Toward a User Preferences Agent Based Web Service Composition

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Abstract  

The basic idea of Service Oriented Architecture (SOA) is to compose an application as a set of services that are language and platform independent, communicate with each other. Therefore, the software's nowadays are designed and built through composing web services to support enterprise applications integration. In this paper, an agent was introduced to compose web services based on user preferences to fulfill a certain process, where the user preferences are essential for determining which web service are to be selected. In other word, the agent designed to maintain the following function: an intelligent web services selection and planning based on user preferences (such as price or availability), along with web services execution, tracking and adaptation.

Keywords: software Agent, Web services, Service composition, User preferences.

1. INTRODUCTION

Service-Oriented Architecture (SOA) is an approach to construct distributed systems that bring application functionality as services to end-user applications [1]. The basic idea of SOA is to compose an application as a set of services to support enterprise applications integration [2] which they are language and platform independent, communicate with each other using standardized messages like XML. Web services is a technology that realize the SOA.  

A web service is a software system identified by a URL, whose public interfaces and bindings are determined and described using XML. Its definition can be discovered by other software systems [1]. As individual web services are limited in their capability, which created the need for composing existing services to create new functionality in the form of composite service. However, the process of creating composite service is achieved by combining existing elementary or complex services, possibly offered by different providers with different feature with each web service. Thus, In carrying out this composition task, the process of selecting and composing the web services must be determined using user preferences along with monitoring the execution of the selected web service to monitor if any web service changed their behavior or become unavailable [3].

Some proposals are being made to enable dynamic composition of web services and execution monitoring frameworks [4]. Few of these proposals address user preferences during the selection of web services [4]. the user preferences must be addressed to satisfy client process requirements, such as price, availability, so it is necessary to represent user preferences in the selected and composed web services. Moreover,
Evaluation of composition process: when the composer selects a web service, it is quite common that many web services have the same functionalities. So it is possible that the composer generates more than one composite service fulfilling the requirements. In that case, the composed web services are evaluated by their overall utilities using the information provided from the non-functional attributes. It is imperative to design an agent to compose web services (selection and execution) based on user preferences. In this paper, we designed a user preferences agent to select to monitor the execution of web services in case of failure of web services among the selected once, or or changes in behavior of selected web services.

The rest of the paper organized as follows: a description of web service composition process is presented in section 2. Related work is described in section 3, the proposed user preferences agent based web service composition is presented in section 4, Finally, the conclusion is drawn in section 5.

2. WEB SERVICE COMPOSITION

Web service composition is the process of combining Web services in order to offer value-added services. Composite services in turn are defined as an aggregation of elementary and composite services as illustrated in Fig. (1). The Web services composition process should satisfy both functional, non-functional requirements and guarantee the correctness of the result. Web service composition is currently an active area of research, with many languages being proposed by academic and industrial research groups due to its complexity. However, the flexibility of composition comes at the penalty of increased system engineering complexity.

The process of composing web services includes many phases as described in [5,6], which refers to the service composition life-cycle. The phases include composition definition, scheduling, construction and execution. The idea behind phased service composition life cycle is to start with an abstract definition and gradually make it concrete to generate executable service processes from these abstract specifications as presented in [6]. Definition phase starts with specifying composite service, which specifies the involved Web services that constitutes the composite service and the constraints under which they operate. Scheduling phase of the approach, where the composer system specifies the order and when to execute involved services of composite service. During this phase the system may generate alternative composition schedules and present them to the application developer for selection. Based on abovementioned the proposed agent in this paper follow this process along with selection of web services based on user preferences and agent also monitor the executing of the selected Web services.

![Web service composition and Execution engine](image)

Fig. (1). Web service composition and Execution engine.

3. RELATED WORK
An agent web service composition was proposed in [7], which is a system for web service composition with key user preferences. The system was designed composing web based on user preferences, provision of the GologPref algorithm that integrates user preference-based reasoning into Golog [8], as they claim the effectiveness and the optimality of GologPref with respect to the user’s preferences.

In [9] an description of a way to augment OWL-S process models by user preferences in planning for Web Service Composition, which was achieved through mapping a given set of process models and user preferences into a planning language for representing hierarchical Task Networks (HTNs). They web service composition process is based on a best-first search over the possible HTN-style task decompositions, by heuristically scoring those decompositions based on ontological reasoning over the input preferences (user preferences).

An approach for web service composition using user preferences was introduced in [10], the suggested approach is based on combination of configuration and query rewriting to find services that implement the functionalities expressed in the user query, the configuration phase in their approach is used to capture dependencies between services, and to generate a set of composed Web services using a ranking algorithm to rank results according to user preferences.

A hybrid Fuzzy-guided Genetic Algorithm approach was introduced in [11] for QoS-based web service composition, through determining a set of candidate web services to be bound to abstract services contained in a composition to meet a set of fuzzy constraints (user preferences) and to optimize a fitness criterion on QoS attributes. In the GA optimization, the fitness function is a fuzzy system that is constructed based on user preferences.

In [12] a hybrid method was proposed using Colored Petri Net (CPN) that takes advantage of search meta-heuristics techniques to consider functional conditions expressed as input and output attributes, and transactional properties expressed as a tolerance level. The method was introduced they uses of Colored Petri Net as formalism to represent composite web service and perform a Best-First search, where transactional and QoS properties are both integrated in the selection process, where the selection of web services is based on QoS properties from candidate service sets formed in the TCSW-CPN.

An approach for composing web services based on multi-agent software with one master agent to control the execution of composite service in [13], but this approach do not an exception handling during the execution. Presented. Although, An extended control flow model for the workflow of Web service composition using BPEL [14], along with verification technique for concurrent properties, such as deadlock-free.

4. THE PROPOSED WSC AGNET

The proposed approach to compose web services in this paper rely on agent based system to automate the composition of web services based on user preferences to fulfill a certain process, where the user preferences are essential for determining which web service are selected. In other word, the agent designed to maintain the following function: an intelligent web services selection and planning based on user preferences (such as price or availability) as illustrated in figure 2.
4.1 User Process and Preferences

The web process is a collection of related, structured activities or tasks that serve a particular goal for a particular customer or customers. Although, the customer may wish to force certain preferences on the whole process or certain of task such as price, execution time, reputation of the provider of web service.

4.2 Agent based Web Service Composition

The WSC agent proposed in this paper is the mediator between user and public registries and web service providers. WSC agent contain a module called Web service discovery and selection as illustrated in figure 2. The WSC agent responsible for the discovery of the candidate web service from Universal Description Discovery and Integration (UDDI) domain registries and returns their Web Service Description Language (WSDL) and URL and also to be stored in agent. the agent Web service discovery and selection module also is provided with an intelligent selection and matching technique to select web services based on user preferences, whether the user preference are on each individual web service or the whole composition process. The WSC agent creates number of composition plans and only one plan will be selected for execution according to user preferences. The chosen composition plan also stored in the agent repository module for later use. WSC agent also contain a module called Web service execution and monitoring, which is used to controls the execution of the composition plan and monitors the execution of web services and dynamically adapts to any change (e.g. service unavailable). The WSC agent takes the WSDL of selected Web services and generates executable BPEL code. The WSCE agent orchestrates the selected Web services to execute composite service. At run time, the WSC agent monitors the execution of composed web services. If everything goes well, after successful complete executions, the WSCE agent reports the actual recorded preferences of selected web service to agent repository of this composition for later use. Although, due to the dynamicity of internet and some of web service may fail to deliver result or become unavailable, if the one of the composed web service failed to provide service, the agent look-up for new candidate web service based on the same user preferences or at least closed to.

5. CONCLUSION

In this paper, an agent was introduced to automate the process of composing web services based on user preferences to fulfill a certain process, where the user preferences are essential for determining which web service are selected. In other word, the agent designed to maintain the following function: an intelligent web services selection and planning based on user preferences(such as price or availability), along with web services
execution and tracking and adaptation. As future work, we intend to design semantic web service composition agent along with experimental results.

6. ACKNOWLEDGMENT
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References:
Drive Safely Using “Lock-If-Drive” Mobile application

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Abstract:

World is contracting with the growth of mobile phone technology. As the number of users is increasing day by day, facilities are also increasing. Starting with simple regular handsets which were used just for making phone calls, mobiles have changed our lives and have become part of it. Now they are not used just for making calls but they have innumerable uses and can be used as a Camera, Music player, Tablet PC, T.V., Web browser etc. And with the new technologies, new software and operating systems are required. It is also a platform so developers can create applications or ‘apps’ developed for Smartphone that can carry out specific functions. There are hundreds of thousands of apps available and they are constantly being developed - each with their own purpose.

For instance, “Lock-If-Drive” app, that I’ll introduce and describe in detail, later on in the third section, will be able to lock an android device when the device is moving with a speed greater than a fixed value and, at the same time, if the device is connected either by WiFi or 3G.

Keywords-Mobile OS; Mobile application; Android; Java.

1. Mobile-Phone Operating Systems

Long gone are the days when mobile phones were just a device to make phone calls and occasional texts. Now they are handheld computers, where we can send emails, play games, watch the news and make video calls to loved ones. More commonly, these are known as 'smartphones'. In the present smartphone era, operating system is an integral part of mobile phones. Many features of smartphones [1] like touch-screen, navigation, Wi-Fi, gaming, etc. rely heavily on operating system for proper functioning. We have operating systems to run our desktop computers and laptops, and smartphones use them too, to introduce advanced functions to a mobile phone that were only available on our computers before. A mobile operating system (mobile OS) is a set of data and programs built exclusively for a mobile device, such as a smartphone, personal digital assistant (PDA), tablet or other embedded mobile OS to manage all the hardware and optimize the efficacy of the application software in the device. A mobile OS typically starts up when a device powers on, presenting a screen with icons or tiles that present information and provide application access. It is responsible for identifying and defining mobile device features and functions, including keypads, application synchronization, email, thumbwheel and text messaging. A mobile OS is similar to a standard OS (like Windows, Linux, and Mac) but is relatively simple and light and primarily manages the cellular and wireless variations of local and broadband connections, mobile multimedia and various input methods. Operating systems are also supporting heavy dedicated graphics and even 3D viewing aids.

