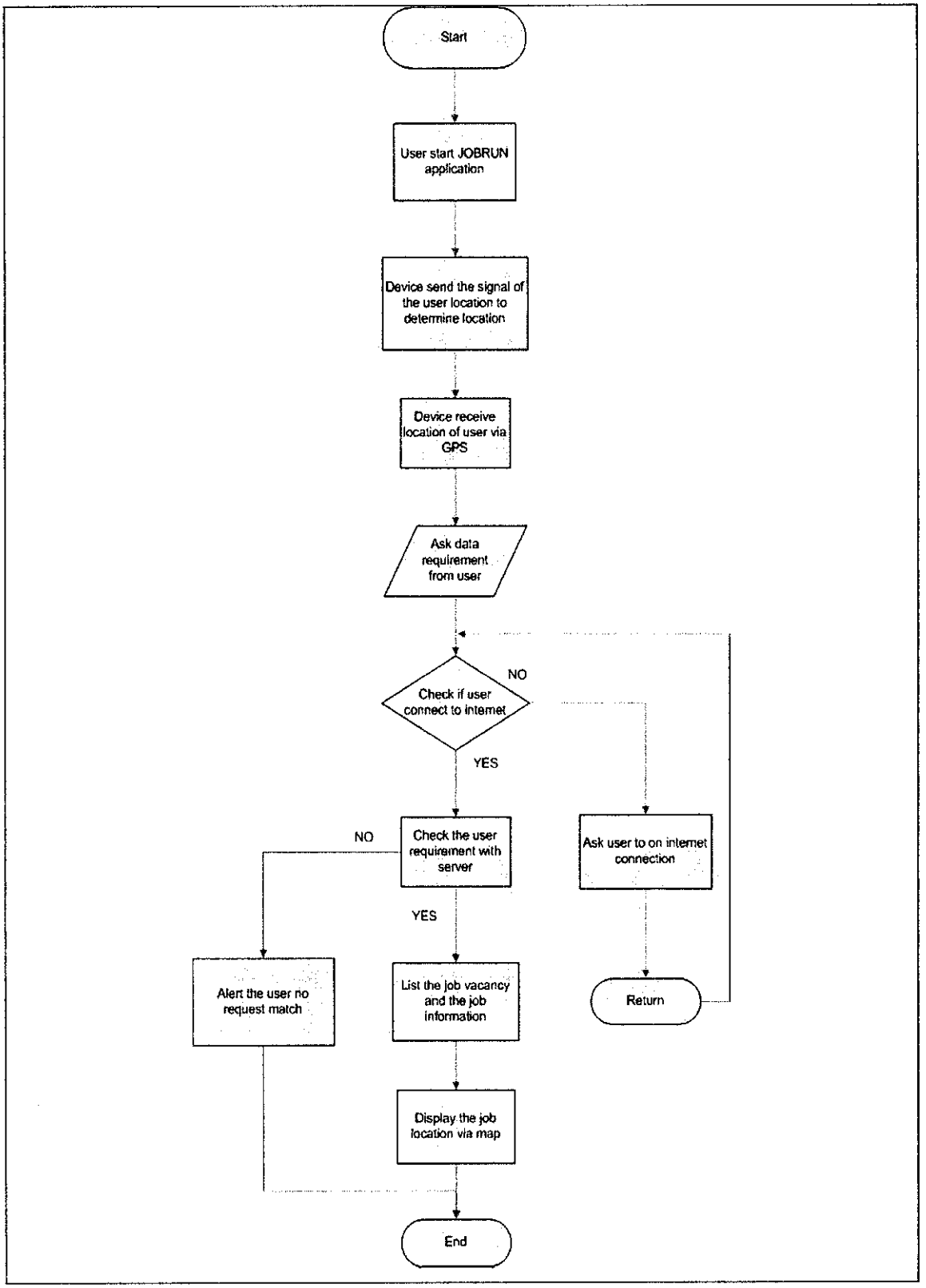


Figure 3.2: Architecture of JOBRUN

Based on the diagram above, in order for the client to track its location, the mobile phone through Geographical Positioning System (GPS) will send the signal to the location provider, which is the satellite. The satellite then will send the location information to the client, which is to the mobile phone. Subsequently, the mobile phone will access the Internet using WAP and check the information of the job vacancy with the server. If the information of job vacancy meets the user requirement, the server will send the information to the client through the Internet. Next, the information will be poped up at the user mobile phone and the details of the job vacancy at the desire location appear to user. The map to the location of the job vacancy will be display to user.

