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ASSESSMENT OF VISUAL COMPUTER SIMULATOR FOR COMPUTER ARCHITECTURE EDUCATION

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ABSTRACT

This paper presents trial assessment of a visual PC test system in 2009-2011, which has been produced to assume a few parts of both direction office and learning device at the same time. Also, it outlines a case of Computer Architecture training for University understudies and utilization of e-Learning apparatus for Assembly Programming keeping in mind the end goal to acknowledge compelling and effective ICT-based Practical Information Education. Assessment for the visual test system has been done as a direction office as well as a self-learning apparatus. The test system can be utilized by instructors as a part of their classroom addresses and by understudies for their making reports (papers). Such assessed outcomes depend on perspectives from guideline of inner structure and conduct in vonNeumann PC, Assembly Programming exercise, some papers by understudies with the test system, and relationship between understudy's examination scores and use of the test system. Second 50% of the paper depicts how to compose different server framework for cooperative learning with the visual test system

Keywords: Collaborative learning, multiple servers, system, qualitative and quantitative evaluation.

I. INTRODUCTION

People of the planet say, a ICT-based instruction need turn into broadly acknowledged starting with basic schools will higher instructive institutes. Much clinched alongside Japan, informatics basics need been incorporated Concerning illustration a standout amongst the menus for college door Examinations. It gets an ever increasing amount paramount for pupils Also people to take computer-related subjects Indeed going in not higher training. A lot of people instructors Also analysts have planned Also produced A percentage sorts about PC simulators in view they appear to be to a chance to be a standout amongst the successfully instructive devices for the address about workstation structural engineering Furthermore data transforming. Exactly of the renowned simulators are acquainted in the fifth area (parts from claiming related Works). Such simulators might a chance to be utilized within those useful training. A few about their simulators need been equipped should show how a workstation meets expectations graphically Furthermore Moreover provide A percentage sorts about modifying exercise nature's domain. A portion about them has been utilized concerning illustration visual instructive instruments from claiming instructors to their learners clinched alongside classroom lectures. Also how have been used Likewise e-taking in instruments for modifying practice through indeed going after school. It is unmistakably distinguished with be advantageous Also productive that such simulators bring been utilized within those genuine Furthermore useful training to more than decade quite some time Also they have assumed ones for huge parts clinched alongside workstation structural engineering What's more its related lectures. In spite of such simulators bring been giving work to great impacts to workstation structural engineering education, there would best a couple reports will assess those simulators in the useful training What's more estimate their impacts clinched alongside qualitative Also quantitative viewpoints. Thereabouts we have portrayed trial assessment of the test system over qualitative approach and additionally quantitative person. The previous may be In light of students' sentiment and the after the fact may be performed by Factual Investigation. Coordinated effort or community oriented Taking in need aid critical to clients should fill in together in exactly sort of effective/efficient surroundings. We have attempted should c different server framework to collective taking in Also bring executed collaborated Taking in surroundings for visual machine test system. We will present how with a various server framework to community oriented Taking in. This paper displays a sample situation of workstation structural engineering including utilization about our visual workstation test system in the following (second) segment. It exhibits those 2009-2011 assessment about our test system in the third area. Those fourth segments of the paper introduce association Also utilization about numerous server frameworks to collective Taking in. The fifth segment specifies those related meets expectations over our exploration. And At long last the paper summarizes its Decision in the most recent (sixth) area.

ISSN: 2394-7659
IMPACT FACTOR- 2.789

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International Journal of Engineering Researches and Management Studies

II. AN VISUAL PC TEST SYSTEM

A test system called VisuSim may be executed Likewise a immaculate java project will furnish two sorts of sections for both java applet code Also java requisition you quit offering on that one. Each might make chose naturally should conjure those suitableness mode of java project. Namely, for example, VisuSim distinguishes its invoking earth and choose to execute Likewise An java applet in the earth from claiming program or should worth of effort Likewise a java requisition in the surroundings the place the java VM executes in the dos prompt for Windows, in the summon mediator about linus pauling et cetera. A necessary condition may be just should furnish those java VM readied will execute the test system. In this way it is exceptionally of service in light At whatever executable nature's domain will do, barely in Windows, linus pauling or mac. There are both sides for perspectives to that visual test system likewise would summarize beneath. The To begin with one is an instrument will visualize an inside structure and self-destructive considerations and conduct for workstation. It may be handy for instructors to demonstrate scholars how a workstation meets expectations graphically. The second will be a e-taking in apparatus will furnish a earth for gathering modifying practice.