Because operating systems are so integrated with the look, feel and function of a mobile phone, many people base their choice of device around which operating system it uses. Some mobile OS are open source software, which means there are no restrictions on what you can download on it, or who can develop its software (there are often a 'community' of developers) - it is entirely customizable, whilst others are restricted in the types of software
permitted to run on the device. Some of the best-known mobile operating systems include: Google Android [2], Apple iOS, Research in Motion’s BlackBerry OS [3], Nokia’s Symbian, Hewlett-Packard’s webOS (formerly Palm OS) and Microsoft’s Windows Phone OS [4] (as Windows Phone 7 and Windows Phone 8 which has been recently introduced) and the new expected competitor Mozilla Firefox OS…

A. Android mobile OS

Android OS [5] is owned by Google and powered by the Linux kernel, which can be found on a wide range of devices. Android is an open source operating system which allows developers to access unlocked hardware and develop new programs as they wish. This means unlimited access to any anyone who wants to develop apps for the phone and places very little restriction on its licensing, so users benefit from a tone of free content. Android is currently the fastest growing smartphone operating system in the market and is expected to become the dominant platform in a few years due to its tremendous traction with a wide spectrum of users. Some of the best features of Android include the ability to customize multiple home screens with useful widgets and apps that give you quicker, easier access to the content and functions you most care about. It also has an excellent capacity for multitasking - with the ability to close programs simply swiping them away. Android Market, which is the Android equivalent of the Apple App Store, is home to more than 370,000 apps, many of which are completely free. The new release Jellybean is Android's fastest mobile operating system. Android 4.1, Jellybean, is the fastest and smoothest version of Android yet. Improvements were made throughout the platform and added great new features for users and developers (enhanced accessibility, support for international users, expandable notifications, resizable app widget, new input types and capabilities, new types of connectivity, new media capabilities and much more…).

B. iOS

Apple's iOS is found on the iPhone, iPad and iPod Touch. Operating system security and compatibility has been a point of contention for some in regards to IOS. It is entirely closed-source, and Apple chooses on its own which software the platform will and will not support. Adobe Flash, for example, does not work on the embedded operating system. Still, it does have a wide variety of apps and an interface that many laud for its ease of use. It responds to the user's touch - allowing you to tap on the screen to open a program, pinch your fingers together to minimise or enlarge an image, or swipe your finger across the screen to change pages. The Apple iOS is not allowed to be used in third party systems, so you will only be able to use it on products made by Apple. It comes with the Safari web browser for internet use, an iPod application for playing music and Apple's Mail for managing your missives. You can download more than 500,000 applications currently available on the App Store directly to any device running iOS, be it an iPhone or an iPad. These encompass everything from accessing recipes to playing the guitar or working on your documents on the move. Recently Apple took the wraps off the next version of its mobile operating system, iOS 6 at the WWDC keynote in San Francisco. With over 200 new features being added to the operating system, here are the few important ones:

The biggest highlight of the iOS 6 will be the addition of Apple's own Maps over Google Maps. Integrated with Siri, the new Maps will have turn by turn voice navigation, 3D maps, real time traffic update and a feature called Flyover, which will have photo-realistic interactive 3D views.
C. Windows Phone

Windows Mobile, also known as Windows Phone, is the mobile phone version of Microsoft's operating system. Because of this, it is easily compatible with many Windows programs such as Microsoft Office, making it a popular choice for businesspeople. Windows Mobile was originally designed for Microsoft's line of Pocket PCs before being adapted for use in phones. The new major release for the Microsoft Windows operating system, Windows 8 has been recently introduced. Windows 8 is expected to be a completely redesigned operating system that's been developed from the ground up with touchscreen use in mind as well as near-instant-on capabilities that enable a Windows 8 PC to load and start up in a matter of seconds rather than in minutes – although it should be noted that this is a feature that's been promised in countless previous releases of Windows as well. Windows 8 is also expected to replace the more traditional Microsoft Windows OS look and feel with a new "Metro" design system interface that first debuted in the Windows Phone 7 mobile operating system. The Metro user interface primarily consists of a "Start screen" made up of "Live Tiles," which are links to applications and features that are dynamic and update in real time. Users will also be able to switch between apps in Metro by simply swiping across the screen. Windows 8 is expected to include the latest Internet Explorer Web browser, Internet Explorer 10, as well as integrated cloud-based online services like Microsoft's app store and Office 365. The new operating system will also likely add built-in support for newer technologies like USB 3.0 and Bluetooth 3.0.

D. Symbian

Symbian OS is basically an open source operating system which is uniquely designed for use with mobile phones. It is common with Nokia advanced and smart phones that are data enabled which you will find at 6Sense Technologies. Running on ARM processors only, it has continuously evolved over the period from Psion’s EPOC which was primarily developed as a rudimentary operating system for use with the electronic organizers of the old age. In the initial stages of development, Psion EPOC OS was referred to as EPOC16 in the early 90s and this was basically to help distinguish it from the 32bit operating system EPOC32 which was much newer. This is what eventually evolved to become Symbian OS. The Psion software which is the origin of Symbian OS was commonly known for its joint venture with many other manufacturers of mobile phones like Motorola, Sony Ericsson as well as Nokia which was called Symbian and later assumed the name Symbian software before being renamed to EPOC32 OS. Symbian OS benefit was the ability to handle several tasks at a go which translates into ability to surf directly from the phone in modern devices. It is uniquely designed such that one cannot lose any details when answering to an incoming call thus making it more suitable for use by many of the 6Sense Technologies customers. It has furthermore adapted several soft features like global positioning software which is projected to become very popular as a camera in the coming days. Even though Microsoft and palm have been dominating the markets as the only providers of system software for mobile phones, Symbian has been making inroads into the industry for some time now positioning itself in a good position to claim a share of the market which it is fully determined to achieve. It began by announcing back in 2008 that its operating system will be open source soon which would allow 6Sense Technologies customers as well as vendors to make an addition to the already established Symbian OS. Symbian is Nokia's own operating system and is now mainly used on mid to low-end handsets since Nokia announced it would be migrating its flagship efforts to Microsoft's Windows Phone operating system. Symbian's strength is in bringing smartphone functionality - including e-mail, apps and multitasking - to handsets at the lower end of the market and in emerging markets. Like most smartphone operating systems, you can download apps on a Symbian
device and customize it to your liking with widgets and shortcuts. You can also get free maps and turn by turn navigation from Nokia and other useful tools installed out of the box, such as a document viewing and editing suite.

E. Mozilla Firefox OS.

Announced in July of 2011, the new OS will be based entirely on HTML5 and built according to open web standards. The operating system makes extensive use of HTML5 technology and aims to do away with the walled-garden approach taken by other manufacturers. The first few phones are expected to launch in Brazil in early 2013, PC Mag reported, with ZTE and TCL Communications Technology making the devices.

2. Android mobile OS Architecture

Figure below outlines the current (layered) Android Architecture [6]. The modified Linux kernel operates as the HAL, and provides device driver, memory management, process management, as well as networking functionalities, respectively. The library layer is interfaced through Java (which deviates from the traditional Linux design). It is in this layer that the Android specific libc (Bionic) is located. The surface manager handles the user interface (UI) windows. The Android runtime layer holds the Dalvik Virtual Machine (DVM) and the core libraries (such as Java or IO). Most of the functionalities available in Android are provided via the core libraries. The application framework houses the API interface. In this layer, the activity manager governs the application life cycle. The content providers enable applications to either access data from other applications or to share their own data. The resource manager provides access to non-code resources (such as graphics), while the notification manager enables applications to display custom alerts. On top of the application framework are the built-in, as well as the user applications, respectively. It has to be pointed out that a user application can replace a built-in application, and that each Android application runs in its own process space, within its own DVM instance. Most of these major Android components are further discussed (in more detail) in the next few sections of this documentation.

Google usually refers to the Android OS as a software stack. Each layer of the stack groups together several programs that support specific operating system functions.

A. Android applications

At the top of the stack are the applications themselves [7-9]. These are applications written in Java. Some of basic applications include an calendar, email client, SMS program, maps, making phone calls, accessing the Web
browser, accessing your contacts list and others. If you are an average user, this is the layer you will use the most. You do that with the user interface. Only Google programmers, application developers and hardware manufacturers access the other layers further down the stack. Android applications are bundled into an Android package (.apk) via the Android Asset Packaging Tool (AAPT). To streamline the development process, Google provides the Android Development Tools (ADT). The ADT streamlines the conversion from class to dex files, and creates the .apk during deployment. In a very simplified manner, Android applications are in general composed of:

- **Activities** (needed to create a screen for a user application – classes with a UI)
- **Intents** (used to transfer control from one activity to another)
- **Services** (classes without a UI, so they can be executed in the background)
- **Content Providers** (allows the application to share information with other applications)

### B. Application building blocks

- **Activity** - a UI component that interacts with a user
- **Service** - a task running in background and it does not have any UI
- **Content Provider** - component that allows applications to share data with other applications.
- **Broadcast Receiver** - component that responds to notification or status changes. Allows an application to register some code that will be run when it is triggered by an external event.

The basic idea in Android OS is to reuse and replace components (OSGi model).

### C. The Application lifecycle

Never forget it's a phone! Your app is entering into a pretty harsh environment - it can be subjected to all manner of external prods, kicks and pokes like running out of memory, running out of power or losing a signal. Oh, and a call might come in ;To support all this, the Android designers implemented a powerful lifecycle support mechanism, all aimed at preserving the integrity of your app no matter what manner of nasties it gets subjected to. Your app will receive **callbacks**, these are hooks in your code which you implement as methods with fixed names such as `onPause()` and `onRestart()`. This way, when these events occur, your code executes, giving you the chance to handle things in a controlled way, such as preserving data to storage when the app quits and so on.

Here's the Google diagram:
Figure 2 Application life cycle

Seeing this for the first time might seem intimidating, but it's not really when you think of how the phone can be used. Say that call does come in - your app will be paused and sent to the background whilst the call is dealt with in the foreground. Your app's onPause() handler will be called. Then, after the call, the user may switch back to your app and so the onResume() method is invoked. Understanding the app lifecycle allows you to play nice with the rest of the handset and makes sure your users get no nasty surprises when using your app in their phone as a whole.

D. Basics of Android Applications

These are the basics of Android applications:

- Android applications are composed of one or more application components (activities, services, content providers, and broadcast receivers)
- Each component performs a different role in the overall application behavior, and each one can be activated individually (even by other applications)
- The manifest file must declare all components in the application and should also declare all application requirements, such as the minimum version of Android required and any hardware configurations required
- Non-code application resources (images, strings, layout files, etc.) should include alternatives for different device configurations (such as different strings for different languages)

Google, for software development and application development, had launched two competitions ADC1 and ADC2 for the most innovative applications for Android. It offered prizes of USD 10 million combined in ADC1 and 2. ADC1 was launched in January 2008 and ADC 2 was launched in May 2009. These competitions helped Google a lot in making Android better, more users friendly, advanced and interactive.
3. Lock-IF-Drive application

The main purpose of this paper was to design, build and implement a mobile application. The application, is supposed to block the mobile device, if the device is moving beyond a certain speed, and if at the same time, the mobile was connected to a certain wireless network. The application target platform was not yet imposed or designated. At the beginning, I assumed that the application will be applied on IPhones, so the application will be built using IOS, but, after researches, several issues popped-up. Then, the solution was to switch to android Phones and Android Mobile operating system for many reasons. The first issue I faced is that I definitely needed a MAC machine to build, simulate and debug an IOS application. Unfortunately that MAC wasn’t available. Second, no apps can be executed on an IOS device, even during development, unless they are signed, the Application must be first Cryptographically Signed and Published on the App Store to be able to test it on a real MAC smartphone. For these reasons, the alternate and promising solution: Android mobile OS for its many characteristics already mentioned in the previous sections, from the fact that is an open Source Code, and for the ability to build android application with an affordable development environment running under Windows, the most popular desktop operating system. So now, let’s begin to build our Lock-IF-Drive application previously defined. Keep in mind that, each time we finish an activity we’ll test it using Android Emulator and see how it works. I’ll also share with you some fundamentals of Android application design skills, including how to build a user interface etc...