3.4 Flow Chart of JOBRUN application.



3.5 Gantt Chart

No.	Detail	Week												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Title Selection / Proposal	■	■											
2	Confirmation of Proposed Title			X										
3	Preparation of Extended Proposal				■	■	■							
4	Extended Proposal Submission						X							
5	Preparation for Proposal Defense							■	■	■				
6	Proposal Defense and Progress Evaluation									X				
7	Preparation of Interim Report										■	■		
8	Interim Report Submission											X		
9	Technical Report												■	■
10	Final Submission													X

Legend:

■ Progress

X Project Milestone

Chapter 4
RESULT AND DISCUSSION

4.1 Planning Phase

Shown below is the Work Breakdown Structure, derived from the Project Gantt Chart. It reveals the time allocation for each individual task, how a task affects or get affected by another task, as well as their completion status. As for now, the documentation part for FYP 1 almost completed and the requirement for the system has been gathered. The development of the project will be completed upon FYP 2 as the work breakdown structure is shown below.

Task ID	**Name of Task**	**Duration in Weeks**	**Task Dependency**	**Task Status**
1	Install software development tools	1		Completed
2	Preparation of Programming Environment	2		In progress
3	Development of system interface	2	1,2	Open
4	System Programming	5	1,2,3	Open
5	Deployment	1	1,2,3,4	Open
6	Prototype Testing and Correction	2	1,2,3,4,5	Open

4.2 Analysis Phase

4.2.1 System Users

There are 2 categories of users for the system, which are the front end users (client side) and back end users (server side). Depending on one's user category, the user will operate the system differently.

4.2.1.1 Front End Users

The front end-users or also known as the client side users are the typical user that using the JOBRUN application to get the information about the job vacancy in desire location. The users do not have the permission and authority to edit and update to the database of the server and this type of user can only retrieve the information through typical way of usage of JOBRUN application. In addition, no unique identification and password need to verify for the front end users to use the JOBRUN application.

4.2.1.2 Back End Users

This type of users has more authority compared to the front end users. Back end users or also known as the server side users require for unique identification for the security purpose. This type of users can edit, delete and add information to the job vacancy information that had been created by them only into the database. Basically, this type of user needs to register and verify through email before getting the authority to do so. Normally, the employers that would like to advertise the job vacancy will be the person who will become the back end user.

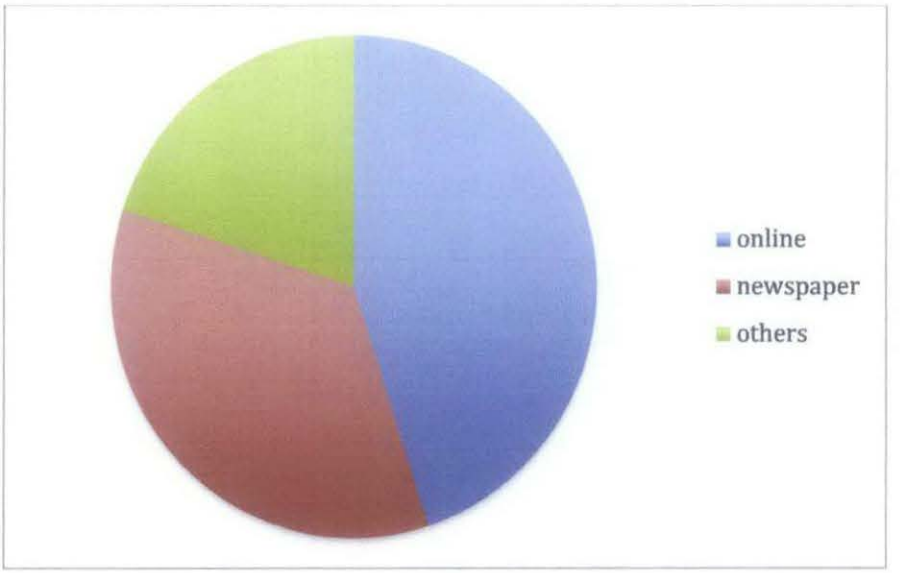
4.2.2 Requirements Gathering

The requirement-gathering process is used for building political support for the author's project and establishing trust and rapport with the users of the systems. A survey was conducted to the 100 respondents for the process of requirements gathering.For the first survey question, the question is "which platform medium has been used by for job searching". 45 percent from the total respondent answered through online. While another 35 percent of the total respondent answered through newspaper and the other remaining fall under the category others.

