CLOUD BASED ON THE GO LAB FOR STUDENT VIRTUAL LABORATORIES SYSTEM

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ABSTRACT:

Practical work is one of the most important instructional tools in education. The practical training of students’ skills is a relevant dimension of the overall education process, especially in the case of educational courses that fall into the Science, Technology, Engineering, and Mathematics category. To address concerns linked to the cost and space requirements of traditional hands-on laboratories, technology-enabled laboratory modes, such as virtual, remote, and take-home laboratory modes are proposed. In this project, we propose ``OTG Lab" as a framework for leveraging digital twins and extended reality technologies to streamline the development and operation of hands-on, virtual, and remote laboratories. The OTG Computer Labs are virtually-hosted labs allowing access to lab software, the network drive (N-Drive), and access to a Windows operating system, all on a powerful system capable of handling intensive workloads and processing. Educational OTG labs are real computer science laboratories that can be controlled over the Internet through a computer, mobile device, or tablet, without installing anything. These types of labs enable faculty and students to access equipment and/or computers via the internet to perform experiments and laboratory tasks without being in the physical lab space.The convenience of the Virtual Lab is that you can access it from any location, using almost any computer or mobile device, at any time of day. It's your personal 24/7, on-the-go lab.Track and evaluate students’ progress and activity in the OTG Lab automatically. This solution provides industrial-level security in remote access and systems operations.

INTRODUCTION

1.1. Overview of the project

In computer science, programming courses such as Java, C, Python, C++, the computer science (CS) lab plays the most significant role in helping freshmen students to learn the coding for the first time. Hands-on technology-exploration experience for students is an integral part of the traditional Computer Science Curriculum. In the labs, students work on some programming assignment problems and submit them on an online platform to be graded by instructors.

The labs are designed to get students hands-on coding and implement the programs on the computer.

Basic programming skills are not only necessary for Computer Science majors but are an important skill just as basic Math, Physics and Chemistry for students in all majors. As such Universities are making introductory programming courses as required in all the curriculums. Writing programs and executing them to see the program's output is as necessary as doing physics or chemistry experiments. Universities have recognized the importance of practical lab component for a computer programming course and so most of the courses are accompanied by a separate lab hour.

However, in many situations, these labs become just a place for students to write programs and submit for grading. Due to the failure to deliver laboratory courses, the growth of distance-learning programs are also limited to certain disciplines. The inclusion of STEM disciplines for distance-learning is slowed down due to the lack of provision for laboratory course offerings. Simulation and multimedia can facilitate a level of educational experience; however, for effective and meaningful education within the STEM disciplines, a combination of theoretical and laboratory sessions is essential.

As it is now, distance-learning programs need their students to visit a designated campus for the laboratory part of the program and most of the time these are for a limited period of time. These limited periods of laboratory exposure are insufficient to achieve their learning objectives. Providing access to remote laboratory facilities over the web and/or cloud would address this problem. Given the necessity of remote laboratory facilities and emergence of Internet and cloud technologies, there is a number of initiatives to develop remote experimentation facilities. There is much need to research and study on how to efficiently conduct a computer programming lab.

1.2. PROBLEM DESCRIPTION

Learning institutions need to invest in computers, servers, printers, scanners, projectors and internet modems or wireless routers when building physical computer labs. On top of that, they also need to consider the costs of building a room which will house all the equipment along with furniture such as desks and chairs. Finally, they also need to invest in proper ventilation, maintenance and power supply.

Due the quantity of programs developed by the students and naturally the need to evaluate them a problem was found. With the current teaching model, with several assignments during the academic period, teachers spend a lot of time to evaluate all the programs and to grade. On the last year's teachers referred that they need to spend lots of time with this program evaluating process. With a big set of proposed exercises, it is not possible to evaluate all of them in a deep way, thus the solution is evaluated by sampling. This means that feedback to students about their own program is neither complete nor given quickly.

It was also perceived that students cannot develop their work and improve their programming skills as fast as desirable and they don't are quite sure if what they did is correct. So to achieve goals in an efficient and fast way teachers referred that classes must have less students or should be considered less assignments moments. A solution must be identified to solve the excess of teacher's assessment work and, at the same time, provide to the students a mechanism that help them to evaluate their programming code with a set of data given by the teachers. With this goal in mind we looked for a new solution to help us to support the process, which allows a
faster assessment of the projects. We identified OTG Programming Labs (VPL), a Moodle module, as a possible solution to solve some of the identified problems. In times of decreasing educational budgets virtual labs provided by cloud computing might be therefore an interesting option for higher education organizations or IT training facilities.