We’ll first begin to create our “Lock-IF-Drive “project previously defined.

A- Create a Project with Eclipse

To start, we have to be sure that our development environment is set up. We need to:

1. Download the Android SDK Starter Package.
2. Install the ADT plugin for Eclipse (if you’ll use the Eclipse IDE). An Android Virtual Device (AVD) is an emulator configuration that lets you model an actual device by defining hardware and software options to be emulated by the Android Emulator.
3. Download the latest SDK tools and platforms using the SDK Manager.

The Android SDK provides you the API libraries and developer tools necessary to build, test, and debug apps for Android.

Let’s begin by creating a new project, named Lock-IF-Drive, with eclipse.

1. In Eclipse, select File > New > Project > Android folder > Android Project
2. Enter a project name (such as "Lock-IF-Drive") and click Next.
3. Select Build Target.
4. Then it’ll appear a window similar to the one in figure 6. Specify other app details, such as the:
   - **Application Name**: The app name that appears to the user. Enter “Lock-IF-Drive”.
   - **Package Name**: Your package name must be unique across all packages installed on the Android system.
• **Create Activity**: This is the class name for the primary user activity in your app (an activity represents a single screen in your app). Enter "Lock-If-DriveActivity".

• **Minimum SDK**: Select 15

You simply need to be sure that you don’t use any APIs that require an API level greater than the minimum SDK version without first using some code to verify the device's system version.

5. Click **Finish**.

Our project’s workspace is now created with some other default files, and we’re ready to begin building the application. This is where we’ll begin to write our main activity of our application.

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**B- “Lock-If-Drive” activities source code (.java)**

Concerning our project, we mainly need to achieve three different main tasks. Each task will be realized by an activity, and at the end we’ll combine all these activities and related classes in one final activity to retrieve our final goal.

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As we see in Figure 8, under **Lock-If-Drive**<src>src<me.com.proj>, 6 activities/classes are to be created: addAdmin.java.java, Connection.java, disAdmin.java, LockApp.java, Lock-If-DriveActivity and Speed.java. For each of these classes I’ll present the task definition, the source code with the necessary explanation.

C- **Lock-If-Drive Activity**

This Activity is the main Activity Launched by the application. From here the user will be directed to all other activities that’ll be introduced later on. And here is where the receiver MyAdmin is defined. This receiver (MyAdmin.class) will be called by all classes that need to add or remove administrator. These buttons and text views have to be declared in the main.xml file responsible of this activity layout, otherwise there’ll be errors. this main.xml with all the others .xml files will be given later in the next section, but for the moment, I’ll cheat a little bit, and I’ll show you , in Figure 9, how the **Lock-If-DriveActivity** will look like , in order to give you a global view of the whole project. This layout is composed of 5 buttons linked to 5 activities and 2 text views to display infos.

![Figure 5 Lock-If-DriveActivity emulator snapshot](image)

D- **Connection activity**

When Check Connection button is pushed, it will launch Connection.java, this activity will be responsible of checking the mobile network status, in other words, it’ll check if the mobile is connected either by WiFi or through 3G Mobile network. if WiFi connection is detected, the emulator will display" Wifi connection available" if mobile 3G connection is detected, the device will display”Mobile 3G connection available”, else “No connection available “ will be displayed as in Figure 10-B. For this Activity the following permission has to be added in AndroidManifest.xml : android.permission .Access_network_state.
E- Speed Activity

When Check Speed button is pressed, Speed.java is launched. Speed activity is responsible of calculating the device speed derived from the device accelerometer’s calculated values. The emulator will display the x-axis, y-axis, z-axis and speed values. The following permission is needed to be added to the AndroidManifest file.

android.permission.INTERNET

F- AddAdmin Activity

If Enable Admin Button is checked, AddAdmin.java will be activated. The main purpose of this class is to activate device administrator, in order to enable this application to lock the phone. For this we need a receiver, (MyAdmin.class), which will be called from the main Activity. If Admin was disabled then a window as in figure 12-B will be displayed. If you click cancel, Admin won’t be activated. Otherwise if you click activate, the Admin will be activated and a screen as in Figure 12-D will display “Admin is now enabled”. If the Admin, when you pressed enable Admin button was already activated, then a message will be displayed to inform you that “Admin is already enabled”.

Figure 6 Connection Activity emulator snapshot

Figure 7 Speed Activity emulator snapshot
Figure 8 Add Admin emulator Snapshots.

G- DisAdmin Activity

This Activity will be responsible of removing the administrator already activated in AddAdmin.java. If the admin was already disabled, the device will display “admin is already disabled” as fig. 13-A. If Admin was already active, and deactivated when initializing the activity, then the device will display “admin will be disabled” as shown in figure 13 – B.
H- lockApp Activity

This class will now combine the functions of the connectivity Activity, the speed Activity and the addAdmin Activity, and if the speed exceeds a certain value and the wifi or 3G connection was detected, then the device will lock. Otherwise if one of these conditions is not true, in other words, if Admin is not active, or if speed is under limits or if no network connection was checked, or even all of them, then you’ll see a window such as in Figure 14 B or C.
I- Lock-If-Drive Manifest

Every application must have an AndroidManifest.xml file (with precisely that name) in its root directory. The manifest presents essential information about the application to the Android system, information the system must have before it can run any of the application's code. Among other things, the manifest does the following:

- It names the Java package for the application. The package name serves as a unique identifier for the application.
- It describes the components of the application — the activities, services, broadcast receivers, and content providers that the application is composed of. It names the classes that implement each of the components and publishes their capabilities (for example, which Intent messages they can handle). These declarations let the Android system know what the components are and under what conditions they can be launched.
- It determines which processes will host application components.
- It declares which permissions the application must have in order to access protected parts of the API and interact with other applications.
- It also declares the permissions that others are required to have in order to interact with the application's components.
- It lists the Instrumentation classes that provide profiling and other information as the application is running. These declarations are present in the manifest only while the application is being developed and tested; they're removed before the application is published.
- It declares the minimum level of the Android API that the application requires.
- It lists the libraries that the application must be linked against.

When publishing the DeviceAdmin subclass as a receiver, it must handle ACTION_DEVICE_ADMIN_ENABLED and require the BIND_DEVICE_ADMIN permission. A typical manifest entry would include <receiver> ……</receiver> as follows.

References

[1] Andrew Nusca (20 August 2009). "Smartphone vs. feature phone arms race heats up; which did you buy?". ZDNet.
next-computing-revolution-0.
Associations Between Computer Lab Environments and Students’ Attitudes Towards Computers and Computer Courses

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Abstract:

The main purpose of this study is to investigate associations between computer lab environments and Turkish students’ attitudes towards computers and computer courses. Participants were 490 students (322 students from middle schools and 168 students from high schools) from 40 different schools (65 middle schools and 35 high schools). The mean student age was 13.38 (SD=1.94). To measure students’ attitudes towards computers and computer courses we used “Attitudes towards Computers and Computer Courses Questionnaire” (ACCC) developed by Newby and Fisher. This questionnaire has four sub-scales which can be described as (1) Anxiety; extent to which the students feel comfortable using a computer, (2) Enjoyment; extent to which the student enjoys using a computer, (3) Usefulness of Computers; extent to which the student believes computers are useful, and (4) Usefulness of Course; extent to which the student found the course useful. The results of the present study showed that there were negative correlations between the number of computers and the “Enjoyment” and “Usefulness of Computer” sub-dimensions. Besides, results also suggested that there were negative correlations between the numbers of students in computer labs and the “Enjoyment” and “Usefulness of Computer Courses” sub-dimensions. However, regression analysis did not reveal significant contributions of computer lab environments to students’ attitudes towards computers and computer courses.

Keywords- computer labs; computer attitudes; attitudes towards computer courses.

I. Introduction

Turkey is a rapidly developing country and has a growing population over 76 million. There are 29.169 elementary schools (grade 1–4), 16.987 middle schools (grade 5–8) and 10.418 high schools (grade 9–12) housing 16.156.519 (5.593.910 elementary school, 5.566.986 middle school, and 4.995.623 high school) students in Turkey [1]. Computers have been used in Turkish public schools since mid-1980s. At the present time, middle school students should take “Information and Communication Technologies (ICT) and Software” (formerly called “Computer” or “ICT”) subject (at grade 5–6) as a compulsory course, and can take the same subject at grade 7–8 as an elective course while high school students can take “Information and Communication Technologies” subject as an elective course at grade 9 to 12. A great number of Turkish middle schools and high schools are equipped
with at least one “Computer Lab” or “Information Technology Classroom” with Internet connection. In the Turkish school system, the computer labs are not just for hands-on activities but also for formal teaching. In other words, in Turkish school system, computer labs are functioning as formal (structured) labs, not as open labs. Studies have shown that there are some challenges regarding conducting “ICT and Software” and “ICT” courses in the computer labs. For example, Reference [2] investigated the possible reasons behind classroom management problems and students’ discipline problems in computer labs in Turkish schools; they found that one of these reasons was the classroom environment. Similarly, several research studies revealed that overcrowded computer labs [3, 4, 5], lack of required infrastructure and technical support [4, 5, 6], and noisy computer lab environments [7] were the main classroom-related problems that Turkish ICT teachers faced. No doubt, these computer lab environment problems cannot only influence teachers’ teaching but also can influence student outcomes.

On the other hand, learning environments have been a subject of academic research around the world for over thirty years [8]. Reference [9] adapted Gardner’s model as the conceptual framework for studying educational environments. Figure 1 shows this conceptual model. This model proposes the joint consideration of physical and psychosocial factors in the environment while considering ICT as a specific teaching context.

![Figure 1. A conceptual model for studying ICT teaching environments](image)

One study based on this conceptual framework revealed that the physical attributes of computerized learning spaces indirectly influenced students’ satisfaction with learning [9]. Other studies on computer laboratory environments demonstrated that computer lab environment variables have statistically significant associations with students’ attitudes towards computers and computer course [10, 11]. These studies also showed that there was an indirect effect of computer lab environment on achievement through attitude. Similarly, a study on computer lab environments and student attitudes showed that the computer classroom learning environments were associated with students’ attitudes [12] and these attitudes were associated with grade point average [13]. Therefore, the main purpose of this study is to investigate associations between the nature of computer lab environments and Turkish students’ attitudes towards computers and computer courses.

