Development of Virtual Intelligent SoftLab on Mobile

Bhaskar Yadao Kathane[1] and Kishor Madhukar Dhole[2]
Bhawabhuti Mahavidyalaya, Amgaon, Gondia, Maharashtra, India[1]
S. K. Porwal College, Kamptee, Nagpur, Maharashtra, India[2]
bykathane@rediffmail.com and km.phd108@gmail.com

Abstract*: The scope of this paper includes development and implementation of virtual lab on mobile. Virtual Lab basically designs for Electronics, Computer Science and Engineering students, teachers or researchers. Virtual laboratories are becoming popular in the education field. There is a facility for change of Input values using virtual instruments and observed the outputs with virtual Instrument. The screen shows the characteristics of devices. The virtual experiment explains here and will help students to perform it any time anywhere. By using java API's application developers are able to create virtual laboratories for android phones. Mobile phones are used as a front end for GUI*

Keywords: SoftLab, Virtual Laboratory, Virtual Instruments, VIS Model, Mobile Applications

I. INTRODUCTION

Origin of the research problem:
Science subjects always have a component of practical. In subject like Physics and Electronics students have to perform a large number of experiments in an academic year. Many times students do not get time to repeat experiments which they have performed during the session. Also many of the laboratories lack in resources to perform experiments in which sophisticated instruments are required. Therefore to provide access to laboratory experiments, anytime anywhere, concept of virtual laboratory is being developed. This virtual laboratory can cater to students at under graduate (UG) and post graduate (PG) levels. Some software's like MatLab and LabView are available for simulation of experiments and for other purposes [1]. However, these software's are generally available only in Institutes Laboratories and student can use them only during college hours. It is therefore decided to develop software for performing individual experiments virtually on mobile screen. In this laboratory an attempt has been made to develop software for electronics experiments from basic to advance level [2].

Problems with Physical Laboratories
Traditional physical laboratories require purchasing high cost equipment's. Reconfiguration and maintenance of these physical laboratories are very difficult and time consuming. Therefore our traditional physical laboratories are not suitable for doing such experiments.
- This is our traditional laboratories in which institutions spend high amount on purchasing costly devices.
- In Physical lab students and researchers can perform their experiments on these laboratories.
- Cost of the physical Laboratories' is more also reconfiguration and reconstruction is more difficult.
- Maintenance cost is high.
- Lab assistant and teacher are required for every setup.
- Not flexible and scalable.

II. PLAN OF WORK

For students, Experiments of Physics and Electronics with devices is very difficult subject to understand. The demonstration of practical gives little idea to student about the subject. The teaching and learning of experiments has to be done during the practical session. Actual devices are costly and require a storage area and maintains. Students cannot repeat the work due to lack of devices. In this model we construct the SoftLab by simulation technique. The

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simulation implemented using computer programming language. This model gives live experiment using virtual SoftLab. The role of virtual laboratories in education is helping researcher/student to improve their quality and capability. The Virtual Laboratory is a platform where user performs their experiment using scientific devices. SoftLab can use in many sophisticated laboratories and reduce the use of physical devices. It provides experiments facility with scientific devices. SoftLab is based on the simulations with application programs. The practical and theoretically concept easily executed. SoftLab fully visualized so that we can easily compute the desire outputs. Virtual laboratory create virtual interface and virtual experiments on SoftLab platform[3].

The Virtual Lab is an application program providing virtual access to a variety of sophisticated scientific instruments. Animations Help Students to design system, observed reading and construct new concepts with SoftLab [4]. Students can interact with different electronics devices, and are also able to do experimental observations through animation and simulation technology. Discussions in this model will involve descriptions on the theoretical framework and modelling of the system, of which the developmental process can be divided into four parts: analysis, design, development and evaluation.

SoftLab is a Virtual Laboratory that provides

- A visual Aid for your lectures
- Student homework that is fun, motivating and building.
- A supplement to laboratory exercises
- Opportunities for independent exploration for highly motivated students.
- Evaluate their experiments without any risk.

Advantages of SoftLab

- Using Simulation Software's students and researchers can create their own experiments as per requirements.
- Simulators are purely based on the software and independent to actual hardware devices.
- Cost of Virtual Laboratories is less as compared to other laboratories.
- Virtual Laborites do not provide actual interface and physical devices.
- These types of laboratories are built on concept of virtualization.
- These types of laboratories are restricted by already defined algorithms in software.
- Problem solving and simulation is done using predefined algorithms.

Objectives

The important objective of the research is to provide a computer base solution to perform experiments in a Basic Electronics anywhere any time. This is achieved through developing a SoftLab Platform. Using VIS model platform the user can run simulations and observe the results. This software tool will allow the students to make a circuit, check its correctness and perform the experiment and analyse results. It supports the laboratory course in Basic Electronics.

- Evaluate the basic characteristics of scientific devices
- Evaluate and identify the best quality SoftLab that makes information available for researcher to implement experiments.
- Develop new methods of SoftLab quality to improve the working of scientific devices.