2. 1 Visualization apparatus. VisuSim need 8 sets for universally useful registers, including stack Pointer, Furthermore 256/512 expressions about fundamental memory. It might mimic machine inner conduct done a register-transfer level. For example, an instructor for workstation structural engineering could use it to show graphical sees around von neumann workstation structural engineering Eventually Tom's perusing method for wall-hanging screen Also pc projector. That instructor's testament might demonstrate orderly activities from claiming internal register What's more memory for VisuSim. Fig. 1 reveals to a review about VisuSim which is downloaded from a server also executes once pc

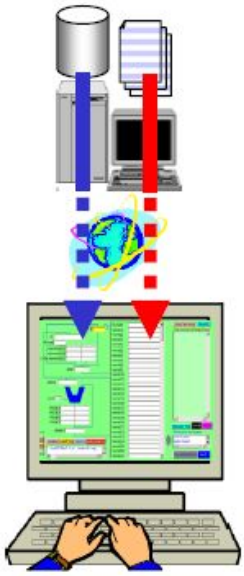

Figure 1. VisuSim on PC

ISSN: 2394-7659
IMPACT FACTOR- 2.789

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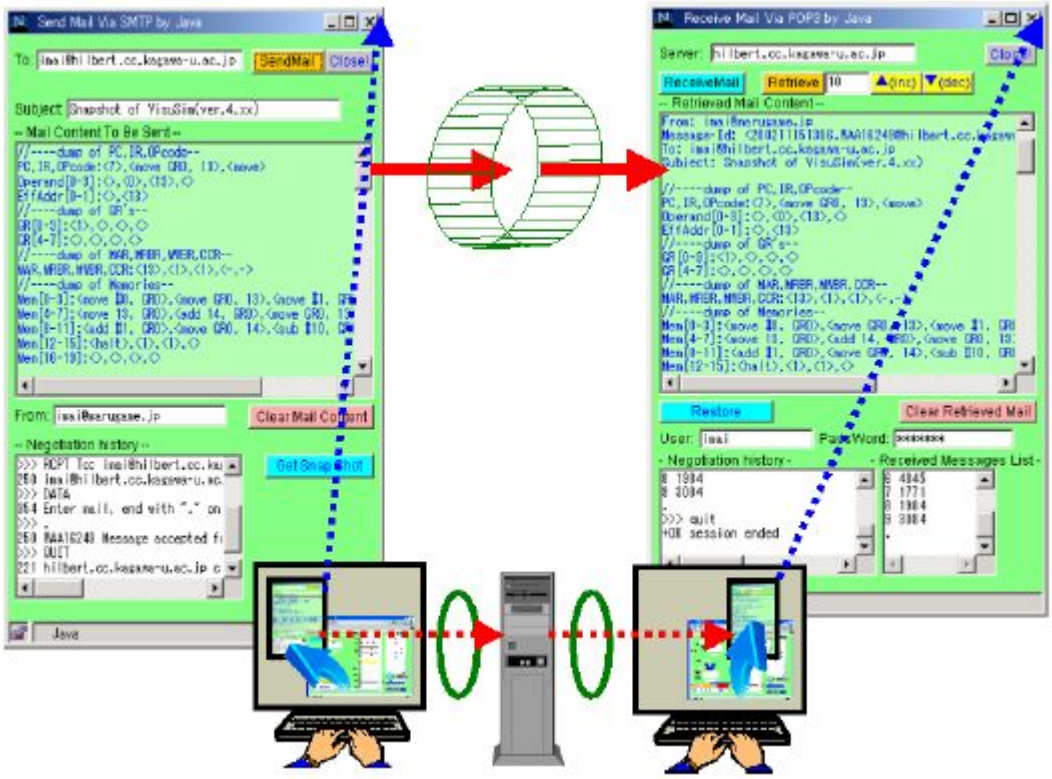