II. METHODS

A. Participants

A total of 490 Turkish students (322 students from middle schools and 168 students from high schools) from 40 different schools (65 middle schools and 35 high schools) participated in the study. Of the participants, 241 were female (49.2%) and 249 were male (50.8%). The mean student age was 13.38 (SD=1.94).
B. Data Collection

For assessing students’ attitudes towards computers and computer courses we used “Attitude towards Computers and Computer Courses Questionnaires” (ACCC) [13]. ACCC has four sub-scales as (1) Anxiety, (2) Enjoyment, (3) Usefulness of Computers, and (4) Usefulness of Course. All the sub-scales have seven items. The description of ACCC sub-scales and a sample item from each sub-scale is given in Table I.

<table>
<thead>
<tr>
<th>Sub-Scales</th>
<th>Description</th>
<th>Sample Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Extent to which the student feels comfortable using a computer</td>
<td>Working with a computer makes me very nervous (+)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>Extent to which the student enjoys using a computer</td>
<td>I enjoy learning on a computer (+)</td>
</tr>
<tr>
<td>Usefulness of Computers</td>
<td>Extent to which the students believes computers are useful</td>
<td>My future career will require a knowledge of computers (+)</td>
</tr>
<tr>
<td>Usefulness of Course</td>
<td>Extent to which the student finds the course useful</td>
<td>I do not think I will use what I learned in this class (-)</td>
</tr>
</tbody>
</table>

Descriptive statistics and the internal consistency coefficients (Cronbach’s alpha) of ACCC sub-scales are presented in Table II.

<table>
<thead>
<tr>
<th>Sub-Scales</th>
<th>M</th>
<th>SD</th>
<th>Internal Consistency Coefficients (Cronbach’s Alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>9.3</td>
<td>4.7</td>
<td>0.83</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>23.3</td>
<td>5.1</td>
<td>0.76</td>
</tr>
<tr>
<td>Usefulness of Computers</td>
<td>21.5</td>
<td>4.5</td>
<td>0.63</td>
</tr>
<tr>
<td>Usefulness of Course</td>
<td>21.5</td>
<td>5.2</td>
<td>0.72</td>
</tr>
</tbody>
</table>

The alpha reliability coefficients ranged from 0.63 to 0.83 indicating that the sub-scales are satisfactory in terms of their internal consistency.

C. Statistical Analyses

Associations between the nature of computer lab environments and students’ attitudes towards computers and computer courses were investigated by examining simple correlations and regression analyses.

III. FINDINGS

Table III, Table IV, Table V and Table VI shows the number of workstations, the number of students in computer labs, the width (m²) of student workspace in computer labs, and the width (m²) of computer labs respectively.
In order to find out the associations between the nature of computer labs and students’ attitudes towards computers and computer courses simple correlation coefficients were calculated. Table VII depicts the results of correlation analysis. Interestingly, there were no statistically significant correlations between anxiety and computer lab environment variables.

The results of simple correlation analysis showed that only four out of possible sixteen relationships were statistically significant. Namely, there were low negative significant correlations between the “number of computer workstation” and “enjoyment” and “usefulness of computers”; and between the “number of students” and “enjoyment” and “usefulness of computer course.” The results of regression analysis for prediction of enjoyment are presented in Table VIII.

---

**TABLE III. THE NUMBER OF COMPUTER WORKSTATIONS IN COMPUTER LABS**

<table>
<thead>
<tr>
<th>Number of computer workstation</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>15</td>
<td>12</td>
<td>30.0</td>
</tr>
<tr>
<td>16</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>25.0</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>26</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

N=40 school

**TABLE IV. THE NUMBER OF STUDENTS IN COMPUTER LABS**

<table>
<thead>
<tr>
<th>Number of students</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>25</td>
<td>16</td>
<td>40.0</td>
</tr>
<tr>
<td>26</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>30</td>
<td>8</td>
<td>20.0</td>
</tr>
<tr>
<td>33</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>35</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

N=490 students

**TABLE V. CORRELATION COEFFICIENTS BETWEEN ACCC-SUB-SCALES AND THE NATURE OF COMPUTER LABS**

<table>
<thead>
<tr>
<th>Nature of Computer Labs</th>
<th>Anxiety</th>
<th>Enjoyment</th>
<th>Usefulness of Computers</th>
<th>Usefulness of Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of computer workstation</td>
<td>-.001</td>
<td>-.164**</td>
<td>-.116*</td>
<td>-.058</td>
</tr>
<tr>
<td>Number of students</td>
<td>.058</td>
<td>-.141**</td>
<td>-.071</td>
<td>-.126**</td>
</tr>
<tr>
<td>Student workspace width (m²)</td>
<td>-.004</td>
<td>.036</td>
<td>.055</td>
<td>.071</td>
</tr>
<tr>
<td>Computer lab width (m²)</td>
<td>.013</td>
<td>.040</td>
<td>-.006</td>
<td>.060</td>
</tr>
</tbody>
</table>

*p<0,05 , **p<0,01

The results of simple correlation analysis showed that only four out of possible sixteen relationships were statistically significant. Namely, there were low negative significant correlations between the “number of computer workstation” and “enjoyment” and “usefulness of computers”; and between the “number of students” and “enjoyment” and “usefulness of computer course.” The results of regression analysis for prediction of enjoyment are presented in Table VIII.
The statistically significant predictors of the “enjoyment” were the number of computer workstations ($\beta = -.130, p = .014$) and the number of students ($\beta = -.139, p = .004$). According to these results it can be said that increased number of student and number of computer workstation in the computer lab may decrease students’ enjoyment regarding using a computer in the computer lab. The results of regression analysis for prediction of usefulness of computers are presented in Table IX.

### Table VI. Analysis of Regression: Prediction of Enjoyment

<table>
<thead>
<tr>
<th>Nature of Computer Labs</th>
<th>B</th>
<th>SE_b</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>Partial r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>30,309</td>
<td>1,861</td>
<td>-1.130</td>
<td>16,283</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of computer workstation</td>
<td>-1.170</td>
<td>.069</td>
<td>-1.130</td>
<td>-2.469</td>
<td>.014</td>
<td>-.164</td>
<td>-.112</td>
</tr>
<tr>
<td>Computer lab width (m$^2$)</td>
<td>.024</td>
<td>.022</td>
<td>.051</td>
<td>1.095</td>
<td>.274</td>
<td>.040</td>
<td>.050</td>
</tr>
<tr>
<td>Number of students</td>
<td>-1.144</td>
<td>.050</td>
<td>-1.139</td>
<td>-2.875</td>
<td>.004</td>
<td>-.141</td>
<td>-.130</td>
</tr>
<tr>
<td>Student workspace width (m$^2$)</td>
<td>-1.049</td>
<td>.074</td>
<td>-.033</td>
<td>-.666</td>
<td>.506</td>
<td>.036</td>
<td>-.030</td>
</tr>
</tbody>
</table>

$R^2=0.244$  $F_{(4,485)}=5.108$  $P=0.000$

The statistically significant predictors of the “usefulness of computers” was the number of computer workstations ($\beta = -.106, p = .049$). According to these results it can be said that increased number of computer workstation in the computer lab may weaken students’ beliefs regarding the usefulness of computers. The results of regression analysis for prediction of usefulness of computer courses are presented in Table X.

### Table VII. Analysis of Regression: Prediction of Usefulness of Computers

<table>
<thead>
<tr>
<th>Nature of Computer Labs</th>
<th>B</th>
<th>SE_b</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>Partial r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>25,402</td>
<td>1,696</td>
<td>-1.124</td>
<td>14,975</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of computer workstation</td>
<td>-1.124</td>
<td>.063</td>
<td>-1.106</td>
<td>-1.971</td>
<td>.049</td>
<td>-.116</td>
<td>-.089</td>
</tr>
<tr>
<td>Computer lab width (m$^2$)</td>
<td>-.003</td>
<td>.020</td>
<td>-.008</td>
<td>-.171</td>
<td>.864</td>
<td>-.006</td>
<td>-.008</td>
</tr>
<tr>
<td>Number of students</td>
<td>-.049</td>
<td>.046</td>
<td>-.053</td>
<td>-1.069</td>
<td>.286</td>
<td>-.071</td>
<td>-.049</td>
</tr>
<tr>
<td>Student workspace width (m$^2$)</td>
<td>.017</td>
<td>.067</td>
<td>.013</td>
<td>.259</td>
<td>.796</td>
<td>.055</td>
<td>.012</td>
</tr>
</tbody>
</table>

$R^2=0.162$  $F_{(4,485)}=2.158$  $P=0.046$

### Table VIII. Analysis of Regression: Prediction of Usefulness of Computer Courses

<table>
<thead>
<tr>
<th>Nature of Computer Labs</th>
<th>B</th>
<th>SE_b</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>Partial r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>24,385</td>
<td>1,932</td>
<td>-0.023</td>
<td>12.623</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of computer workstation</td>
<td>-0.023</td>
<td>.071</td>
<td>-0.018</td>
<td>-0.327</td>
<td>.744</td>
<td>-.058</td>
<td>-.015</td>
</tr>
<tr>
<td>Computer lab width (m$^2$)</td>
<td>.039</td>
<td>.023</td>
<td>.081</td>
<td>1.723</td>
<td>.086</td>
<td>.060</td>
<td>.078</td>
</tr>
<tr>
<td>Number of students</td>
<td>-.115</td>
<td>.052</td>
<td>-.109</td>
<td>-2.209</td>
<td>.028</td>
<td>-.126</td>
<td>-.100</td>
</tr>
<tr>
<td>Student workspace width (m$^2$)</td>
<td>.059</td>
<td>.077</td>
<td>.039</td>
<td>.773</td>
<td>.440</td>
<td>.071</td>
<td>.035</td>
</tr>
</tbody>
</table>

$R=0.165$  $R^2=0.027$  $F_{(4,485)}=2.258$  $P=0.037$
The statistically significant predictors of the “usefulness of computer courses” was the number of students ($\beta=-1.09$, $p = .028$). According to these results it can be said that increased number of students in the computer lab may negatively influence the students’ thoughts regarding the usefulness of computer course.

DISCUSSIONS

The main purpose of this study was to investigate associations between the nature of computer lab environments and Turkish students’ attitudes towards computers and computer courses. According to the results, the weak but statistically significant negative associations noted between:

- the number of computer workstations and enjoyment;
- the number of students in the computer lab and enjoyment;
- the number of computer workstations and usefulness of computer; and
- the number of students in the computer lab and usefulness of computer course.