III. WORKING FLOW OF VIS

VIS Management systems basically design for the students or researcher. There are four courses available for user such as Characteristic of Solid state devices, Application of solid state devices, Digital Electronics and Communication Electronics. All courses have the Virtual Classroom (experimental methodology) and the Virtual Laboratory. In virtual classroom we explain the purpose of virtual experiments; virtual experimental procedure and virtual connection help with virtual instruments and detect possible observation and its application. In Virtual Laboratory we provide virtual Instruments for circuit connection and observed the results on the screen [5].
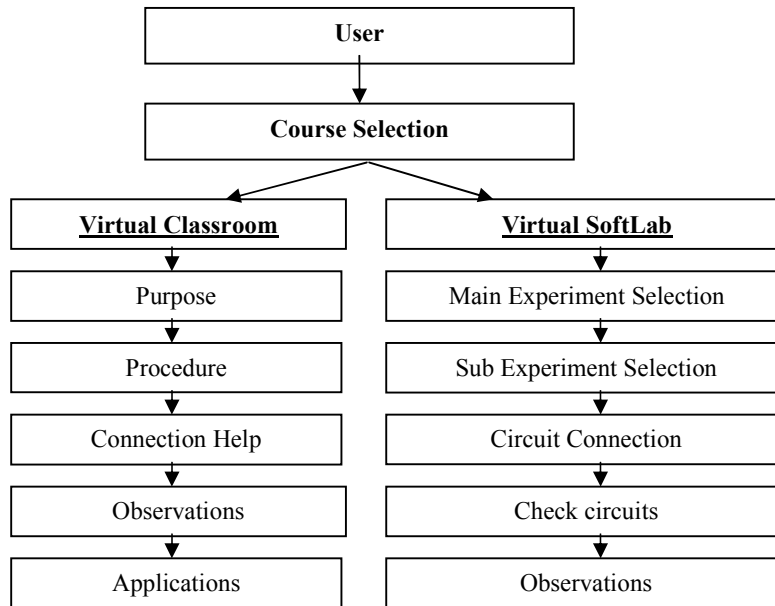
Figure 1: The Main working flow of VIS

3.1 System Architecture

The Virtual Intelligent SoftLab (VIS) model use three-tier system architecture such as User, VIS Management System and Database. User Tier is mainly for the user. In this Tier the Students, researcher and Teacher can access the virtual experimental facility from the VIS Management System. Second Tier is complete VIS software developed inweb-applications which is directly executed on smartphone that performing SoftLab experiments. These virtual instruments are design forsignal generator, Oscilloscope, Power Supply and components like potentiometer are brought visually on the screen of the computer. Third Tier mainly is the Database. In this third tier we have stored data necessary for performing experiments, their result are analysis. The three tier system work as a simulator for experiments.

A facility is also provided in the VIS Management System software whereby an administrator or teacher in the lab first logs in and then other system can be used by students [6].
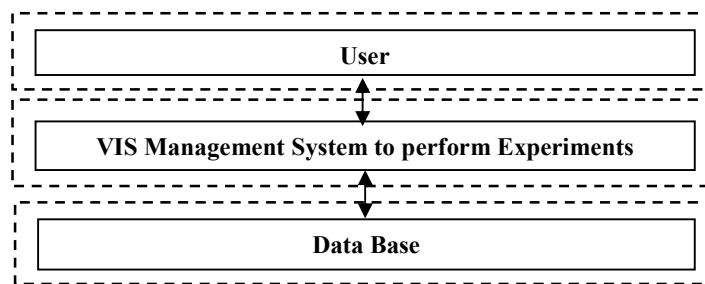

Figure 2: Three Tier Architecture of VIS

3.2 Mobile Technology

Mobile phone or cell phone as it is often called is equally important to the network in the operation of the complete cellular telecommunications network. Despite the huge numbers that are made, they still cost a significant amount to manufacture, discounts being offered to users as incentives to use a particular network. Their cost is a reflection of the complexity of the mobile phone electronics. They comprise several different areas of electronics, from radio frequency (RF) to signal processing, and general processing.

3.3 Mobile Applications

Mobiles are no longer a luxury; it has become a necessity of life. Most of us have mobile phone whether it is an Android or iOS does not really matters. Mobiles does not have any boundaries and mobile applications have equally grown becoming equally important since mobile apps are used not only for utility but for each and every aspect of our life. We design and develop custom apps for Android devices for smart phones, tabs etc. Android SDK includes tools and Application Programming Interfaces (APIs) Mobile application development for custom made apps builds a strong development area for added functionality and improved performance of Smartphone's[7][8]. The most popular Smartphone's are the iPhone, Blackberry and Android, possessing different strengths that suits individual business and personal needs. We appreciate SoftlabTechnologies that fulfils business requirements vary significantly which yields a need for customized mobile applications development to create value-added applications tailored exactly to your specific business requirements for enhanced efficiency, functionality and value addition [9].

Figure 3: Mobile Application view

3.4 Methodology

Android is a software stack used for the mobile devices that includes an operating system, middleware and applications. Android is a system software platform and operating system for smartphone devices based on the Linux operating system and developed by Google. It allows developers to write and managed code in a Java-like language that utilizes Google-developed Java libraries, but does not support programs developed in native code. Basic features of androids are Application Framework, Integrated Browser, Optimized Graphics, SQLite, Data Storage, Connectivity, Messaging, Media Support, Web Browser, Linux Kernel etc.

IV. EXPECTED CONCLUSIONS

SoftLab will help students of various departments to perform and practice experiments to improve their understanding of the subject. This research paper proposed architecture of virtual laboratory design using VIS Model for smart phones. Android applications provide very attractive GUI with mobility makes these types of laboratories flexible. As compared to physical laboratories our mobile virtual laboratory is re-configurable, flexible, scalable, isolated, cost efficient and secure. Researchers and students can make use of these laboratories using mobile phones so no restrictions on location and time.

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