Figure 2. Communication between pair of VisuSim with buit-in e-mail functions

2.2 e-Learning Tool with Communication Facility

VisuSim is used for composing expositions and noting issues of Assembly Programming exercise. Clients (Students) of VisuSim can comprehend PC conduct, program preparing and all around characterized calculation through confirmation of gathering project execution. What's more, besides correspondence administration can be given between match of VisuSim with its inherent email work. So it bolsters viable data sharing amongst sender and collector of VisuSim. It is exceptionally helpful in an e-Learning device among clients in Fig.2.

III. ASSESSMENT OF VISUAL COMPUTER SIMULATOR

This segment portrays an assessment of the visual PC test system. It introduces the detail of article issues in the address, breaks down the scores of understudies' expositions, short test and semester-end examination. And after that it demonstrates the relations of them as an assessment of VisuSim in the pertinent year. What's more, it likewise clarifies subjective and quantitative assessment in the second half.

3.1 Essay Problems for Computer Architecture Education

It is critical for understudies to learn vonNeumann PC engineering as productively as could be expected under the circumstances, in light of the fact that such a subject is situated as an early on discuss address and its ideal comprehension makes more productive and expansible for the succeeding instruction in personnel or doctoral level college of college. Much the same as, for instance, understanding Pipeline Processing as higher execution innovation is a basic talk for the propelled engineering subjects, for example, Super-pipeline, Superscalar, VLIW et

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IMPACT FACTOR- 2.789

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cetera. In our college, a semester has just 15 weeks for each address and dependably experiences absence of time enough to instruct a few things for understudies. This is one of motivations to build up our visual PC test system portrayed in the past segment. From such a perspective for address, it is important to use an instructive device for productive address and give an e-Learning device to compelling activity environment. Paper issues of Computer Architecture are appeared in the accompanying style:

$$(1)\ \sum_{i=1}^{10}(2*i)+10 \quad , \quad (2)\ \sum_{i=0}^{3}A(i) \leftarrow A(0)=1000, A(1)=900, A(2)=50, A(3)=5$$

These would of service will see math calculation with iteration, register-register operation, and use for index-register built backhanded address adjustment. On a person composes such projects Also research them utilizing our visual simulator, he/she cam wood distinguish basic idea of von Neumann workstation structural engineering.

3. 2 Connection between exposition two sorts of Tests for workstation structural engineering.

Over address for "Computer Architecture", people need aid asked should compose gathering projects Furthermore check their projects for our visual test system. Toward those same time, they also bought with check by themselves if they get it vonNeumann workstation structural engineering alternately not. Substance of a short test incorporates a few things other than gathering modifying alternately algorithm. So there may be not continuously certain that the students, who used to work our visual test system altogether well, get fantastic scores in such An test. It might make expected that the substance of the test bring not many variables to relate ability of visual test system. Under these conditions, there will be an after effect from claiming examination between Essay's scores from understudies Furthermore scores for short test Toward those same learners demonstrated over. Fig. 3. There is An sure connection about scores the middle of exposition Furthermore short test. So we might affirm that understanding vonNeumann workstation structural engineering will be essentially influenced by composing essays for utilization of visual PC simulator, VisuSim. It will be also investigated if there may be any connection about scores the middle of exposition Furthermore semester-end examination or not. It need been not yet An flawless examination Furthermore affirmation should dissect At whatever connection the middle of article Also examination yet. We ought not precisely specify around a sort from claiming connection between article and examination. Along these lines we main hint at a portion sort of useful correspondence from claiming scores the middle of article Also examination Concerning illustration may be demonstrated clinched alongside fig. 4.