These relationships would seem to advise that increasing class size and number of computers in a computer lab is potentially counter-productive. In addition, these results suggest that overcrowded computer labs may negatively influence students’ satisfaction with learning in these environments by weakening the students’ beliefs about the usefulness of computers and computer courses. Therefore, class size should be taken into consideration when scheduling computer courses. On the other hand, no relationships were found between the computer lab width or student workspace width and students’ attitudes towards computers and computer courses. This is an interesting situation. Thus, future studies should illuminate why this is the case.

References


Learning Vocabulary Via Mobile Phone

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Abstract:

Since mobile phones have been entered Iran like other countries, it seems quite vital to have a research in application of the short message service (SMS) in second language learning, specifically vocabulary learning. This study attempts to examine the effectiveness of SMS vocabulary learning on university students in Islamic Azad University, Taft Branch, Iran. 55 students were chosen. They were all between 20-30 years old, freshmen and in the elementary level. The students were randomly distributed into two groups and given two sets of English words. (All the chosen words were nouns.) either on paper or through SMS messages. Students recognized more vocabulary during the post-test after reading the regular and brief SMS lessons than they did after reading the relatively more detailed print material. Qualitative data from interviews offer information about the learning process as well as the benefits and limitations of m-learning. Results of the questionnaires show that students in general hold positive attitudes towards learning vocabulary via mobile phone. On the other hand, technological limitations, unfamiliar presentations and learning activities may prevent students from reading SMS lessons.

Keywords—mobile learning; SMS learning; vocabulary learning; learning through technology

I. Introduction

Because of the fast improvements in mobile phone technology, it sounds that in future mobile phones would replace computers. Therefore, many researchers think that mobile phones are not only able to support formal and informal learning but also to complete the process of learning via computers.

[1] believed that among all mobile devices such as mobile phones, Personal Digital Assistants (PDAs), or smart phones mobile phones are probably the most popular and widely used all over the world. [2] reported that some 4.6 billion people are now mobile phone subscribers, indicating that 67 percent of all the people in the world are affected. Now, mobile phone has not only become an entertainment device (featuring functions such as camera, FM, and MP3 players) but also allows users to access, through the Internet, Personal Digital Assistant (PDA) functions and have video conferences using the state-of-the-art 3G (third generation of mobile phones) network.

Since learning English is very popular in non-English speaking countries, developing modern learning tools that support effective English learning is a critical issue in English-language education [3]. However, advances in the application of mobile technology in language learning and teaching necessarily involve, in the early phases, a challenging process of trial and error, as teachers seek to incorporate new technologies into their students’ already complex language-learning lives [4]. According to [5], there is a large body of research on second language learning, but often much of the relevant theory and empirical findings are overlooked by developers of language learning technology support.
II. Review of Literature

A. MALL (Mobile automated Learning laboratory)

Mobile Automated Learning Laboratory (MALL) has been highly concerned with the exploitation of the mobile technologies, such as mobile phones, MP3/MP4 players, Personal Digital Assistants (PDAs) and palmtops computers, in order to support students' language learning. With MALL students would be able to access language learning materials, and to communicate with their teachers and peers, at anytime, anywhere.

Nowadays, because of the growth of wireless and emerging technologies, MALL is available through various instruments including mobile phones, iPods, tablet PCs, hand-held computers, PDAs, MP3 players and more. MALL designers have started to move away from merely copying the traditions of standard non-mobile language learning and are implementing techniques that maximize the benefits of these new devices. The increasing number of possible delivery tools has spawned a wide-range of mobile language learning programs, from very short tutorials to full courses. The number of people capable of producing MALL content is also on the rise, due largely to a combination of increased popularity, demand and the advent of content generation tools that simplify the programming process through the use of templates and macros.

According to [3], a personalized mobile English vocabulary learning system based on Item Response Theory and learning memory cycle, has been successfully implemented on personal digital assistant (PDA) for personalized English vocabulary learning. The experimental results indicated that the proposed system could obviously promote the learning performances and interests of learners due to effective and flexible learning mode for English vocabulary learning.

A review of publications reporting mobile-assisted language learning (MALL) was undertaken by [6], to discover how far mobile devices are being used to support social contact and collaborative learning. In particular, they were interested in speaking and listening practice and in the possibilities for both synchronous and asynchronous interaction in the context of online and distance learning. They reflect on how mobile language learning has developed to date and suggest directions for the future.

B. (SMS) Short Message Service

Reference [7] indicated that providing learning materials by SMS can significantly enhance nursing students' medication knowledge. Greater satisfaction with SMS learning is associated with higher scores in medication knowledge.

Reference [8] showed that presenting learning materials with pictorial or written annotations rather than without annotations to learners with high visual and high verbal abilities resulted in better learning. Also, presenting learning materials with pictorial annotation to learners with high visual ability as well as presenting the material with written annotation to learners with high verbal ability resulted in better learning. Low visual and low verbal ability groups showed better results under no annotation condition. The findings can provide an appropriate model for designing learning material for L2 learners.
III. Methodology

A. Subjects

This study makes an attempt to examine the effectiveness of SMS vocabulary learning on university students in Islamic Azad University, Taft Branch, Taft, Iran. 55 students were chosen. They were all between 20-30 years old, freshmen and in the elementary level. They were from both sexes and were divided into 2 groups: mobile learning and the other group which received vocabulary on papers.

B. Procedure

- For the latter group, there was a program of vocabulary learning on paper. This group participated in a 20-session term. On six first sessions (each week 2 sessions), 30 words were being taught, each session 5 words. These words were selected from their elementary book.

- The first group received the vocabularies and their meanings in English and Persian three times a day each time three same words via SMS in ten days. A 20-item test was devised for eliciting the subjects' knowledge of vocabulary. This Test was administered as a pre-test and post-tests both. To avoid the effects of test-witness, an interval of one month was accepted.

IV. Discussion

By administering the pretests and posttests and gathering the data, to find out whether there was any significant differences between pretests and posttests, paired-samples t-test was run. The results of these analyses are presented in the following tables.

TABLE 1.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Mobile learners pretest</td>
<td>12.1786</td>
<td>28</td>
<td>1.82683</td>
</tr>
<tr>
<td></td>
<td>Mobile learners posttest</td>
<td>17.3571</td>
<td>28</td>
<td>2.92137</td>
</tr>
<tr>
<td>Pair 2</td>
<td>Paper learners pretest</td>
<td>12.3704</td>
<td>27</td>
<td>2.40429</td>
</tr>
<tr>
<td></td>
<td>Paper learners posttest</td>
<td>12.5926</td>
<td>27</td>
<td>2.32477</td>
</tr>
</tbody>
</table>

a. Paired samples Statistics

TABLE 2.

<table>
<thead>
<tr>
<th>Oct</th>
<th>N</th>
<th>Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Mobile learners pretest &amp; Mobile learners posttest</td>
<td>28</td>
<td>.383</td>
<td>.044</td>
</tr>
<tr>
<td>Pair 2 Paper learners pretest &amp; Paper learners posttest</td>
<td>27</td>
<td>.985</td>
<td>.000</td>
</tr>
</tbody>
</table>

b. Paired samples Correlation
As it is observed, the findings of this study suggest that learning vocabulary via mobile is more efficient in developing the knowledge of vocabulary in learners in comparison to learning on papers. The vocabulary learners via mobile also showed their interests orally to pursue the plan; even they were eager to do it enthusiastically.

The words in this study were all from noun class and it is suggested to do some researches on other parts of speeches.

References

6. Kukulska-Hulme, L. Shield, “An overview of mobile assisted language learning: from content delivery to supported collaboration and interaction.” in ReCALL, vol. 20, issue 3, pp. 271-289.
COMPUTER BASED VIRTUAL LEARNING OBJECTS IN ELECTRICAL ENGINEERING

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Abstract

The remarkable growth in IT and computer technology has made great impact on the way we communicate, learn and educate students. IT integration in education must above all promote communication, critical thinking, collaboration and problem solving as key education parameters of the twenty first century. As we move towards more integration of technology in the classroom, a large variety of tools have become an integral part of the modern learning environment while many of such tools don’t make it beyond the year. Computer embedded content is important to substantiate the teaching and learning of inherently complex engineering disciplines. The recent trend of interactive, multimedia based virtual learning objects is making significant impact on teaching and learning in a manner not possible with standard tools and learning management systems.

This paper examines the integration of computer based virtual learning objects into teaching and learning of electrical engineering. Typical virtual learning objects developed by the author will be illustrated as reusable learning components to build and promote richer teaching and learning of Electrical Engineering.

Keywords
Virtual Learning Objects (VLOs), VLEs(virtual learning environments), LO(learning object), CBT, Simulation, Electrical Engineering, Simulators, Online, Thevenin, Norton, Electrical circuits

1. INTRODUCTION

Over the last decade, we have witnessed tremendous advances in computing power in tandem with powerful software development tools. Educators and course developers have unprecedented opportunities to extend the limits of teaching and learning and set new standards in the educational practice. E-learning in all its form, has gained tremendous popularity as a standard mode of delivery across the education sector and in some institutions it has become the only mode of deliver to meet the needs of specific learners.

Moreover, substantial interest and development work has been geared towards virtual learning environments (VLEs) to respond to the ever changing needs and preferences to pursue structured learning for college credits or enrol in courses that offer continuing education credits.

Virtual learning environments are simply software packages with self-contained built-in learning objects. Such learning objects are designed to offer the learners and the teacher alike most of the benefits of a physical classroom while the educational process occurs online in a virtual learning environment reaching more people in record time at lower cost.

2. VIRTUAL LEARNING OBJECTS
Educators and teachers alike, face a plethora of teaching possibilities, especially in the realm of emerging media and technology. Almost all teaching nowadays uses, at least partially, some form of electronic learning so much so to render the “E” in E-learning is almost obsolete as media and technology have become the classroom standards.

One form of media being increasingly being integrated in the curriculum is the computer based virtual learning objects (VLOs). They are simply software components embedded with rich media, interactive features and designed to explain some complex engineering or science concept, illustrate the operation principle of a system or an equipment showing all the components and their interactions in the system. Animation, interactivity and graphics play critical role in VLOs as they add realism and visualisation to promote understanding and reach out to students who have individual competency gaps in specific areas.

Varying the delivery style aided by several types of technology in one lesson can help all students understand many of the rather complex problems and concepts across many disciplines and engineering in particular. Such tools alleviate many of the queries and misunderstandings students may have, as well as lessening the times a teacher must dwell repeatedly on the concepts to those who may require more time to grasp them.

