# VISIR SYSTEM @ DEUSTO, BTH, ISEP, AND UNED INSTITUTES: ASSISTING AND SUPPORTING A HANDS-ON LABORATORIES TO SERVE HIGHER EDUCATION STUDENTS

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## Abstract

Practical study is considered a backbone of qualification in engineering and sciences education. It helps to understand the theoretical concepts for university students. Over the last decades, limitation of available lab has become one of encumbrances to some universities and institutions owing to the cost and unavailability of instructors. It led to decline the students' qualifications in experimentation in engineering and sciences fields.

Today, several ideas have implemented to get over the limitation of lab, for example online labs technology, which is refers to "Remote and Virtual Labs". This technology is become available over Internet, for instance Virtual Instrument Systems in Reality (VISIR). In addition, online labs are proven that they can assist hands-on laboratories and may become the best technology for supporting hands-on ones, regarding to its low cost and ubiquity.

This paper presents the number of students (access and users access) who are involved to use VISIR nodes that located at BTH, Deusto, ISEP, and UNED institutions. The filtration that used in this study is to categorize yearly and monthly access of students from those VISIR nodes.

Keywords: Online labs, VISIR System, BTH, Deusto, ISEP, UNED, Engineering and Sciences Education, Data Filtering.

## 1 INTRODUCTION

Historically, novel of practical and experimental learning, and a new philosophy of promoting knowledge have been discussed by the Royal Society of London, which is one of the eminent scientific authorities in the world. The Royal Society began meeting in the mid-1640s to discuss this philosophy of knowledge to the world through observation and experiment. The group of philosophers, named Wren, Boyle, Wilkins, Moray, William, and Brouncke, promoted to Physico-Mathematical Experimental Learning which is called now science study [1].

For people, practical learning is not just something to do for interesting, but it is also to get a good quality of information that can be used to develop their own career path. Therefore, practical learning must be benefited of young people. In addition, it gives them the best possible start in life [2].

Furthermore, the practical learning can be an ideal way to engage student learning in the STEM (Science, Technology, Engineering and Maths), especially in engineering and sciences fields. These two kinds of fields, meaning engineering and sciences, have been developed by practical learning [3].

Nowadays, several e-learning courses offer the education learning via Internet, for example: Coursera[1] and Codeacademy[2]. They benefit the students and educators by offering external courses in flexible way without limitation of place and time. Additionally, they make the education more and widely accessible, , and took advantages of it for students and educators to extend and develop their existing skills [4].

Currently, there is another technology which is used to increase the students' skills in practical learning. This technology is called online labs, in which the students are allowed to run and control the experiments via Internet. It is available for students and teachers during 24/7. Some examples of online labs is VISIR system and OnlineLabs.in[3].

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[1] https://www.coursera.org/

[2] http://www.codecademy.com/

[3] It is virtual science labs that feature online educational resources in Chemistry, Physics and Biology and Anatomy, Geology, Astronomy, Design and Math. http://onlinelabs.in/.

This paper focuses on the remote lab which is represented by VISIR system. It is implemented in eight institutions globally [5]. In addition, the paper is discussed the filtration data, number of users (Access and Users access) who involved of VISIR system at BTH, Deusto, ISEP, and UNED institutions. The data of access users are received from the managers of the VISIR system server nodes. These data are included the users access from the beginning of install until the end of April, 2015.

The rest of this paper is: section two, generally, explain the online labs and VISIR system. The other parts of paper include section three, which showed the filtration of VISIR data from ISEP, BTH, UNED, and Deusto, and section four is the result of filtration data and remarks. The Section five conclude the paper.

# 2 ONLINE LABS AND VISIR SYSTEM

## 2.1 Online labs

In engineering and sciences education, real experiments are indispensable for developing the students' skills by dealing with physical processes and instrumentation. The students conduct experiments in hands-on laboratory that is located at university physically. Furthermore, they work as a team in the laboratory and receive the tutorials and instructions from the teachers [6][7].

In general, online labs can be classified into two kinds: Virtual labs and remote labs. The virtual lab is a software simulation of physical devices, while remote lab can be realized by computer network or collaborative experiments and it is interacted with real devices. Brinson [8] discusses the learning outcome achievement in online labs versus hands-on labs, in very recent article.