The OTG Lab is a web-based platform designed to introduce a safe and interactive lab environment for computer science student. It creates a virtual learning space that enables students to conduct programming lab individually via the internet. Furthermore, it allows teachers to add additional experiments to enhance their students' knowledge and to perform laboratory tests to observe the improvement of their students.

OTG Lab is a Web application where registered students can program in multiple languages, such as Java, Cþþ, and JavaScript etc., All the participants in a virtual lab are shown, and a chat area allows the class participants to communicate with each other.OTG provides a powerful automatic grading system. Instructors define how the student program is evaluated, allowing different kinds of tests. They can also define therubric used to grade each program, which is automatically incorporated in the student record. OTG Lab also provides a plagiarism test to detect programs with a high level of similarity.

LITERATURE SURVEY

In [1] Virtual and remote labs in education: A bibliometric analysis: R.Heradio, L. Torre, D. Galan, F. Cabrerizo, E. Herrera-Viedma, and S. Dormido, Laboratory experimentation plays an essential role in engineering and scientific education. Virtual and remote labs reduce the costs associated with conventional hands-on labs due to their required equipment, space, and maintenance staff. Furthermore, they provide additional benefits such as supporting distance learning, improving lab accessibility to handicapped people, and increasing safety for dangerous experimentation. This paper analyzes the literature on virtual and remote labs from its beginnings to 2015, identifying the most influential publications, the most researched topics, and how the interest in those topics has evolved along the way. To do so, bibliographical data gathered from ISI Web of Science, Scopus and GRC2014 have been examined using two prominent bibliometric approaches: science mapping and performance analysis.

In [2] on Education in process systems engineering: Why it matters more than ever and how it can be structured, T. Cameron, S. Engell, C. Georgakis, N. Asprion, D. Bonvin, F. Gao, D. I. Gerogiorgis, I. E. Grossmann, S. Macchietto, H. A. Preisig, and B. R. Young, This position paper is an outcome of discussions that took place at the third FIPSE Symposium in Rhodes, Greece, between June 20–22, 2016. The FIPSE objective is to discuss open research challenges in topics of Process Systems Engineering (PSE). Here, we discuss the societal and industrial context in which systems thinking and Process Systems Engineering provide indispensable skills and tools for generating innovative solutions to complex problems. We further highlight the present and future challenges that require systems approaches and tools to address not only ‘grand’ challenges but any complex socio-technical challenge. The current state of Process Systems Engineering (PSE) education in the area of chemical and biochemical engineering is considered. We discuss approaches and content at both the unit learning level and at the curriculum level that will enhance the graduates’ capabilities to meet the future challenges they will be facing. PSE principles are important in their own right, but importantly they provide significant opportunities to aid the integration of learning in the basic and engineering sciences across the whole curriculum. This fact is crucial in curriculum design and implementation, such that our graduates benefit to the maximum extent from their learning.

In [3] Interactive tools for education in automatic control: M. Johansson, M. Gafvert, and K. J. Astrom. Experiments have shown that the time is now ripe for a new generation of interactive learning tools for control. The tools are based on objects which admit direct graphical manipulation. During manipulations, objects are updated instantaneously, so that relations between objects are maintained all the time. The tools are natural complements to traditional education, and allow students to quickly gain insight and motivation. A high degree of interactivity has been found to be a key issue in the design. Together with a high bandwidth in the man-machine interaction, this enhances learning significantly. Another nice feature is the possibility to hide minor issues and focus on the essentials. It is not easy to describe the power of these tools adequately in text. The best way to appreciate them is simply to use them. We believe that there is a strong pedagogical potential for the type of tools that we have described. We are also of the opinion that we are only at the very beginning in the development of learning tools of this type. The addition of sound and animation are interesting avenues that should be pursued.

In [4] Evidence-based control engineering education: Evaluating the LCSD simulation tool: The advance in control engineering education needs well-designed studies that validate what methods and tools work best. This paper addresses the lack of empirical evidence supporting innovations in control engineering education by proposing a methodology that works at different abstraction levels. Hence, innovations' impact on students' performance can be statistically analyzed either globally or locally by examining competencies or fine-grained indicators, respectively. The article reports the application of the methodology for evaluating an interactive simulation tool, named LCSD, on 101 students at the Pontifical Catholic University of Valparaiso in Chile. According to the experimental results, LCSD is an effective free alternative to enhance the student's skills on control system analysis for our automatic control course. Also, some improvements have been identified for future LCSD versions.