3. VLOs AS SIMULATORS

Being purely software based, VLOs [1] are an ideal tool for simulation purposes in integrated teaching laboratories. Simulators can mimic closely the operation of real systems. They have been used in many engineering fields and are becoming increasingly popular in education as cost effective tools to supplement the analytical approach to teaching and learning. Hardware based apparatus are expensive, limited in scope and have a limited average life span. Given tight budgets and lack of funds, computer based simulators are very cost effective, wider in scope and learning opportunities.

VLOs are portable with the flexibility to be used in multiple learning environments and integrated easily into various teaching and laboratory practices. They can be easily updated, augmented in scope and customized to match specific learning objectives.

3.1 VLO in Basic Electrical Engineering

Computer simulation and computer based training (CBT) have and still being used to provide a pathway for students in multiple learning environments to practice and gain knowledge on various concepts, principles and laws in science and engineering. Traditional CBTS have long reached the end of their life cycle after more than two decades of comprehensive functionality. Off-the-shelves simulation and design packages, written largely for the subject experts and specialists, offer learners versatility with rigorous functionality and depth at a high cost with little or no features to cater for the novice users and learners who quickly become disenchanted and frustrated with the rather steep learning curve of such tools. The author’s experience with a variety of cost inhibitive computer packages acquired to simulate and design various electrical system, supports the fact that they are the least popular amongst learners. Small chunks, media rich virtual learning objects were therefore introduced in the curriculum to experiment with. Student’s response was very encouraging as they characterise VLOs cool, fun and stimulating [3]
The next sections illustrate some prototypes VLO developed by the author and used in the laboratory practice to supplement other hardware set ups and support learning of designated electrical engineering modules.

### 3.1.1 Basic Electrical Circuit Theory VLO

In this section, we describe a prototype VLO on Thevenin’s and Norton’s equivalent circuits as part of the first year across-discipline electrical engineering module. The VLO was primarily developed as a hands-on virtual experiment to verify and experiment with the concepts of Thevenin and Norton equivalent circuits across a given load. The components of the model are virtual objects depicted by a variable power supply and virtual controls and instruments to measure voltages and currents under variable load. The virtual circuit breakers represent power switches to energise the required paths of the circuit. It is not intended to dwell on the theory of electrical circuits in this section. However, the objective is to highlight the use of the VLO the virtual instruments to measure the required parameters, calculate the equivalent circuit across the load and verify the theory as depicted on the online worksheet, followed by a final student report containing the results of the virtual experiment and interpretation of the results.

![Figure 1. Screen view of a typical circuit analysis VLO](image)

The worksheet and online help are designed to guide the user through the procedure and provide the required guidance and help information.

### 3.2 VLO in Advanced Electrical Engineering

Advocates of computer based simulation in lieu of hardware argue that learning objects are ineffective unless they are implemented into the curriculum. The following VLO is a multipurpose virtual learning simulator designed to be used as a laboratory platform to carry out experiments or as a project based learning to analyse the electrical system under various loading conditions and voltage level requirements.
The user is presented with a prototype layout of an electrical power system and the corresponding physical data for analysis. Data is then converted into the required format and then entered interactively into the data pages of the VLO. After preliminary checks for data validity, simulation is initiated. The VLO performs the rather complex analysis and the results of the proposed model under specific loading and voltage requirements will be displayed in tabular and graphical forms should the analysis be successful. The interactive features and the calculation being carried in the background enables the user to concentrate on his primary objective of analysis of a typical electrical power system. The interactive control devices which mimic the real system apparatus, enable the user to carry out “what if scenarios” and observe the consequences of the actions undertaken immediately. The user can alter the parameters of the system to simulate practical scenarios and observe immediately the effect of such changes on the screen.

3.2.1 Features of the VLO

- **The VLO is highly interactive and graphical** with visualization of data entry and results, all embedded in a compact multimedia environment to promote the user enthusiastic involvement and challenge his initiative and imagination leading to a better design and effective learning.

- **The simulator allows the user to focus on his/her design.** The simulator interface involves a rigorous mathematical framework and laborious solution process. However, no computing knowledge is required to enable the user to concentrate on his/her engineering design.

- **Immediate feedback** on erroneous or unrealistic data: The system model equations are highly nonlinear in nature and the mathematical solution is complex. Should data be erroneous or unrealistic, the system will prompt and directs the user to the specific area of the model being erroneous.

- **Interactive data entry:** Each user/student can be provided with a set of raw data. He or she prepares the data and converts it into a format that is compatible with the solution process as per the theory stipulated in the related formal lectures. Incorrect input data is detected and no analysis will be carried out. The user is prompted immediately with a message/warning on the screen.

- **Fast solution results:** On successful data checks, the user is presented with the results of the proposed design in graphical as well as tabular format for his/her interpretation. Should the design need to be refined or required to meet some operational requirements, the user can adjust the on-screen control devices or simply alter the system loadings or other parameters interactively.
• **What if scenarios**: the flexibility of the computer based simulator provides not only valuable learning opportunities about electrical power flow, but also encourages the user enthusiastic involvement to perform “what if” scenarios to acquire a broadened understanding of this particular area of electrical technology and its relation to the real electrical power systems.

![Diagram of busbars data and line impedances](image1)

![Diagram of transformers impedances and form Ybus matrix](image2)

3.3 A Stand Alone Multi-Purpose Power System VLO

Virtual learning objects are portable, Web-deployable self-contained, small chunks of targeted learning, and suitable to be integrated in all learning activities. However, there is absolutely no reason why they cannot be
sequenced, combined or augmented to cover a wider spectrum and cater for a variety of courses and learner’s requirements. There are ongoing discussions with regards to the size or granularity of a VLO and the demarcation line between a virtual learning object and a learning resource. As far as software design and computer programming are concerned, there is ample room to accommodate wider and deeper coverage of any particular engineering application related to any engineering course.

In the following section a virtual learning object has been designed to cover a wider spectrum in electrical power namely: generation, transmission and distribution all integrated in one object. With embedded multimedia and interactive graphic features to facilitate learning, the object acts as a computer based power system simulator to provide hands-on laboratory experience on electrical power systems dispensing the need for a costly hardware based power system simulator. The versatility of the VLO provides plenty of scope and functionality not possible or too costly on a hardware based simulator. An industry standard currently in use consists of half the features implemented on the virtual version at a much higher cost and minimum flexibility.

4- VLO DESIGN CRITERIA AND APPROACH

4.1 Basic Design Criteria

The authors adopted design criteria in the development process to produce a flexible model and support the designated modules, namely:

- The learning content is valid, accurate and balanced
- Learning is task oriented rather than content oriented
- Learning is connected with learner’s prior knowledge obtained from formal instruction
- Learning is self-initiated and self-paced within a fixed time frame.
The simulation tasks were concise and modular with built-in immediate feedback on erroneous actions. Learning must be integrated with the curriculum [2] and classroom instructional material.

4.2 System Approach Design Steps

The design of VLOs [4] cannot be in isolation with the course curriculum and must be geared towards integration with specific courses and modules learning outcomes. The following system design [3] approach underpins the development of VLOs discussed in this paper, namely:

- Identify the target audience and the particular course or module area of interest.
- Estimate the pre-requisite user competency levels and skills required to use the VLO effectively.
- Define the objectives and learning outcomes to be designed in the VLO.
- Specify the interactive features, appropriate media, graphical interface, internal feedback functions and implement the content to meet the learning objectives.
- Test the validity, and assess user acceptance, performance and the learning experiences gained.
- Collect user feedback and review periodically the VLO in order to address shortcomings, and areas of improvement.

5. CONCLUSION

Learning and teaching takes place in diverse environment using a wide variety of styles and delivery platforms. Learning objects are increasingly gaining a wider acceptance not as ready-made courses nor as a fixed sequence of lessons but a standing piece of targeted learning that is flexible and adaptable to various learning environments. Development and cost of the VLOs are as important as those pedagogical goals and objectives to which LOs are used. The development requires an array of skills in instructional design, content know-how and the use of software scripting languages and multimedia authoring tools. However, it is essential to harness the potential of VLOs as an effective and modern pedagogical approach being considered by many educational institutions to supplement and support traditional practices.

REFERENCES

III. Alex Koohang et Al. 2006. Learning Objects and Instructional Design
Study On Implementation And Management Of The Bpl Networks In Islamic Azad University

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Abstract:

Broadband over power lines are systems for carrying data on conductors used for electric power transmission. Power line communication technologies can be used for different applications ranging from home automation to internet access. With the spread of broadband technologies in the last few years, there are yet significant areas in the world that do not have access to high speed internet, as compared with the few internet service providers in existence, the additive expenditures of laying cables and building necessary infrastructure to provide DSL in many areas most especially rural areas is too great. But if broadband is served through power lines considering the fact that it exist all over the country, there will be no need to build new infrastructure. Therefore, anywhere there is electricity, there could also be broadband. Broadband over Power line is designed to offer an alternative means to provide high speed internet access, voice over Internet protocol (VOIP) and other broadband services, using medium and low voltage lines to reach customers and businesses by combining the principle of wireless networking, modems and Radio. Researchers and developers have created ways to transmit data over power lines into homes at speeds between 500 kilobits and 3 megabits per second which is equivalent to the cable DSL (Digital Subscriber Line) and this is achieved by modifying the present power grids with specialized equipments.

This paper provides an introduction to broadband power line communications systems and the potential issues relating to their widespread use in Islamic Azad University of Hadishahr. It examines the current status of technology development and reports on the regulatory arrangements currently in place and being developed overseas to cope with the issues raised by the use of these systems.

This paper was prepared following concerns raised in Islamic Azad University of Hadishahr about the risk of Interference to HF radio communications services from broadband power line Communications systems. With this knowledge, the broadband power line developers could partner with power companies and Internet service providers to bring broadband to everyone with access to electricity.

Keywords- Broadband over power line, voice over Internet protocol, Digital Subscriber Line.

I. INTRODUCTION
The main aim of power line communication is to use the power supply system for communication purposes. Broadband over Power Line (BPL) can provide a vast coverage for broadband services. They have the potential to provide simplified in-house interconnection of computers and peripherals, and cost effective last-mile delivery of broadband data services. The power line communication systems consist of terminal devices that are plugged into the electrical power supply network and allow data to be transmitted via the network to other terminal devices plugged into or attached to the network. The use of the existing electrical power supply network wiring reduces costs and provides convenient access to broadband interconnection between devices. This technology can however achieve 14 Mbps raw data rate and it has the potential for up to 200 Mbps, which makes it competitive with cable and DSL technology. Historically, power line communications systems are known to be limited to low data rates typically less than 500 Kbit/s. These low data rate systems are used in applications such as the remote control of switches in domestic installations and by power supply authorities.