Currently, several online laboratories projects are implemented and controlled over the Internet, especially in engineering and science fields [5][9], for example VISIR system, WebLab-Deusto project, Go-Lab project, and iLab project, see appendix (I). Additional, some of them are adopted with learning environments and socials network [5][10]. This paper is focused on the VISIR project as one of the best online labs in 2015 [5][11].

## 2.2 VISIR System

In 2015, VISIR is awarded by Global Online Laboratory Consortium (GOLC) [11]. It becomes one of the general remote labs and is implemented in eight institutions global, which are located in different countries: Sweden, Portugal, Spain (two nodes), Austria (two nodes), India, and Georgia. Currently, these VISIR nodes are served thousands of students around the world [5].

VISIR system interfaces are implemented in several languages (English, Spanish, Swedish, Portuguese, and Greek). The source code of VISIR system is available in seven languages (Arabic and Kurdish languages plus the languages that listed previously).

Nowadays, VISIR is adapted with other learning environments such as MOOC, Moodle. Furthermore, it is created a large collaboration and cooperation work among researchers and students from different countries [5][7].

# 3 DATA FILTERING OF VISIR SYSTEM @, BTH, DEUSTO, ISEP, AND UNED

Data filtering refers to strategies or solutions for refining data sets. It refines into simply what a user needs, without including other data that can be repetitive, irrelevant. Different types of data filters can be used to amend reports, query results, or other kinds of information results [12]. Fig.1. shows the steps of work from receiving the data of VISIR nodes to analyzing the result.

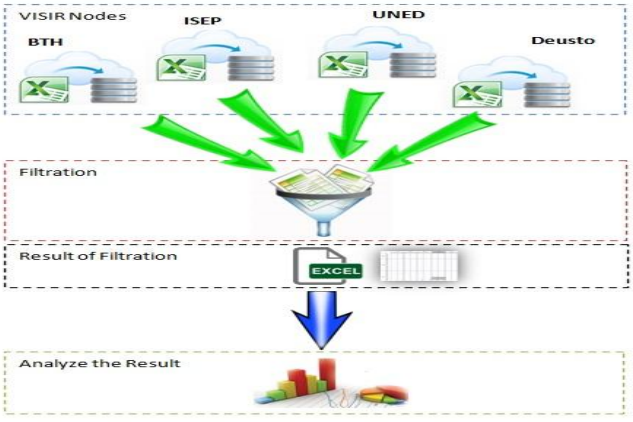


Fig.1 DATA FILTERING AND ANALYZE OF VISIR SYSTEM NODES

## 3.1 First step: Received Data from BTH, Deusto, ISEP, and UNED Nodes

To start with, we received files from BTH, Deusto, ISEP and UNED VISIR nodes as login.log and excel file. All the login.log files were imported to excel file, which helped us to filtrate the data. The data were included huge numbers of information, for instance: User_Id, Start_date, Time, IP address, Email, etc.

It must be clarified there are differences information in the login file form node to another one. For example, in terms of information, the data that obtained from BTH, ISEP, and UNED have similar columns information, while the data obtained from Deusto have few different information columns. However, often all data files have similar information columns, for instance date of access, time of access, and user email, which is considered the main information need in this study for distinguishing the user login.

Before filtering the data, the first results of user access from the VISIR nodes are detailed in Table I. During six years, nine months, and 28 days, the number of accesses from all VISIR nodes was 49,198. The highest number is from Deusto institute.

TABLE I. VISIR NODES ACCESS BEFORE FILTRATION

| VISIR Node | Date: from -to (DD/MM/YY) | No. of Days | No. of Access | Percentage of access |
|---|---|---|---|---|
| BTH | (03/07/2008) To (14/04/2015) | 2,476 days | 3,496 | 7.1% |
| Deusto | (11/03/2009) To (30/04/2015) | 2,242 days | 31,802 | 64.6% |
| ISEP | (12/07/2010) To (30/04/2015) | 1,746 days | 5,868 | 11.9% |
| UNED | (07/12/2010) To (26/04/2015) | 1,601 days | 8,032 | 16.3% |
| Total | 6 Years, 9 Months, and 28 Days | 8,065 days | 49,198 | 100% |

## 3.2 Second step: Filtration Data and Result

The information into excel file is filtered according to these criteria.