ISSN: 2394-7659
IMPACT FACTOR- 2.789

IJERMS

International Journal of Engineering Researches and Management Studies

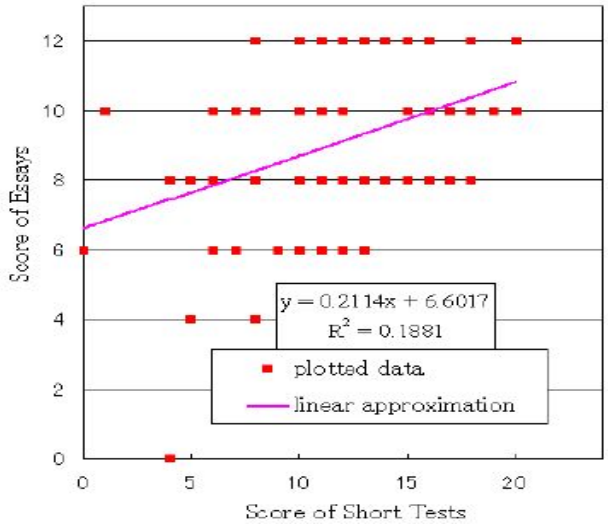

Figure 3. Relation of Scores between Essay and short Test of the same student

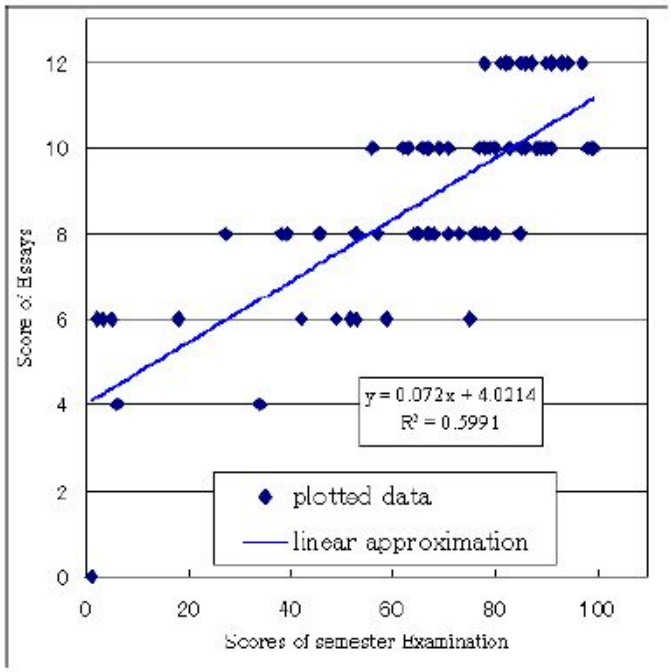

Figure 4. Relation of Scores between Essay and semester-end Examination.

3.3 Qualitative and Quantitative Evaluation of our Simulator

There are a few remarks and proposal portrayed in Essays from the understudies, who learned "PC Architecture" in 2009. We feel that these remarks and others scripts are thought to be genuine and valuable assessment for our test

ISSN: 2394-7659
IMPACT FACTOR- 2.789

International Journal of Engineering Researches and Management Studies

system. They should be subjective, obviously. Be that as it may, they can be likewise subjective assessment about our test system VisuSim from the understudies who were genuine clients of it. Some of positive remarks are as per the following:

1) It is anything but difficult to check and call attention to botches through well ordered execution and show the outcome by VisuSim.
2) I can check change for substance of registers and memory gave by VisuSim.
3) As I utilize test programs through VisuSim, it is adequate for me to compose new comparative ones.
4) It is imperative that I can without much of a stretch see how a PC functions, in light of the fact that VisuSim envisions elucidation and count of my projects graphically.
5) I can perceive qualities of Stored Programming amid composing programs and my article.
6) The above positive remarks might be considered as positive assessments for our visual test system. In the meantime, be that as it may, there are some of negative remarks in the important Essays, which are as per the following:
7) It is troublesome for me to work VisuSim, so I should help my companions show me to work it. At last I do compose my paper just barely until due date. When I adjust my program, I have discovered misstep at the point where program bounce from another schedule. So I should modify and move the concurring schedule.