In [5] An interactive software tool to learn/teach robust closed-loop shaping control systems design: Models are always subject to uncertainty. This can come mainly from parameter uncertainty, reduced order dynamics, or unmodelled dynamics. The model uncertainty is a concept that is difficult to introduce in automatic control introductory courses. The mathematical formalization of many of the ideas necessary to introduce students to robust control is complex for most students, causing many students to get lost in the mathematics and do not understand the important control concepts. The closed-loop shaping control design methodology allows introducing the model uncertainty in a simple way. It has some very interesting characteristics from a teaching point of view, since it allows concentrating on shaping the closed-loop frequency response in order to obtain the desired performance and robustness. This paper presents the main features and functionality of RCLSD an interactive software tool developed by the authors for learning and teaching the robust closed-loop shaping control design methodology.

EXISTING SYSTEM

EXISTING SYSTEM

Colleges and universities provide students with on-campus computer laboratories which they can use for coursework, research and other learning activities. These labs usually house dozens to thousands of computers equipped with software applications for different purposes.Eventually, campuses started building physical computer labs to grant that easy access to technology students.In college in house labs, we pose different programming activities, that require strong lecturer–student interaction. Instructors need a system to not only communicate

with students, but also see the code they are typing. When a student makes an important mistake, or they are not doing what they should, the lecturer could be able to see it and help them out straightaway—that is how we do it in face-to-face labs.

3.1. Disadvantages

- Machine and equipment costs
- Personnel costs for troubleshooting, maintenance and software installation
- Repair and upgrade costs
- Software licenses, antivirus protection and other core programs
- Real estate costs
- Students will need to come on campus to complete in-person learning requirements.

- Difficult to assess if the student is properly understanding the submitted program and the underlying concepts
- Difficult to provide effective feedback on the programming skills of the student.
- Causes retention problem due to lack of student progress

PROPOSED SYSTEM

PROPOSED METHOD

A OTG computer lab is a learning platform hosted on the cloud and made accessible to its users via web browsers. The OTG Lab includes web-based compiler and remote access for programming, as well as lab management and scheduling administration tools. This technology gives students the ability to access software programs and work with them as if the applications were running on their own computers. OTG labs allow students to perform their coursework in a virtual learning environment anytime and anywhere, as long as they have a device connected to the Internet.

It is used in modern engineering laboratories to help academic researchers and students perform laboratory programs remotely through the Internet. From the client side, a computer is connected to the internet with a Web browser from which the real experiment is to be conducted. On the server side, there are two important components: A lab server and a Web server. The lab server consists of a computer connected to the different compiler to compile the program. The Web server, which is connected to the labserver, is responsible of managing the access by clients to the experimental setup.The OTG Lab system provides students and faculty with the ability to access academic software typically restricted to physical computer labs from home. IT admins can easily deploy and manage OTG lab through a centralized console. Flexible grouping and access permissions allow admins to give students and instructors access only to the programs they need. Students can see which computers are in session and which are available to use.

No servers to worry about. No Dropbox/Google Docs to provision. No compilers, IDEs to install and maintain. No coding problem statements to craft. No need to expend time to compile and run (and troubleshoot) student solutions one-by-one.

4.1. Advantages

- Support and accommodate distance learning
- Allow learners to easily and quickly assess the educational resources they need
- Provide an efficient and cost-effective alternative for schools without the ability or means to build and maintain computer labs
- Maximise software licenses and reduce expenses
- Help develop digital skills and hone employability skills for all students, including those who prefer to learn remotely or flexibly.
- Effective distance learning Use of personal devices like Chromebooks and iPads to leverage the processing and computing power of lab computers.

MODULES DISCRIBTION

MODULES

- **OTGLAB DASHBOARD**
- **COMPILER INTEGRATION**
- **PROGRAM LOADER**
- **PROGRAM VALIDATOR**
- **ACCESS CONTROL**
- **SESSION MANAGEMENT**

MODULE DESCRIPTION:

1. **OTGLab Dashboard**

An OTG or On The Go adapter (sometimes called an OTG cable, or OTG connector) allows you to connect a full sized USB flash drive or USB A cable to your phone or tablet through the Micro USB or USB-C charging port. In this web dashboard are used the virtual lab methods. In this methods are useful for all students used in any locations.