1. Deselecting the missed and failed access from login column and gathering the result of all nodes in one file excel sheet. (Result of access).
2. Removing the duplicate of email user from Email column to find the number of user access. (Result of user access "*unique user*").
3. Comparing the number of access (duplicate user email) with the number of user access "*unique user*" (without duplicate user email).

The result of the flirtation process is shown, in Appendix (II) as a chart, in Fig. 2. In general, the number of access and users access after filtration are contented in Table II and highlighted as (A) and (B). Equation (1), (2), and (3) are used to determine the number of access (on average) per user. The result is presented in the form 1:N, meaning that, on average, each user accessed the corresponding VISIR node.

$$R1 = B/No.Of\ Days \quad (1)$$

$$R2 = A/No.Of\ Days \quad (2)$$

$$Ratio = R2/R1 \quad (3)$$

TABLE II. VISIR NODES ACCESS, USERS ACCESS, AND RATIO AFTER FILTRATION

| VISIR Node | Date: DD/MM/YY | No. of Days | No. of Access (A) | No. of Users (B) | Result Ratio (1:N) |
|---|---|---|---|---|---|
| BTH | (03/07/2008) To (14/04/2015) | 2476 days | 2,754 | 189 | 1:15 |
| Deusto | (11/03/2009) To (30/04/2015) | 2242 days | 31,802 | 542 | 1:59 |
| ISEP | (12/07/2010) To (30/04/2015) | 1746 days | 5,137 | 1,292 | 1:4 |
| UNED | (07/12/2010) To (26/04/2015) | 1601 days | 5,971 | 177 | 1:34 |
| Total | 6 Years, 9 Months, and 28 Days. | 8,065 days | 45,664 | 2,200 | 1:21 |

## 3.3 Third step: Analyzing the Result

This step analyzes the result of number access, user access, and ratio from each VISIR nodes which are included the date of setup VISIR untill the end of April, 2015, whose accessed to the VISIR system by email. The result is classified into two ways for each VISIR node. In the first way, the access, users access and ratio are classified according to year. While in the second way, the access, users access and ratio are classified according to month (from January till December).

### *3.3.1 VISIR @ BTH*

As prototype, the first VISIR system was in 1999 and it was in the BTH Institute. This prototype was created to provide some fixed experiments in circuit analysis. In 2002, the second prototype represented a major step forward towards an electronics laboratory capable of emulating a traditional one. Final edition was in 2006 which launched to work by students via the Internet. Therefore, according to login file from BTH VISIR node, the first login access to the VISIR system was on 12/February/2008.

- **Classification According to Year.**

Table III is shown the number of the access, users access, and ratio to VISIR system per year from 03/July/2008 to 14/April/2015. The details are shown in below.

TABLE III. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER YEAR AT BTH

| Year | Date | No. of Days | No. of Access (A) | No. of Users (B) | Result Ratio (1:N) |
|---|---|---|---|---|---|
| 2008 | (03/July) To (19/ Dec.) | 170 days | 206 | 3 | 1:69 |
| 2009 | (14/ Jan) To (30/ Dec.) | 351 days | 410 | 21 | 1:20 |
| 2010 | (12/ Jan) To (17/ Dec.) | 340 days | 416 | 32 | 1:13 |
| 2011 | (10/ Jan) To (19/ Dec.) | 344 days | 356 | 22 | 1:16 |
| 2012 | (09/ Jan) To (07/Nov.) | 355 days | 463 | 52 | 1:9 |
| 2013 | (02/ Jan) To (17/Mar.) | 350 days | 506 | 36 | 1:14 |
| 2014 | (08/ Jan) To (28/ Dec.) | 355 days | 289 | 23 | 1:13 |
| 2015 | (07/ Jan) To (14/Apr.) | 98 days | 108 | 23 | 1:5 |
| Total | 6 years, 9 months, and 12 days | 2363 days | 2,754 | 212 | 1:13 |

- **Classification According to Month.**

In this subsection it is shown the number of access, users access, and ratio to the BTH VISIR system during month from 12/July/2010 to 12/March/2015. It is classified according to each month. The result is shown in Table IV.