These are not helpful with the goal that I think it is important to be made strides. These remarks must be thought to be valuable suggestions for development of VisuSim and educating techniques. We ought to have an arrangement to change our visual test system from these inputs "PC Literacy" is a basic address for learners of "PC Architecture" at the principal year of our college. Table 1 demonstrates the connection of learners' scores between the reports utilizing VisuSim for comprehension PC and examinations for "PC Literacy". The quantity of learners is 81. The positions of the scores for reports are grouped from A+ to D (rising request), while the positions of the scores for examination are "Predominant", "Fantastic", "Great", "Reasonable" and "No Good", individually. In light of this table, we attempt to assess our visual test system VisuSim by method for trial of criticalness as takes after. Compelling with take "Computer Literacy".

Table 1. Distribution of Learners' Scores for Report and Examination

	Superior	Excellent	Good	Fair	NoGood	number
A+	8	13	3	2	1	27
A	2	15	10	4	0	31
B	0	0	3	2	0	5
C	0	0	1	2	5	8
D	0	0	0	2	8	10
total	10	26	17	12	14	81

H0 is a null hypothesis: "using VisuSim is independent from learners' scores of Computer Literacy." A chi-square test is used to decide whether the null hypothesis H0 holds or not. With data of Table 1, the chi-square statistic is

ISSN: 2394-7659
IMPACT FACTOR- 2.789

IJERMS

International Journal of Engineering Researches and Management Studies

$$\chi^2 = \frac{(8-27\cdot 10/81)^2}{27\cdot 10/81} + \cdots + \frac{(8-10\cdot 14/81)^2}{10\cdot 14/81} = 87.5$$

By the way, the significance of the chi-square statistic is evaluated for (5-1)*(5-1) degrees of freedom. The chi-square percentile with (5-1)*(5-1) degrees of freedom at the 5% significance level is $\chi^2_{0.05}(16) = 26.3$ From this result, the null hypothesis H0 is rejected and the alternative is accepted. An evidence of the above analysis indicates that a relation between using VisuSim to understand "Computer Literacy" and the learners' scores of "Computer Literacy" shows a statistically significant dependency. So it is said to be statistically significant that using of our visual simulator is effective to learn "Computer Literacy".

IV. METHODOLOGY

This segment clarifies two sorts from claiming requisitions from claiming disseminated numerous server systems, namely, execution from claiming community oriented Taking in nature's domain and conveyed reconnaissance framework for crisis correspondence.

4. 1 Community oriented Taking in nature's domain.

In place with oversee our instructive device effectively, it may be irreplaceable on configuration What's more actualize all the an extraordinary design majority of the data server, which could give some sorts for information-exchanging nature's domain for the device What's more its clients. With such a server, those devices might assume those extremely critical parts with do correspondence "around clients. Inherent email handlers of the device figure it out such correspondence between users, i.e. A learner and a teacher. Learners utilizing our tool, visual PC simulator, could get their essential majority of the data from the special-purpose majority of the data server through its correspondence supporting works as stated by their understanding levels. With the goal the majority of the data server necessities those taking after three fundamental capacities.

4. 1. 1 Web administration capacities

They need aid a whole lot crucial on convey those project (executable) code from claiming test system Also example (source) projects to test system. They relate to HTTP-based correspondence with 3-way hand-shaking technique. Additionally, they help FTP-based information transferring administration.

4. 1. 2. Email administration capacities

Test system cam wood backing those correspondence furthermore information-sharing components "around clients toward method for SMTP-based or POP3-based offices. It may be necessary to those server with make actualized to provide SMTP transferring server capacity Also POP3-receiving server ones.

4.1.3 Client management administration capacities

There must make client management works in the server, not just due to POP3-service as well as due to client ID number will remember user's understanding level. The previous may be essential on acknowledge POP3- service, same time the last is crucial will define user's level to use test system that's only the tip of the iceberg successfully. With these functions, those special-purpose majorities of the data server prepares important What's more insignificant states will figure it out correspondence supporting also information-exchanging nature's domain to the instructive device Furthermore its clients.