2. **Compiler Integration**

In this Modules are used in workout the C programs are final output compile to the modules. In this an all programs workout to the compiler integration modules. So this an students are any locations an used the lab and compile the programs

3. **Program Loader**

The Upload the programs and an Run the program. And The Addend the lab test this an used for Program Loader Modules.

4. **Program Validator**

A validator is a computer program used to check the validity or syntactical correctness of a fragment of code or document. The term is commonly used in the context of validating HTML, CSS, and XML documents like RSS feeds, though it can be used for any defined format or language.

5. Access Control

5.1. Student

Student are Login our Id ,worked the Lab and attend the lab test for any other locations.

5.2. Lab Admin

Manage the student details and Verify the Programs

5.3. AP or Faculty

Manage student lab hours and attendance .In this faculty follow the students worked programs and tests

5.4. College Admin

The college admin are manage the all details and set the timeshedules. And upload the C programs and Test questions.

6. **Session Management**

In this Modules are used in management of the colleges all details and student attendance and test results

DATA FLOW DIAGRAM

There are essentially two different types of notations for data flow diagrams (Yourdon & Coad or Gane&Sarson) defining different visual representations for processes, data stores, data flow and external entities. Yourdon and Coad type data flow diagrams are usually used for system analysis and design, while Gane and Sarson type DFDs are more common for visualizing information systems.

Visually, the biggest difference between the two ways of drawing data flow diagrams is how processes look. In the Yourdon and Coad way, processes are depicted as circles, while in the Gane and Sarson diagram the processes are squares with rounded corners.

Process Notations.

A process transforms incoming data flow into outgoing data flow.

Data store Notations.

Data stores are repositories of data in the system. They are sometimes also referred to as files.

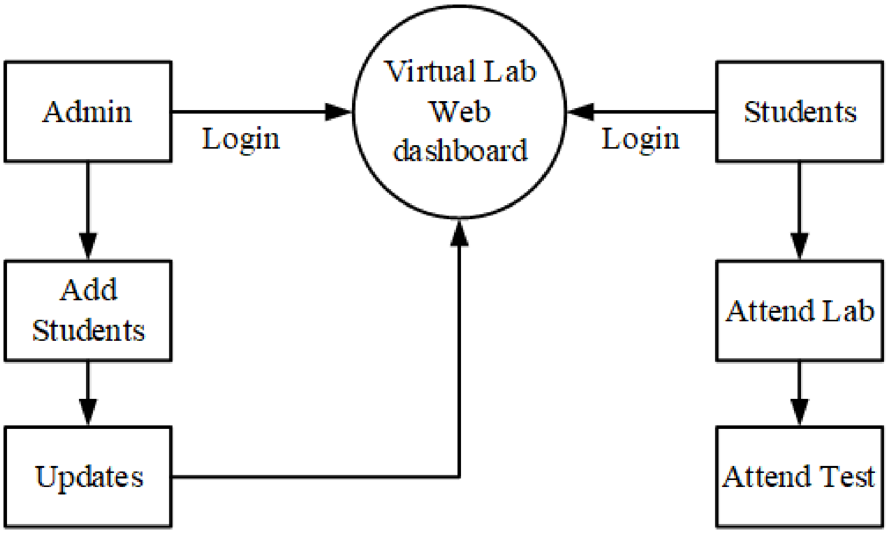
Dataflow Notations.

Dataflow are pipelines through which packets of information flow. Label the arrows with the name of the data that moves through it.