TABLE IV. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER MONTH AT BTH

| Month | No. of Days | No. of Access (A) | No. of Users Access (B) | Result Ratio (1:N) |
|---|---|---|---|---|
| January | 31 days | 250 | 55 | 1:5 |
| February | 28 days | 181 | 95 | 1:2 |
| March | 31 days | 351 | 67 | 1:5 |
| April | 30 days | 326 | 70 | 1:5 |
| May | 31 days | 532 | 116 | 1:5 |
| June | 30 days | 84 | 27 | 1:3 |
| July | 31 days | 136 | 22 | 1:6 |
| August | 31 days | 113 | 25 | 1:5 |
| September | 30 days | 263 | 61 | 1:4 |
| October | 31 days | 268 | 50 | 1:5 |
| November | 30 days | 149 | 16 | 1:9 |
| December | 31 days | 101 | 14 | 1:7 |
| Total | 366 days | 2,727 | 618 | 1:4 |

### *3.3.2 VISIR @ Deusto*

Deusto has installed VISIR system in their remote labs project. It grouped into WebLab-Deusto which enables students from university of Deusto and abroad to access to the experiments over the Internet.

Indeed, WebLab-Deusto uses another umbrella platform, which is a little different way from other VISIR nodes to save the users details.

According to login file, the first access to the VISIR system in Deusto was 03/November/2009. One thing that we noted from the Deusto login file is that there is no data in 2009 and 2010. Therefore, we are not account those two years in our results. It means, they are not included in our result.

- **Classification According to Year.**

In this subsection we show the number of access, users access, and ratio to the Deusto VISIR system per year from 07/February/2011 to 30/April/2015. The details are shown in Table V. The years 2009 and 2010 are not included in this classification, as mentioned in above.

TABLE V. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER YEAR AT DEUSTO

| Year | Date | No. of Days | No. of Access (A) | No. of Users (B) | Result Ratio (1:N) |
|---|---|---|---|---|---|
| 2009 | (12/July) To (Unknown) | 0 day | 0 | 0 | 0:0 |
| 2010 | Not listed | 0 days | 0 | 0 | 0:0 |
| 2011 | (7/Feb.) To (29/ Dec.) | 326 days | 2,215 | 88 | 1:25 |
| 2012 | (03/Jan.) To (27/ Dec.) | 360 days | 5,667 | 123 | 1:46 |
| 2013 | (03/Jan.) To (27/ Dec.) | 359 days | 11,565 | 105 | 1:110 |
| 2014 | (05/Jan.) To (30/ Dec.) | 360 days | 8,725 | 210 | 1:42 |
| 2015 | (01/Jan.) To 30/Apr.) | 126 days | 3,629 | 115 | 1:32 |
| Total | 4 years, 2 months, and 24 days | 1531 days | 31,802 | 641 | 1:50 |

- **Classification According to Month.**

In this subsection, we show the number of access, users access, and ratio to VISIR system by user's email during month from 07/February/2011 to 30/April/2015. It classifies them according to the month. The result is shown in Table VI.

TABLE VI. VISIR ACCESS, USERS ACCESS, RATIO FROM PER MONTH AT DEUSTO

| Month | No. of Days | No. of Access (A) | No. of Users Access (B) | Result Ratio (1:N) |
|---|---|---|---|---|
| January | 31 days | 3,338 | 98 | 1:34 |
| February | 28 days | 6,663 | 361 | 1:18 |
| March | 31 days | 5,536 | 342 | 1:16 |
| April | 30 days | 1,041 | 210 | 1:5 |
| May | 31 days | 1,446 | 165 | 1:9 |
| June | 30 days | 923 | 83 | 1:11 |
| July | 31 days | 5,402 | 33 | 1:164 |
| August | 31 days | 68 | 22 | 1:3 |
| September | 30 days | 3,639 | 130 | 1:28 |
| October | 31 days | 1,508 | 136 | 1:11 |
| November | 30 days | 723 | 94 | 1:8 |
| December | 31 days | 1,515 | 37 | 1:41 |
| Total | 366 days | 30,356 | 1,669 | 1:18 |

### *3.3.3 VISIR @ ISEP*

In 2010, ISEP Institute has implemented VISIR system. According to login file that is received from the ISIP VISIR server, the first login access to the system was on 12/July/2010.