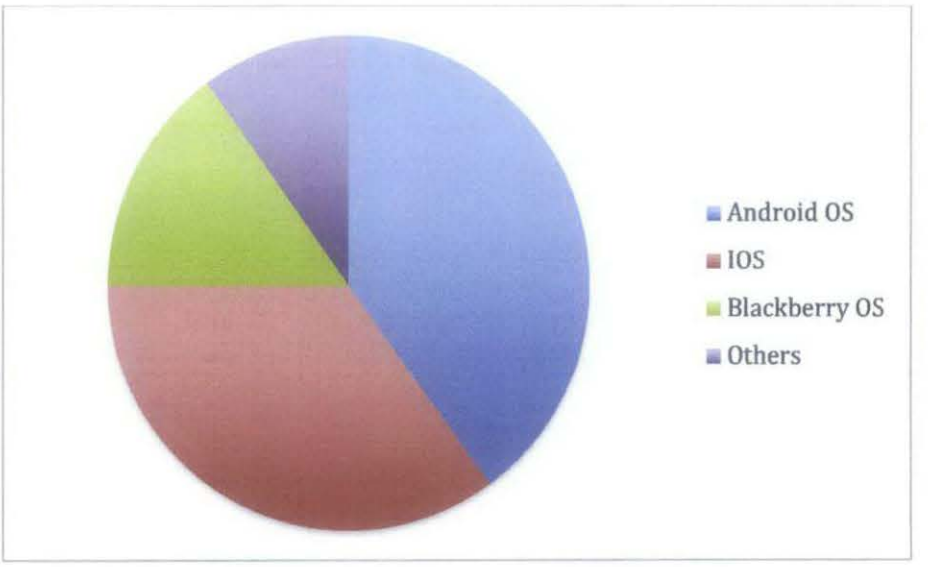
As for the second question, the question is about the platform of the respondent's smart phone. The question is "what is the operating system of your Smart Phone". 40 percent of the respondents use Android OS as the operating system of their smart phone. 30 percent of the respondents use IOS as the operating system while 20 percent use Blackberry OS for their smart phone. The remaining percentage was fall under others.

Subsequently the third question asking about the important factor that affecting the selection of the jobs. 55 percent of the total respondent answered that salary is the most important factor to choose a job. In the other hand the location of the jobs is an important factor for 35 percent from the total respondent. Last but not least 15 percent of the total respondent falls into others.

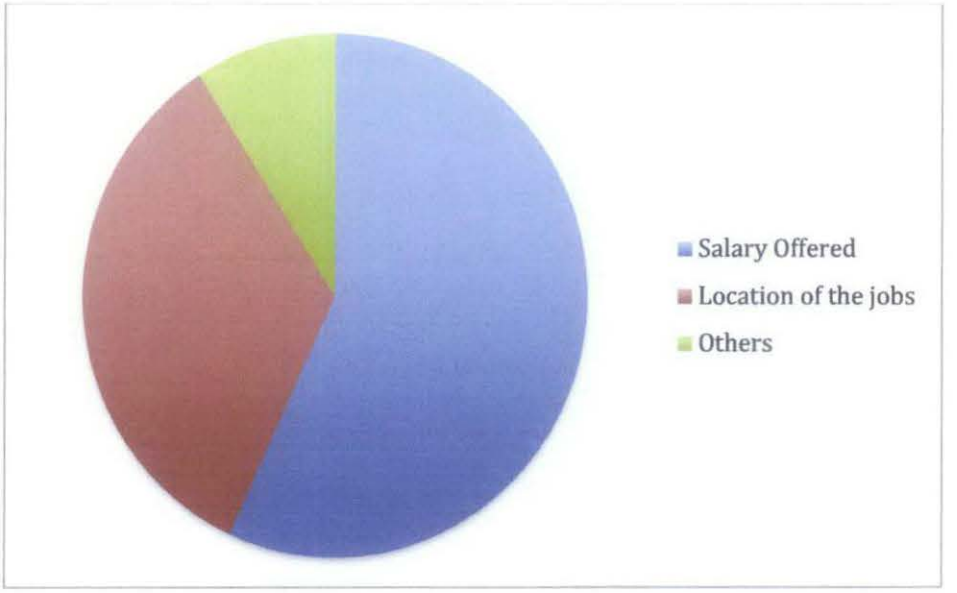
Question 1: "Which platform medium used for job searching"



Question 2: "What is the Operating System of your Smart Phone?"