Broadband power line communication systems, also known as power line telecommunications (PLT) systems or broadband power line (BPL) systems are a new type of power line communications (PLC) system capable of providing significantly higher data rates than previous PLC systems. They have the potential to provide simplified in-house interconnection of computers and peripherals, and cost effective last-mile delivery of broadband data services. PLC systems consist of terminal devices that are plugged into or attached to the electrical power supply network and allow data to be transmitted via the network to other terminal devices plugged into or attached to the network. The use of the existing electrical power supply network wiring reduces costs and provides convenient access to broadband interconnection between devices. Historically, power line communications systems had been limited to relatively low data rates - typically less than 500 kbit/s. These low data rate systems are still in use and are used in such applications as the remote control of switches in domestic installations and by power supply authorities. Examples include domestic appliance control systems, off peak hot water supply control systems and power supply authority switch yard control and monitoring systems.

Net access and Power Plus Communications (PPC) partnered specifically to collaborate on projects within the military sector, utilizing the specific skills and experience of both companies to offer the benefits of PPC’s IP-based BPL technology and the IP-based security systems and international sales channel of net access. PPC is internationally acknowledged as the market leader for broadband power line communication (BPL) systems and the integration of BPL-based solutions. Since its foundation in 2001, PPC has successfully installed BPL networks covering more than 300,000 households.

II. WHAT IS BPL

Broadband Power line Communication (BPL) technology uses the existing and most widely distributed infrastructure for broadband data transmission: the existing power grid. BPL systems provide significantly higher data rates than old-fashioned narrowband PLC systems. The usage of the Internet protocol (IP), together with the high speed of data transfer and the open interfaces of BPL systems, increases the sustainable worth of existing power networks and enables a wide variety of applications.

III. BPL - SYSTEM

PPC’s BPL system is the latest generation of the development of Access Broadband over Power line technology (BPL). Based on the 200 Mbps standard, the BPL technology turns existing electricity grids into an
Internet protocol-based communication platform. It enables broadband data transmission with 200 Mbps gross data rate on low (110/230/400V) and medium voltage (1-24kV) electricity networks. The BPL system is adapted to the operational standards of electricity grids and does not affect the controlled operation of any power grid. Dynamic routing between the different units ensures continuous optimal connection quality, even during switching processes in the distribution network. Based on PPC’s long-term experience with BPL technology, power and telecommunication networks, the new BPL system enables a fast and easy setup of extended BPL networks. And, for optimal network operation, the network management system provides permanent control and central configuration of all BPL system components.

IV. BPL ARCHITECTURE

The International Organization for Standardization (ISO) 7-layer Open Systems Interconnection (OSI) Communications Reference Model is defined in ISO 7498. In this model the first layer is defined to be the Physical layer. For BPL, layer 1 is inclusive of all the in-place, power line distribution systems, the electrical power line distribution system, and the in home electrical wiring down to the wall sockets. In some configurations, however, the power line transformers are bypassed, which excludes them from being part of the communications system architecture. A BPL Access network is usually comprised of a base station and a number of users connected via BPL modems. The modems can provide various standardized user interfaces into the BPL network. For example, a BPL modem can provide the user with a standard IEEE 802.3 (Ethernet) interface for connecting a personal computer to the network. The BPL modem connects to the power line transmission medium by means of a BPL specific (e.g., vendor proprietary) interface. Typically, BPL user interface modems provide the Medium Access Control (MAC) lower sub layer and the Logical Link Control (LLC) upper sub layer functions of the Layer 2 of the OSI model in addition to the physical layer. The modems also provide the Network Layer functionality of Layer 3 by supporting Internet Protocol (IP) routing. The manufacturers of existing BPL systems developed proprietary solutions for the MAC layer that are incompatible. The basic BPL components of injectors, repeaters, and couplers have been implemented in a variety of systems architectures, which feature different modulation techniques and designs at the Physical layer, MAC, and LLC. The Physical layer channel impairments in BPL systems include: noise, multipath, strong channel Selectivity, and non-linear channel characteristics. To combat these impairments a number of different technologies have been employed that range from spread spectrum to Orthogonal Frequency Division Multiplexing (OFDM). BPL channel impairments reduce the available bandwidth to users, which is of most concern, because BPL access networks operate in a shared transmission medium where subscribers compete to use the same transmission resources.

V. BPL TECHNOLOGY

The general technical idea of Power Line Communication is to modulate a radio signal with data and send it through power lines in a band of frequencies which are not used for supplying electricity. The used frequencies and the modulation scheme have a significant influence on the efficiency and the speed of the BPL service. The modulation scheme which is used in BPL is orthogonal frequency division multiplexing (OFDM). This is a multi-carrier transmission technique which has been recently recognized as an excellent method for high speed data communication. Orthogonal Frequency Division Multiplexing (OFDM) was first used on military high frequency radio links starting in the 1960s. It performs services at the physical layer of the OSI model. OFDM is
based on the idea of frequency division multiplexing (FDM), which is a technology that uses multiple frequencies to transmit multiple signals in parallel at the same time.

VI. TYPES OF BPL

There are two main types of BPL, The Access BPL and the In-Home BPL.

A. Access BPL

Provides internet and other broadband services like voice (IP Telephony), Video, surveillance systems and entertainment (gaming) for homes and offices, utilities metering (electricity/water/gas) services. It is comprised of injectors which serve as the interface between internet backbone and medium voltage power lines and are also used to inject high frequency signals unto medium or low voltage power lines, Extractors used to retrieve the signals and provide the interface between end-users and medium-voltage power lines. Extractors are placed at each distribution transformer which provides low voltage electric power for a group of homes in that area. BPL signals can propagate for 1000 to 3000 feet before they become too distorted and weak. Repeaters are then used to regenerate and amplify the signals to prevent loss due to attenuation.

B. In-Home BPL

Modems utilize the existing house wiring to provide local area network (LAN) that can be used throughout the home. These applications occur within a single building with both ends of the communications link within the same building. The building might be a house, an apartment block or an office building. The path over which the transfer of data occurs within these buildings is relatively short - typically it is less than 100 m between devices. There are, however, some cities in overseas countries where the building density, the configuration of the AC power line network (e.g. underground) and the existing broadband data network infrastructure have been such that it has only been necessary to use outdoor power line communications systems over distances of a few hundred meters. This has allowed the use of devices with signal levels similar to in-house systems.
VII. ADVANTAGES OF BPL

BPL has the ability to provide internet service by means of transmission line control protocol/Internet protocol (TCP/IP) which can support voice, data and video services. The advantages therefore are:

Wide Coverage: BPL can provide wide coverage, since the power lines are already installed almost everywhere. This is advantageous especially for substations in rural areas where there is usually no communication infrastructure.

Cost: The communication network can be established quickly and cost-effectively because it utilizes the existing wires to carry the communication signals. Thus, PLC can offer substations new cost-saving methods for remotely monitoring power uses and outages.

VIII. DISADVANTAGES

High noise sources over power lines: The power lines are noisy environments for data communications due to several noise sources such as electrical motors, power supplies, fluorescent lights and radio signal interferences. These noise sources over the power lines can result in high bit error rates during communication which severely reduces the performance of BPL.

Capacity: Power line is a shared medium and therefore, the average data rate per end user will be lower than the total capacity depending on coincident utilization, i.e., the number of users on the network at the same time and the applications they are using. Thus, possible technical problems should be comprehensively addressed with various field tests before the BPL technology is widely deployed.

Open circuit problem: Communication over the power lines is lost with devices on the side of an open circuit. This fact severely restricts the usefulness of PLC for applications especially involving switches.

Signal attenuation and distortion: In power lines, the attenuation and distortion of signals are immense due to the reasons such as physical topology of the power network and load impedance fluctuation over the power lines. In addition, there is significant signal attenuation at specific frequency bands due to wave reflection at the terminal points. Therefore, there is loss in signal due to high signal attenuation and distortion.

Security: There are some security concerns for BPL arising from the nature of power lines. Power cables are not twisted and use no shielding which means power lines produce a fair amount of Electro Magnetic Interference (EMI). Such EMI can be received via radio receivers easily.
Lack of regulations for Broadband Power line Communication: In addition to technical challenges, fundamental regulation issues of BPL should be addressed for substantial progress to be made. The limits of transmitted energy and frequencies employed for PLC should be determined in order to both provide broadband PLC and prevent the interference with already established radio signals such as mobile communications, broadcasting channels and military communications. In this respect, the Institute of Electrical and Electronics Engineers (IEEE) has developed a standard to support broadband communications over power lines.

IX. CONCLUSION:

BPL is one of the most exciting areas of innovation. It is a technology which needs further research and developments to be completely practical in a wide range. The major advantage of this technology is the already existing infrastructure for BPL even in rural areas which makes its deployment economically justified and also increases the potential coverage of the technology. On the other hand, the main issue with this technology is its interference with other radio systems. This issue has limited the deployment of BPL and to some extent has increased the cost of its deployment. However some companies claim that they have overcome the problem. The future still holds the widespread deployment of BPL.

REFERENCES

3. “An Overview of Broadband communication over Power Lines” Adekunle, Oluwadara Victoria Electrical and Information Engineering Department, Covenant University, Ota.
The Sphere of Influence Graph: Theory and Applications

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Abstract:
The sphere of influence graph of a set of points in the plane is a graph G(V, E) in which the vertex set V consists of the points, and the edge set E consists of edges joining two points if their nearest neighbor circles intersect. The nearest neighbor circle of a point P is the largest circle centered at P that does not contain any other points in its interior. This graph was proposed in 1980 as a geometric model for a primal sketch in computer vision. Since then it has been explored, generalized, and applied to problems in several disciplines. This paper traces the history of this graph, surveys the progress made since 1980, and lists areas for further research.

Keywords - sphere of influence graph; proximity graph; intersection graph; graph theory; computational geometry, computer vision, artificial intelligence

I. INTRODUCTION

In 1980 I proposed a planar graph that I called the sphere of influence graph (SIG) as a computational model of the primal sketch in computer vision [24]. The SIG was motivated by the fact that earlier proximity graphs such as the minimum spanning tree (MST) and the relative neighbourhood graph (RNG), that were used in this context, necessarily yield connected graphs [25]. To force these graphs to produce disconnected components where appropriate, heuristics were needed to delete the longest edges from these graphs, thus requiring parameters to be tuned. The SIG on the other hand produces disconnected components that agree to a remarkable degree with human perception completely automatically without the need of tuning parameters. The SIG of seven points is illustrated in Fig. 1, where each point $x_i$ is surrounded by the largest disc with center $x_i$ that contains no points in its interior.

For any point $v_i$ in Fig. 1, the radius of its corresponding disc is determined by the nearest neighbor of $v_i$. The SIG contains an edge between vertices $v_i$ and $v_j$ if, and only if, the discs associated with $v_i$ and $v_j$ intersect. The SIG in the example of Fig. 1 contains two disconnected components, and one cycle between vertices $v_i$, $v_k$, and $v_j$. The example in Fig. 1 is a plane graph, but examples may be constructed in which the SIG contains
complete subgraphs (cliques) that contain crossing edges. Thus the SIG need not be a plane graph. Since 1980 the SIG has been explored from the computational geometry and graph theory points of view, it has been generalized in several ways, and it has found use in several applications. This paper traces the history and progress made on this graph and its generalizations, and lists open problems for further research.