- **Classification According to Year.**

We show the number of access, users access, and ratio to, who are logined to the VISIR system by email, per year from 12/July/2010 to 30/April/2015. These details are shown in Table VII.

TABLE VII. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER YEAR AT ISEP

| Year | Date | No. of Days | No. of Access (A) | No. of Users (B) | Result Ratio (1:N) |
|---|---|---|---|---|---|
| 2010 | (12/July) To (22/Dec.) | 164 days | 1410 | 389 | 1:4 |
| 2011 | (14/Jan) To (15/ Dec.) | 336 days | 1849 | 475 | 1:4 |
| 2012 | (04/Feb.) To (12/ Dec.) | 313 days | 688 | 149 | 1:5 |
| 2013 | (30/ Jan ) To (17/ Dec.) | 322 days | 683 | 103 | 1:7 |
| 2014 | (23/ Jan ) To (21/Nov.) | 303 days | 254 | 67 | 1:4 |
| 2015 | (30/ Jan) To (30/Apr.) | 91 days | 262 | 119 | 1:2 |
| Total | 4 years, 9 months, and 19 day | 1529 days | 5,137 | 1,292 | 1:4 |

- **Classification According to Month.**

In Table VIII, we show the number of access, users access, and ratio to the VISIR system by user email from 12/July/2010 to 30/April/2015. The number of access, users access, and ratio is classified according to each month.

TABLE VIII. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER MONTH AT ISEP

| Month | No. of Days | No. of Access (A) | No. of Users Access (B) | Result Ratio (1:N) |
|---|---|---|---|---|
| January | 31 days | 207 | 29 | 1:7 |
| February | 28 days | 119 | 59 | 1:2 |
| March | 31 days | 616 | 198 | 1:3 |
| April | 30 days | 1087 | 363 | 1:3 |
| May | 31 days | 881 | 298 | 1:3 |
| June | 30 days | 618 | 220 | 1:3 |
| July | 31 days | 96 | 18 | 1:5 |
| August | 31 days | 29 | 10 | 1:3 |
| September | 30 days | 410 | 236 | 1:2 |
| October | 31 days | 1080 | 315 | 1:2 |
| November | 30 days | 107 | 92 | 1:1 |
| December | 31 days | 73 | 21 | 1:3 |
| Total | 366 days | 5243 | 2057 | 1:3 |

### *3.3.4 VISIR @ UNED*

In 2010, UNED is implemented VISIR and has become a member of the VISIR community for sharing its labs experiments with the other to enhance the experimentation skills in the electric and electronic engineering fields.

According to login file from UNED VISIR server, the first access to VISIR system was 12/July/2010.

- **Classification According to Year.**

In this subsection we show the number of access, users access, and ratio that happened in UNED VISIR node by user email. Table IX is detailed the result of access, users access, and ratio to the VISIR system per year from 12/July/2010 to 26/April/2015.

TABLE IX. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER YEAR AT UNED

| Year | Date | No. of Days | No. of Access (A) | No. of Users (B) | Result Ratio (1:N) |
|---|---|---|---|---|---|
| 2010 | (12/Jul.) To (23/ Dec.) | 165 days | 152 | 3 | 1:51 |
| 2011 | (4/Jan.) To (31/ Dec.) | 362 days | 846 | 55 | 1:15 |
| 2012 | (01/Jan.) To (25/ Dec.) | 360 days | 870 | 113 | 1:8 |
| 2013 | (02/Jan.) To (31/ Dec.) | 364 days | 1,721 | 26 | 1:66 |
| 2014 | (07/Jan.) To (31/ Dec.) | 359 days | 1,801 | 14 | 1:129 |
| 2015 | (01/Jan.) To (26/Apr.) | 116 days | 581 | 49 | 1:12 |
| Total | 4 years, 9 months, and 15 days | 1726 days | 5,971 | 260 | 1:23 |

- **Classification According to Month.**

In this subsection we show the number of access, users access, and ratio to VISIR system monthly, from 12/July/2010 to 26/April/2015. The result is shown in Table X.