Question 3:"What is the most important factor for you to choose the job offering?"



4.3 Features of JOBRUN

Proactive

All the useful information regarding the job vacancy will be push to the user. Once the user set the requirement of the job, which they are searching for, the information will be alerting the user and will be pushed to the mobile application interface.

Device Centric

The JOBRUN application will not involving the network centric using mobile base station to track the location of the user. However, to get more accurate positioning of the client, the system will be using Geographical Positioning System (GPS), which is the device centric.

Outdoor

For the developing prototype, JOBRUN is suitable for outdoor usage. This is because the GPS can detect the location of the client outdoor only. In the future, this mobile

application can be used for both indoor and outdoor usage using more advance technology for location tracking.

4.4 Prototype

Based on requirement determination in analysis phase, the mobile application has been developed. Basically, the main page of this mobile application will display the user's longitude and latitude, whichgenerated by the GPS.

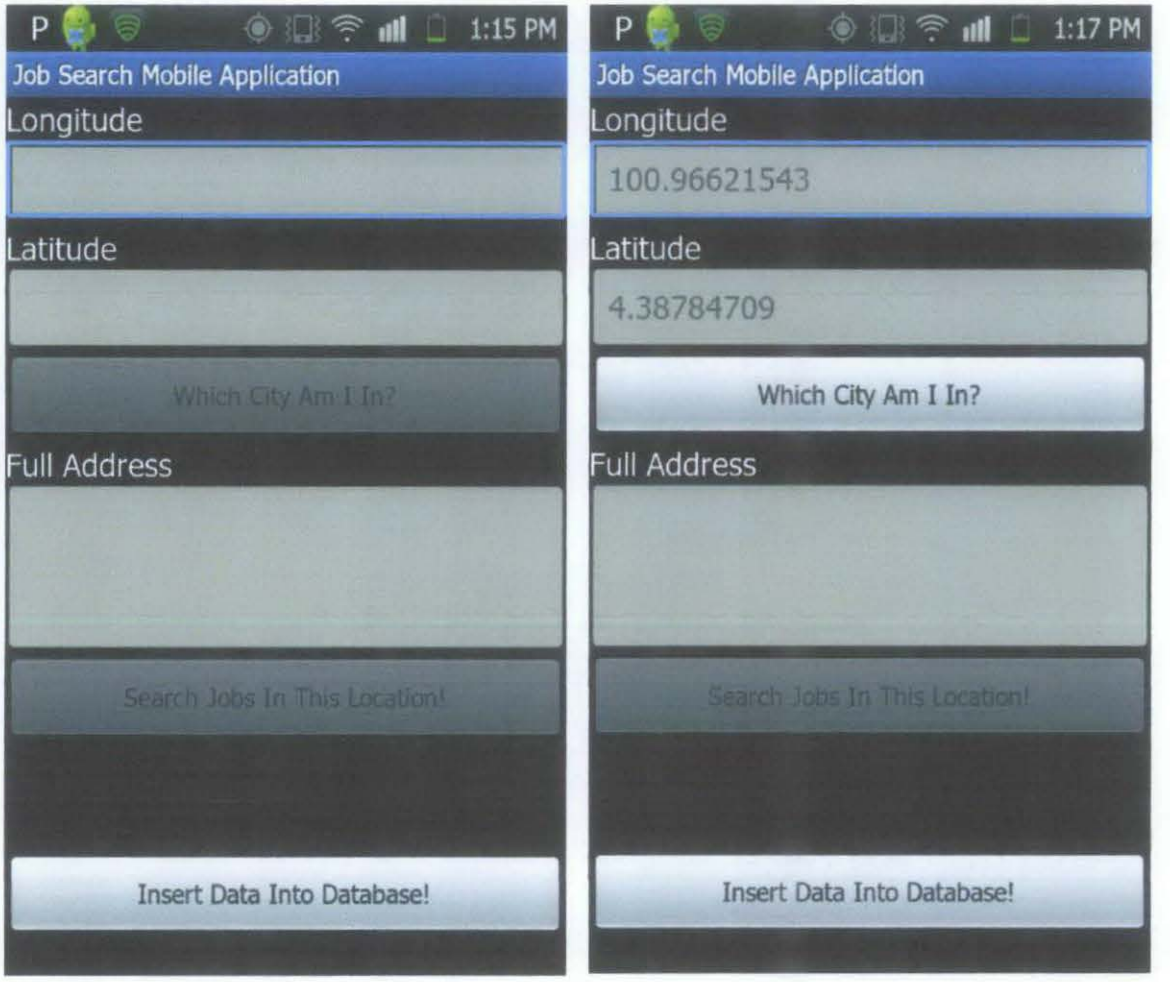


Figure 4.1: The main page of the JOBRUN mobile application

After the longitude and latitude of the user has been detected, the user then must press a button to show which locality that there are at currently. After the button has been pressed, the reverse geocoding process will be executed and the user longitude and latitude will be converted into the strings of address. The locality of the user will be generated at the full address bar.

Figure 4.2: Auto generated by reverse geocoding process to get full address

Subsequently, the user needs to press the button 'Search Jobs In This Location!' and the job details that available at that locality will be prompted out to the user. The user can press at the job title to go to the job details and requirement.