ISSN: 2394-7659
IMPACT FACTOR- 2.789

IJERMS

International Journal of Engineering Researches and Management Studies

4. 2 Collaboration around various Servers framework.

The past data server basically utilized one server framework to every last one of users' management, client ID number with serial number, something like that that there were some regulations for example, not Along these lines great two-way verification "around users, not thus productive majority of the data transmission or imparting the middle of diverse level from claiming users, and so forth. Notwithstanding we need utilized another determination for cloud administration on gathering every last one of clients under group and relegate such a group should one server Concerning illustration a standout amongst transitory expedients to management from claiming clients Around various servers. From claiming course, that over palliative medication is not powerful to collaboration around numerous servers. Fig. 5 indicates usage about collective Taking in nature's domain for our instructive device for a dispersed numerous server framework.

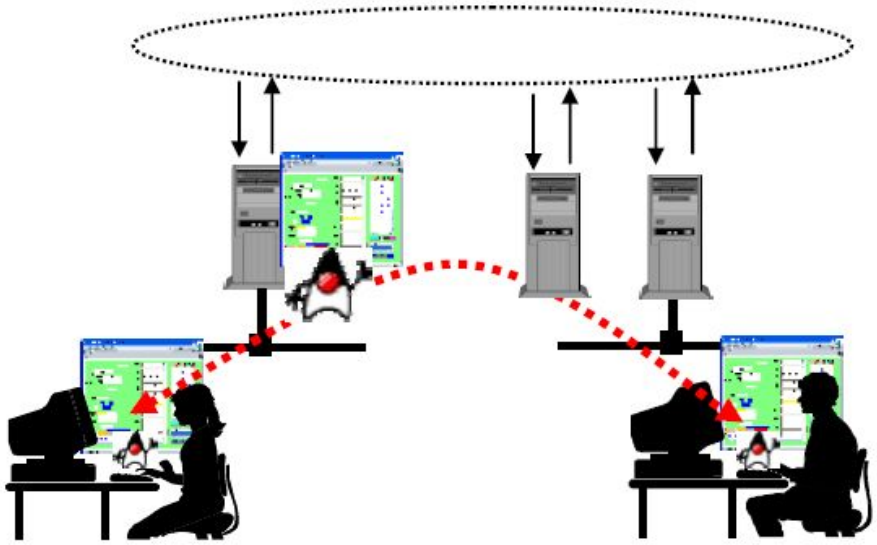

Figure 5. Collaborative learning environment on multiple server system for Visual Computer Simulator

It is necessary to establish more effective methods to organize and cooperate different servers. One of those is to utilize e-mail function of the educational tool and communication facilities between its users. An then all the users of the tool are registered on the shared user database and their mail spool area and users' home directories are created in the shared volume area by means of NIS/NFS or SAMBA (or Network- Attached Storage) facilities. Flexible user identification is necessary to allow hierarchical user naming. With introduction of LDAP (Lightweight Directory Access Protocol) based authentication, it is very much smooth to manage the users among multiple servers and easy to implement flexible user authority for such servers. Although this is a useful method for user management, it will be suffering from some dangerous intrusion without closed network based characteristics and benefits. Security problems are very much heavily serious and expensive to protect correctly and urgently. Additional facilities such as NAT/NAPT (Network Address (& Port) Translation) mechanism will be implemented into a new information server simultaneously. So that will be one of future problems to be resolved for practical cooperation in a distributed environment.

4.3 Related Works

First of all, visualization is an absolutely necessary keyword and idea to improve the learner's understanding level. For example, when instructors educate their learners about computer, they want to use effective educational tools.

ISSN: 2394-7659
IMPACT FACTOR- 2.789

IJERMS

International Journal of Engineering Researches and Management Studies

These tools are expected to have some kind of function to visualize what is difficult to understand. With such tools, many learners will understand computer in a shorter period than other cases without using visualization tool.