TABLE X. VISIR ACCESS, USERS ACCESS, AND RATIO FROM PER MONTH AT UNED

| Month | No. of Days | No. of Access (A) | No. of Users Access (B) | Result Ratio (1:N) |
|---|---|---|---|---|
| January | 31 days | 1,494 | 50 | 1:30 |
| February | 28 days | 316 | 26 | 1:12 |
| March | 31 days | 299 | 62 | 1:5 |
| April | 30 days | 243 | 26 | 1:9 |
| May | 31 days | 215 | 15 | 1:14 |
| June | 30 days | 233 | 10 | 1:23 |
| July | 31 days | 175 | 8 | 1:22 |
| August | 31 days | 77 | 3 | 1:26 |
| September | 30 days | 44 | 6 | 1:7 |
| October | 31 days | 43 | 14 | 1:3 |
| November | 30 days | 601 | 27 | 1:22 |
| December | 31 days | 2,227 | 147 | 1:15 |
| Total | 366 days | 5,967 | 394 | 1:15 |

## 4 RESULTS AND REMARKS

There are several points have listed in our analysis. These points are shown in bellow.

- **Before filtration:**

The total of access from all VISIR nodes is =49,198 access. The highest access and parentage are from Deusto node (from both of PXI and LXI platform [5][13]), then UNED, ISEP and BTH, sequentially.

- **After filtration.**

a) In general, the total number of access is =45,664 access, while the total number of users access (unique user) is= 2,200 users, from all nodes during six years, 9 months, and 28 days. The highest number of access is from Deusto VISIR node, while the highest number of users access is from ISEP VISIR node.
b) In total ratio, each user has 21 accesses. The highest ratio among the VISIR nodes is in Deusto VISIR node (1 User= 59 Access).

- **Access and user access, and ratio per year.**

a) Number of user access to the VISIR system at ISEP and UNED, is grown up in beginning of 2015 until the end of April, 2015, compared with the previous year. Probably, it will be growing up at BTH and Deusto VISIR nodes as well.

b) From beginning of 2015 until the end of April, 2015, the number of access to the VISIR system at ISEP is grown up. While, it can be say that the number of access at BTH, Deusto, and UNED might be grown until the end of 2015, if we consider the rest of days until 2015.
c) Totally, the highest ratio was from Deusto VISIR node (1 User= 50 Access) while least in ISEP VISIR node (1 User= 4 Access).
In details, the highest ratio at BTH VISIR node was in 2008 and 2009. For Deusto, 2012 and 2013 were the highest ratio. 2012 and 2013 were the highest ratio for ISEP VISIR node, while 2013 and 2014 were the highest ratio for UNED VISIR node.

- **Access, users access, ratio per month.**

In this step we selected two highest months that recorded in the access, users access, and ratio.

a) For BTH VISIR system, the two highest months access to the system are March and May. February and July are the highest months to access to the Deusto VISIR. About ISEP VISIR system, April and October have the highest two months, while January and December are the highest number of access.
b) February and May months are the highest number of users access at BTH VISIR node. February and March month are the highest number of users access at Deusto VISIR system. While, April and October month are the highest number of users access at ISEP VISIR node. Finally, March and December are the highest number user access at UNED VISIR node.
c) At BTH VISIR node, the highest two months are November and December. July and December are the highest two month for Deusto. At ISEP VISIR node, January and July are the higher number of user per access, while January and August are the highest to number of user per access for UNED VISIR node.
d) The highest ratio of all nodes was from Deusto VISIR node, which is a highest ratio of user access. Afterward, UNED VISIR node, BTH, and ISEP, respectively.

All those details about access, users access, and ratio per month, from each VISIR node, are shown in Table XI, XII, and XIII.