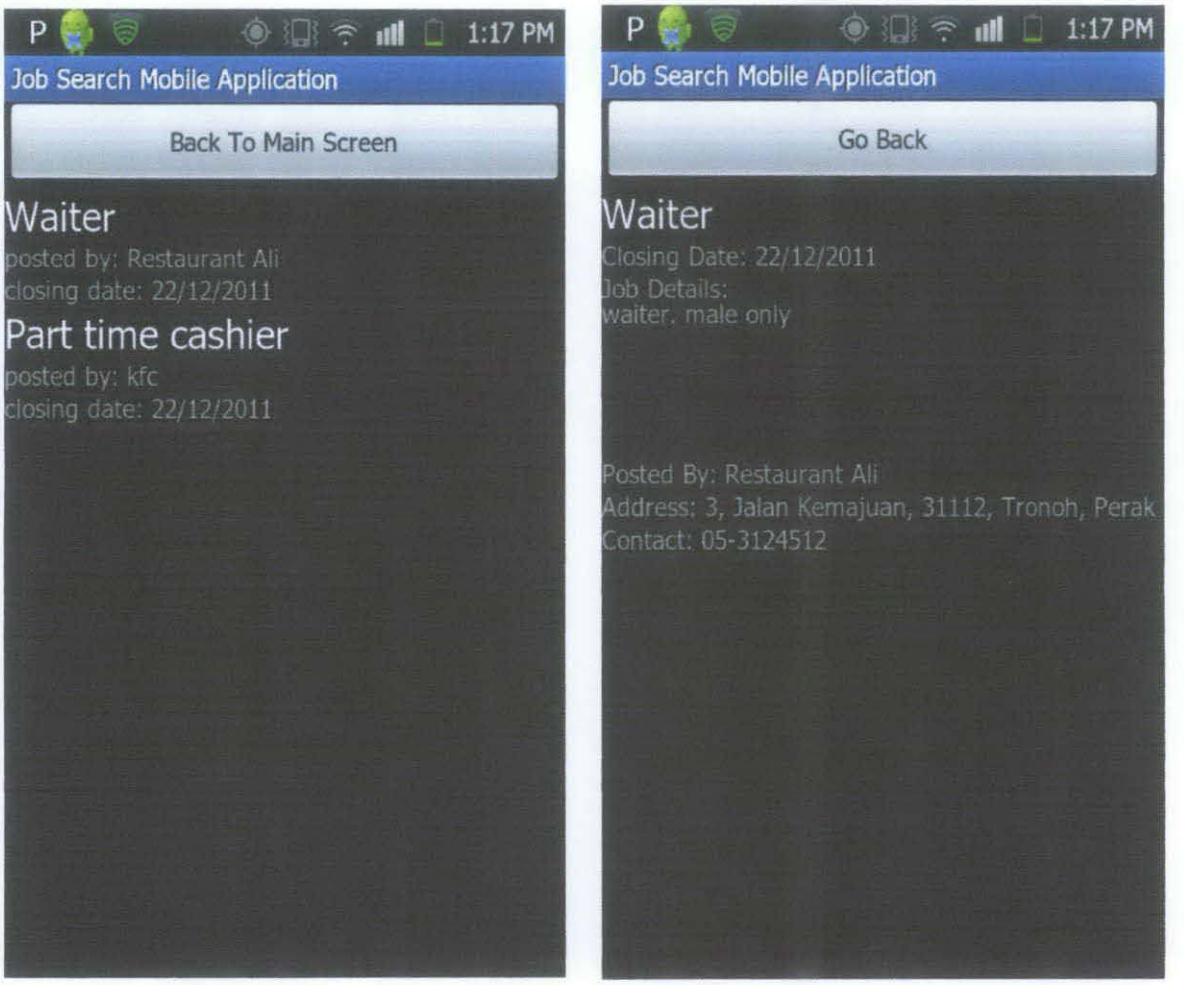


Figure 4.3: The jobs vacancy available and job details.

For the purpose of prototype, a dummy database has been created using mysqlite which is a simple database stored within the mobile application. The employer can enter the details about the job vacancy and also the administrator could also delete the data that is irrelevant to the user anymore.