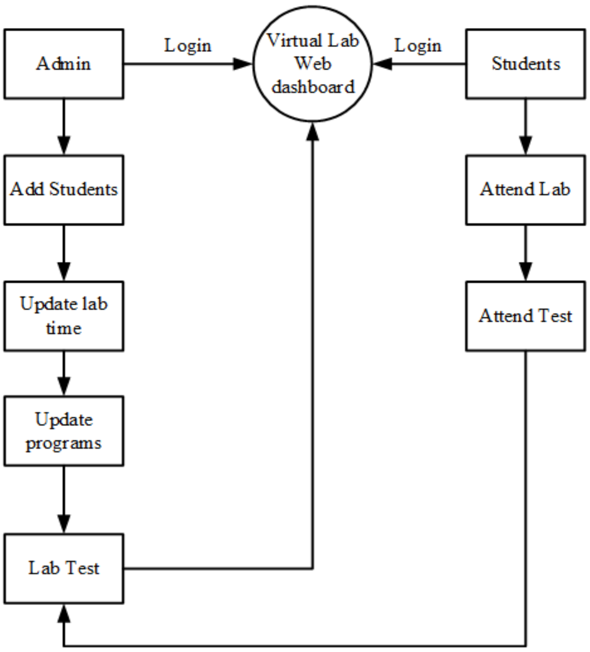
External Entity Notations.

External entities are objects outside the system, with which the system communicates. External entities are sources and destinations of the system's inputs and outputs.

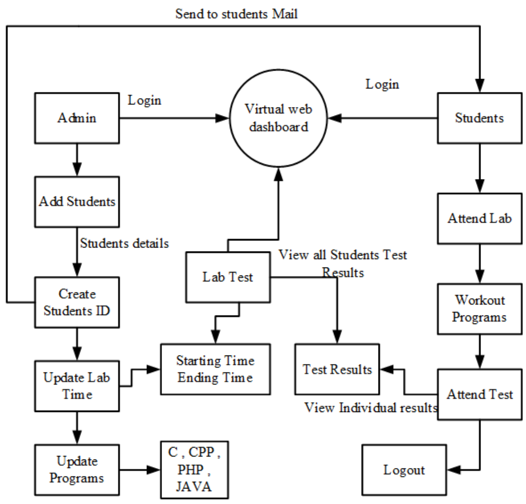
DFD Level 0



DFD Level 1

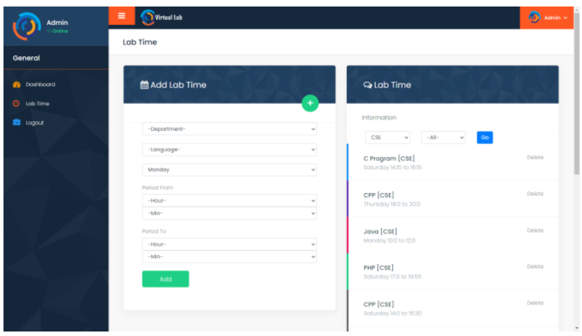


DFD Level 2



EXPREMENTAL ANALYSIS

INPUT DESIGN



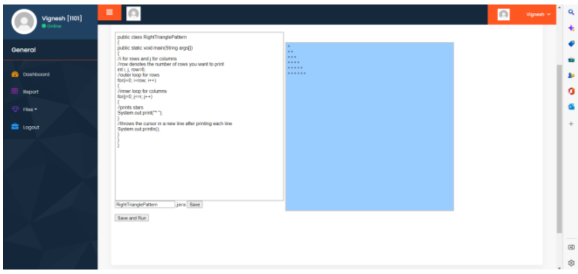
Virtual lab web dashboard is getting information from students. Admin can able to create and add student, and updates the student information.

After that student details updated to virtual lab after that only students are able to login the portal for attend lab and also can able to add attend test throw the virtual web dashboard portal this is input design for this product.

OUTPUT DESIGN

The design of output is the most important task of any system. During output design, developers identify the type of outputs needed, and consider the necessary output controls and prototype report layouts. Manufacturers create and design external outputs for printers. External outputs enable the system to leave the trigger actions on the part of their recipients or confirm actions to their recipients.

Some of the external outputs are designed as turnaround outputs, which are implemented as a form and re-enter the system as an input.



FUTURE ENHANCEMENT

The Future scope in this OTG lab methods are implemented to virtual lab in used for any other locations and an automatic attendance enrolled view all student results this an successfully of the method for students.

After that virtual lab experiment then we can get the attendance and their lab marks get from this portal this is called output design.

CONCLUSION

In this project the main challenge has been to design an efficient communication between the model and views that is transparent to virtual lab developers. The OTG PC Labs are basically facilitated labs permitting admittance to lab programming, the organization drive (N-Drive), and admittance to a Windows working framework, all on a strong framework equipped for dealing with escalated jobs and handling. Instructive OTG labs are genuine software engineering labs that can be controlled over the Web through a PC, cell phone, or tablet, without introducing anything.

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