4.3.1 Three Simulator Tools for Teaching Computer Architecture

Yehezkel et al. have pointed out that teaching computer architecture is not an easy task. So they provide three types of simulators with visualizations for different computer architectures. They are (a) Easy CPU for the Intel 80x86 families; (b) Little Man Computer for a general von Neumann computer architecture; and (c) RTLSim simulator for a MIPS-like CPU [1]. They are excellent works, but their GUIs are neither general nor common. It is difficult for beginners to use different GUIs of education tools in the related educational fields.

4.3.2 Simulators over the Network

Llamas-Nistal et al. have designed, implemented and tested a Web-based learning system in pure Java. They have attempted to stay within those standards what are suggested for distance learning, particularly Web-based collaborative distance learning [2]. From their paper, an architecture education of their system seems to be well conceived because of its visualization. Their academic results and opinions from their students who have utilized their system are generally. But the function of simulation is limited for a mid-level or lower computer course, so it seems to be not so useful enough to be applied to assembly programming exercise including recursion.

4.3.3 The MARIE Computer Simulator

Null et al. have prepared MarieSim (a computer architecture simulator based on the MARIE architecture) to teach beginners to study computer organization and architecture. It provides interactive tools and simulations to help them deepen their understanding. The graphical environment for MarieSim is written in Java Swing and seems to be useful in introductory computer architecture[3]. But MARIE employs accumulator-based simple architecture, so that it is not so suitable enough to execute recursive assembly program and moreover the MarieSim is not completely web-based but Java stand-alone application. It is not so convenient. Secondarily, Web-based educational tools have realized powerful and fruitful results from scientific field to computing one. The second half of this section focuses the following two researches as the related works based on Web-based e-Learning system with effective GUIs.

4.3.4 Integrated Component Web-based Interactive Learning Systems for Engineering

Humar et al. have proposed a strategic approach to integrate already-developed components for development of a web-based learning environment. Although examples from their system only demonstrate how the system can be used with a course on electromagnetism, however, their basic approach must be applicable in other fields of engineering and natural science [4].

4.3.5 A Web-based Educational Environment for Teaching the Computer Cache Memory

Grigoriadou et al. have introduced a Web-based educational environment for teaching the computer cache memory and shown their aims to support and enhance the learning process for such a special and normally invisible memory. The results obtained from the application/evaluation of such a Web-based environment are to indicate that the simulation and such an approach can effectively support and enhance the learning process [5]. Other related works are listed in the last references, as follows; Moure et al[6] have developed The KScalar simulator not only for ``Computer Architecture Education'' but also for normal professional usage. Dr. Chen [7] has designed and (maybe as his trial challenges) implemented an Automated Feedback System for Computer in order to utilize and improve his and other teachers' educational environments. Both of Huey- Ing Lui and Min-Num Yang [8] have originally designed and developed an excellent e-Learning system, which can provide QoL guaranteed adaptation and personalization in e-Learning systems. Djordjevic et al. [9] have already developed and utilize Web-based Educational System for Computer Architecture Teaching in their university. And finally, we would like to introduce

ISSN: 2394-7659
IMPACT FACTOR- 2.789

International Journal of Engineering Researches and Management Studies

our related work about VisuSim in paper [10]. From the surveys of above described works, we have decided to design a Web-based educational tool with visualization and implement an effective GUI in order to support user-friendly learning process. The following three sections illustrate the detail of our Web-based educational tool for Computer Literacy and Architecture as focusing the characteristics of its GUI.

V. CONCLUSION

This paper describes summaries of a visual computer simulator, some trial evaluation of the simulator, and organization of multiple server system for collaborative learning with the simulator. And it introduces related works for computer simulators and Web-based e-Learning tools. Through the above explanation, our conclusion is summarized as follows:

1) The visual computer simulator has been evaluated in qualitative and quantitative approaches based on users' comments and statistical analysis for relation between essay and two kinds of tests of "Computer Architecture".
2) It is confirmed to be statistically significant that using of our visual computer simulator VisuSim can be effective to learn "Computer Literacy".
3) It shows an overview of distributed multiple server system for collaborative learning with the simulator. Such an environment will be useful and effective for practical education. But there are some problems to be resolved for practical education, just like security and external violation

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