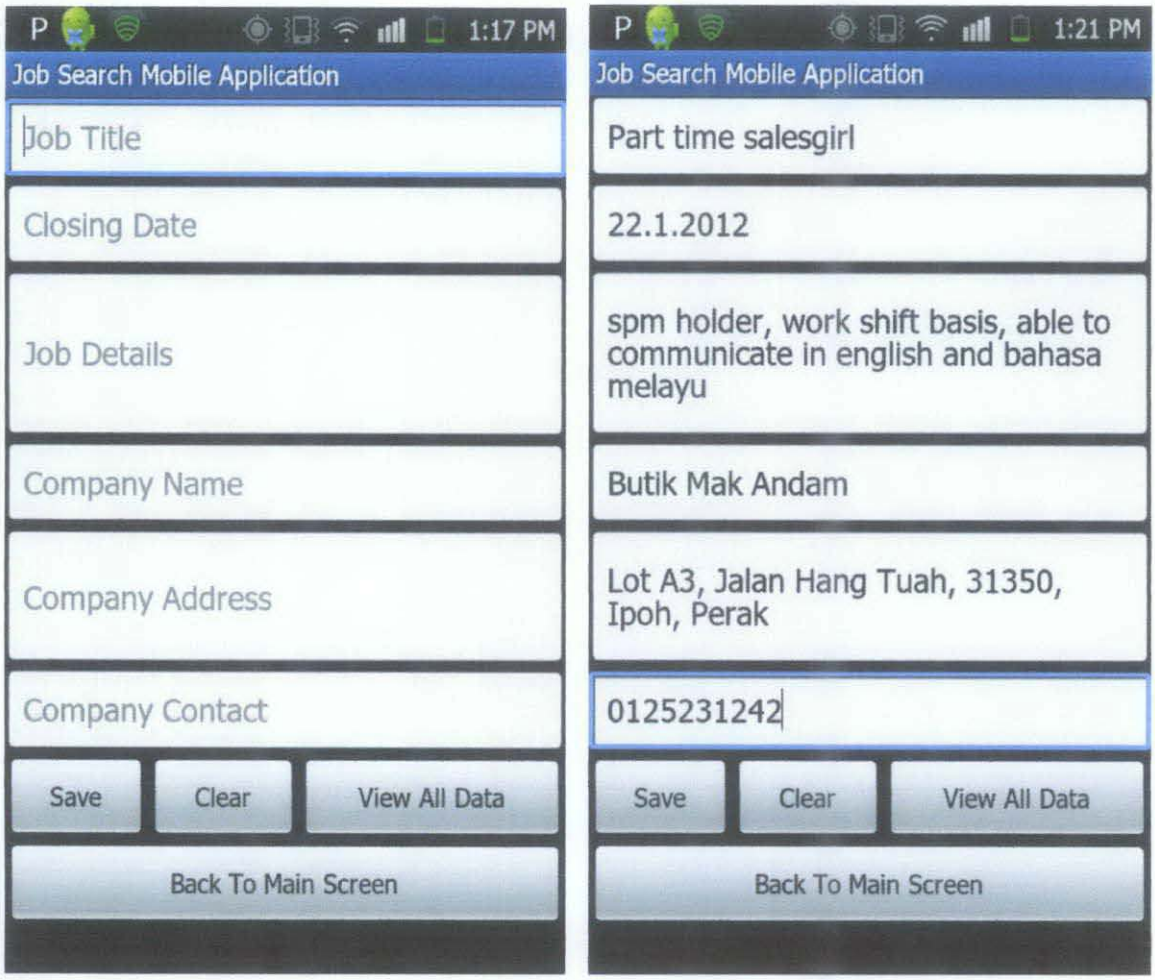


Figure 4.4: Form for the employer to enter the job details

4.5 User Acceptance Test

User acceptance test is an important process to measure and justify the system's usefulness. Approximately 30 people who acted as the system users have tested the functionality of JOBRUN mobile application. After trying out the mobile application, they were requested to fill in a feedback form. Below is the summarization of the user acceptance test.

1. I understand the purpose of the mobile application
2. It is difficult for me to perform a desired action
3. The mobile application is hard to learn
4. I think the system is confusing
5. The system able to achieve my objective
6. The system behaves differently from my expectation
7. I think I need the system manual
8. I find the system helpful

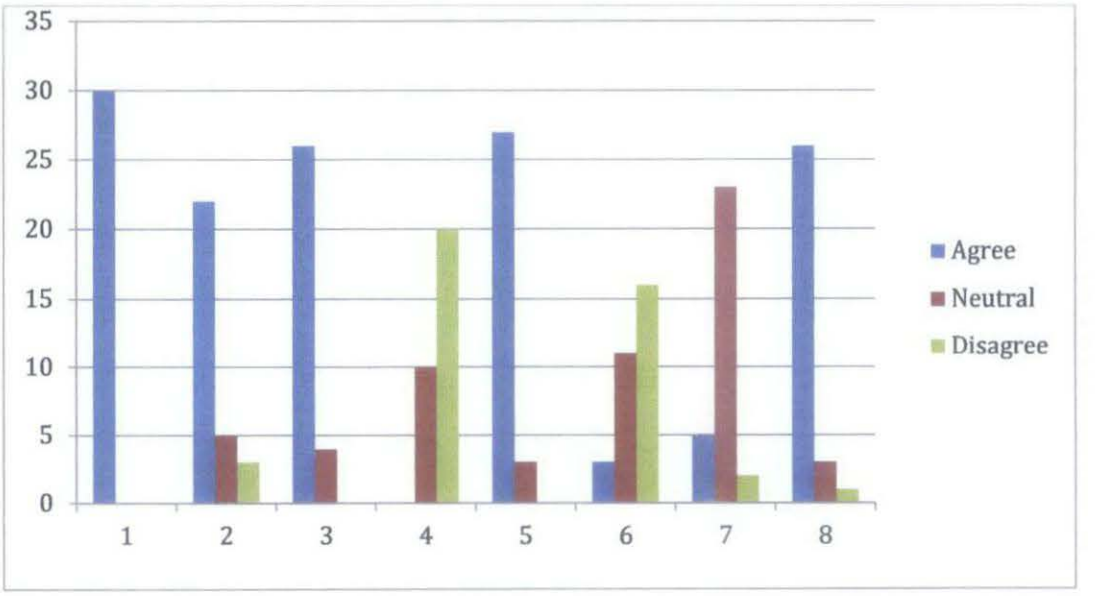


Figure 4.5: User acceptance test result and analysis

Chapter 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The Job Searching Mobile Application using Location Awareness (JOBRUN) is a productive and effective platform to search for the vacancy of part time job and ad-hoc job while the user is on mobile. Through the features of location awareness, users can be alerted on the availability of the job vacancy that meeting their requirement. This mobile application can make the process of job searching easy and fast comparing to the old conventional ways of job searching. Last but not least, with the occurrence of this application, it will directly help to reduce the unemployment rate in the country.

5.2 Recommendations

As for the first phase of the development, the system is available for outdoor usage only as the GPS can only track the signal at outdoor location. It is recommended for the system to be use both indoors and outdoors in the future development. In addition, for the development of the application, the system should be able to navigate the user to the desire location of the job vacancy that meets the user requirement.

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