II. THEORY

A. The Size of the Sphere of Influence Graph

Although the SIG in the plane contains sub-graphs that are cliques [15], I observed that the cliques could not be very large, which led me to conjecture in 1980 that for $n$ points in the plane the number of edges in their SIG was $O(n)$. Shortly after, in 1982, Avis and Horton [1] proved that the SIG of $n$ points in the plane has at most $29n$ edges, and that every decision tree algorithm for computing a SIG requires at least $\Omega(n \log n)$ steps in the worst case. Hossam ElGindy, one of our graduate students at McGill University at that time, pointed out that with existing computational geometry techniques the SIG could be computed in $O(n \log n)$ time, thus matching the lower bound [1]. Soss showed that a result obtained independently by Reifenberg [18] and Bateman and Erdős [2] could be used to show that the SIG has at most $18n$ edges. Michael and Quint [MQ-1994] reduced this upper bound to $17.5n$, and Soss sharpened this upper bound to $15n$ [21]. David Avis conjectured that a tight upper bound is $9n$ [21]. Soss also obtained bounds on the size of the open sphere of influence graph in $L_\infty$ metric spaces [20]. Guibas, Pach, and Sharir [7] showed that for fixed dimensions the number of edges in the SIG remains $O(n)$.

Another interesting property of random SIGs is the number of vertices of degree one. Sperling determines the expected value and variance of this number for SIGs in $d$-dimensional spaces for $d \geq 2$ [19]. A natural way to construct a random SIG is to generate the points uniformly on the unit hypersphere or in a unit hypercube. For the hypersphere Dwyer [5] found upper and lower bounds on the expected number of edges in a random SIG. Since then asymptotically exact values for the expected number of edges in random SIGs for points in the unit hypercube have been determined for all values of $d$ [4]. See also the papers of Furedi [6] and Hitczenko, Janson, and Yukich [9].

Related to the problem of cliques in SIGs is that of determining which complete graphs are SIGs. It is known that $K_8$ is a SIG [28], and it was shown by Kézdy and Kubicki [27], that $K(12)$ is not a closed SIG.

B. Generalizations of the Sphere of Influence Graph

The original definition of the SIG with the Euclidean distance [24] has been generalized to other metrics [3], [7], [13], [14]. Also, the original definition of a SIG that specified open balls, was modified slightly to include the boundaries of the balls, leading to the closed SIG [8]. In the context of computing the surfaces of dense clouds of points, Klein and Zaxhmann [33] proposed the k-SIG, which constructs the balls for each point with radius determined by the point’s $k$th nearest neighbor. A broader generalization is the abstract SIG, which is a graph that is isomorphic to a SIG [8]. Holm and Bogart [26] generalize the SIG by assigning to each point a tolerance, and adding an edge between two points if their balls overlap by more than the sum (also minimum) of their tolerances. Lipman has introduced the maximum tolerance SIG [29]. Jacobson, Lipman, and McMorris [30], characterize trees which are open and closed SIGs, and obtain a bound on the number of edges when the SIGs are triangle-
free. Their characterization of closed SIGs is succinct: a tree is a closed SIG if, and only if, it contains a perfect matching. For more on trees see [39]. McMorris and Wang [35] proposed a variant of the SIG, which they called the sphere-of-attraction graph (SAG). In this generalization the points are divided into two sets \( C \) and \( P \), which may be viewed, respectively, as customers and products, and the ball for each point in \( C \) has a radius equal to the closest point in \( P \). In the SAG an edge is inserted connecting two points in \( C \) if their balls intersect.

III. APPLICATIONS

The main area of application for SIGs is in low-level computer vision [12], [17] cluster analysis [10], pattern recognition [23], geographic information systems [37], modeling visual illusions [23], and streaming processes in music perception [22]. For some of these applications it is useful to know which graphs are SIGs of sets of pixels in an image. In this context Lipman [11] shows that every SIG has a realization as a set of points with integer coordinates. One weakness of the SIG in some applications, where a connected shape structure must be extracted from a dot pattern, is evident when there are pairs of points closer to each other than to the rest of the set. In such circumstances these pairs will be connected to each other but not to the remaining points. Klein and Zachmann [33] propose several extensions of the SIG to handle such problems. One of their extensions constructs balls with radius greater than that determined by the nearest neighbor. The sphere-of-attraction graph proposed by McMorris and Wang [35] has applications to marketing [28].

IV. CONCLUSION AND OPEN PROBLEMS

A natural family of open problems concerns sharpening the bounds on the number of edges in a SIG. For example, it is not known whether the complete graphs \( K_9, K_{10}, \) or \( K_{11} \) are SIGs. Soss showed that the Euclidean open SIG has at most \( 15n \) edges. Can this bound be improved to \( 9n \)? Another area where the exploration of the SIG can make a contribution is in the visualization of large graphs or networks, by computing the SIG of the graph, and rendering the SIG instead of the large graph, as has been done with other proximity graphs [38].

Algorithms for computing the SIG of a prescribed graph already exist [31], [32]. Computing the SIG of social networks [34] could also provide a useful tool for analyzing “social cartography” [36] processes such as citation networks, commercial networks and marketing, customer relations, and the spreading of diseases.

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REFERENCES

28. T. A. McKee, and F. R. McMorris, Intersection Graph Theory, Monographs on Discrete Mathematics and Applications (Book 2), Society for Industrial and Applied Mathematics (February 1999).
Learning Basic Mathematics Using MATLAB

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Abstract:

In this paper, we discuss ways of in which computer technology can be used to learn basic mathematics. MATLAB is helpful software for numerical computation. MATLAB contains several symbolic mathematical functions for illustrating mathematical solutions and provide students visual examples. In particular, six topics in basic mathematics are illustrated using Matlab: order of operations, factoring, operations with polynomials, quadratic equations, functions and system of linear equations.

Keywords-basic mathematics; learning methodology; Computer support education; Matlab.

I. INTRODUCTION

The use of technology in teaching mathematics has become a popular component of most introductory mathematics classes such as Calculus. A recently conducted research project [1, 2] analysed the influences on attitudes and learning, and found that almost all students responded positively to MATLAB for ease of computation and graphing. In addition, the use of the software as a tool was found to have a strong impact on the learning strategies adopted and on their confidence towards mathematics. Others have found similar effects of the influence of computing methods on learning mathematics. For example, [3] found that students with high computer mathematics interaction feel that computers enhance mathematics learning by providing many examples enable user to focus on major ideas by reducing mechanical toil, and find computers helpful in linking algebraic and geometric ideas. Matlab is a high-level mathematics package designed for doing numerical computations and graphic. Matlab also has powerful symbolic math ability. Rather than making calculations on known numbers, we can make calculations on symbolic expressions. Several research papers detailed the learning process of Calculus using Matlab [4] and Microsoft Excel [5] but no one study the learning of basic mathematics. In this paper, we will discuss how to learn basic mathematics through symbolic toolbox of Matlab [6].

II. MATLAB-AIDED TEACHING TOPICS

A. Order of Operations in Matlab

The first step and before starting the mentioned topics, we teach student how to use Matlab as calculator. Additionally, we start studying the order of operations. Our experience show that the best practice to understand the foundation topic in Matlab, order of operations, can be done visually in Matlab by playing on the locations of powers, multiplication, division and brackets. The arithmetic operators in decreasing order of precedence are:
Figure 1 illustrates how to use Matlab as calculator:

<table>
<thead>
<tr>
<th>arithmetic operator</th>
<th>operation performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>^</td>
<td>Raise to power</td>
</tr>
<tr>
<td>/</td>
<td>Division</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
</tr>
<tr>
<td>+</td>
<td>Addition</td>
</tr>
</tbody>
</table>

Figure 1: Matlab as calculator

For the order of operations we use the PEMDAS rule from left to right: do things in Parentheses first, then Exponents or powers, then Multiplication (from left to right), then Division (from left to right), then Addition (from left to right) then Subtraction (from left to right). Figure 2 illustrate the influence of the parentheses location on the expression:
Figure 2: parentheses location

Figure 3: order of operations
B. Factoring

Factoring (called “Factorising” in the UK) is the process of finding the factors. Finding what to multiply together to get an expression. In Matlab, we use the function “factor(expression)”. As we work symbolically, we must define the variable in the “expression” using the command “syms x” to define x variable. Following figure show how to factor in Matlab:

![Figure 3: Factoring in Matlab](image)

To verify the result of factoring, we can use the “expand(expression)” command:

![Figure 4: Expand in Matlab](image)
C. Operations with polynomials

A polynomial in Matlab is represented by a vector of coefficients. For instance the polynomial: \( p = [1 \ 7 \ 11 \ 0 \ -12] \). We can add/subtract two polynomials in Matlab by just adding or subtracting the coefficient vectors. Both vectors must be of the same size, so the shorter vector must be padded with zeros. Matlab can also multiply polynomials by using the command “conv(polynomial 1, polynomial 2). For the division, we can use the command “deconv(polynomial 1, polynomial 2). The following figure shows different operations with polynomials in Matlab: \( 12 \ 11 \ 7 \ 2 \ 3 \ 4 \ x \ x \ x \)

![Figure 5: polynomial operations](image)

D. Quadratic equations in Matlab

The “solve('equation')” command can also solve higher order equations. It is often used to solve quadratic equations. The function returns the roots of the equation. Example:
To plot the quadratic function, we can use the “ezplot('function')” in Matlab:

**Figure 6: solve in Matlab**

**Figure 7: plot in Matlab**

**E. Functions in Matlab**
A function relates an input to an output. It is like a machine that has an input and an output. And the output is related somehow to the input. Functions have been used in mathematics for a very long time, and lots of different names and ways of writing functions have come about. Here are some common terms:

![function terminology](image)

\textbf{Figure 8: function terminology}

To represent a function in Matlab, we use the command “inline”. Similarly to solve, this command is followed by parenthesis and has the following form: inline(‘function’, ‘independent variable of the function’). Example:

![functions in Matlab](image)

\textbf{Figure 9: functions in Matlab}

\textbf{F. System of linear equations}

We can solve more than one equation simultaneously using “solve” command. Note that command solve has to be preceded with [list of all variables]. Example:

In the same way, we can solve non-linear systems:
III. CONCLUSION

In this paper, we study how to use computer technology in education. Especially, how to learn basic mathematics using Matlab software through six selected topics. In our future study, we will compare the performance of the students who study basic mathematics using traditional lecture style and through Matlab.

REFERENCES