TABLE XI. ACCESS PER MONTH (TWO HIGHEST RECORDS)

| **Quarter** | 1st Quarter | | | 2nd Quarter | | | 3rd Quarter | | | 4th Quarter | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | January | February | March | April | May | June | July | August | September | October | November | December |
| **Node** | **UNED** | **Deusto** | **BTH** | **ISEP** | **BTH** | | **Deusto** | | | **ISEP** | | **UNED** |

TABLE XII. USERS ACCESS PER MONTH (TWO HIGHEST RECORDS)

| **Quarter** | 1st Quarter | | | 2nd Quarter | | | 3rd Quarter | | | 4th Quarter | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | January | February | March | April | May | June | July | August | September | October | November | December |
| **Node** | **BTH** | **Deusto** | **Deusto, UNED** | **ISEP** | **BTH** | | | | | **ISEP** | | **UNED** |

TABLE XIII. RATIO USER ACCESS PER MONTH (TWO HIGHEST RECORDS)

| **Quarter** | 1st Quarter | | | 2nd Quarter | | | 3rd Quarter | | | 4th Quarter | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | January | February | March | April | May | June | July | August | September | October | November | December |
| **Node** | **ISEP, UNED** | | | | | | **Deusto, ISEP** | **UNED** | | | **BTH** | **BTH, Deusto** |

***Remarks!***

1. BTH was the pioneer [14][15]
2. Deusto had an attempt in 2009, but then was freezed until 2011.
3. ISEP started with the second half of 2010 and in compare to other universities' starts, quickly gained many users access [16].
4. BTH hasn't too many users, but the number of users is relatively fixed.
5. Deusto is sharp mileage, and is easy to see periods with high number of users' access that recurs.
6. Usually, accesses to the ISEP, BTH, UNED, and Deusto VISIR have almost done in all quarters of year. Less than happened in the third quarter.
7. Usually, user access to the BTH, Deusto, ISEP, and UNED VISIR nodes has done in the first quarter of the year and then happened in the second and fourth quarter. Deusto and UNED VISIR nodes are shared the highest access (in March).
8. Generally, the highest two ratio from all VISIR nodes is in the third and fourth quarters of year. Less than happened in the first quarter, while no highest ratio in the second quarter. In addition, January is shared the highest ratio of ISEP and UNED VISIR nodes, July is shared the highest ratio of Deusto and ISEP VISIR nodes, and December is shared the highest ratio of access of BTH and Deusto.

## 5 CONCLUSION

This paper shows the activity of VISIR system from four nodes (BTH, Deusto, ISEP, and UNED). It analyzes the results of access and users access before filtration process and after filtration the login files, which are received from the VISIR nodes servers. The filtration is count on the user email to make the filtration. Indeed, one of the nodes, namely Deusto VISIR, has a little different way to save the access details, while other nodes have the same way to save user access details.

The main idea of this paper is not to show which VISIR node has more students or access user, but to show that VISIR system has served and can serve thousands of students from higher education during year, especially in engineering and science fields. Moreover, it shows that VISIR system is a good example of online labs and usually is active system that can be opened during all year. These facilities and other [5] such as collaboration work among researchers, teachers that having to VISIR system are supported and assisted hands-on labs to serve thousands of student over the world and from different countries.

In sum, it can be said that if these institutions decide to share these labs, in principle these will be no over lopping concerning the months exhibiting the highest number of accesses, for each institution.

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## APPENDIX (I)

***VISIR System*** is a remote laboratory for wiring and measuring of electronic circuits. The VISIR project was initially founded by the Signal Processing Department (ASB) at Blekinge Institute of Technology (BTH) in Sweden together with National Instruments and Axiom EduTECH in Sweden. So far, VISIR system has been implemented in seven Institutes after Blekinge Institute of Technology. http://openlabs.bth.se/electronics/index.php/en.

***WebLab-Deusto Project*** is an initiative of the University of Deusto aiming to increase the experiential learning by the use and development of remote laboratories. It is used by universities and secondary schools from different countries worldwide, as well as in multiple research projects. Additionally, it is available in over 10 languages. http://weblab.deusto.es/website/.

***Go-Lab Project*** aims to support teachers and students in their inquiry learning activities offering online tools to work on scientific problems in a virtual environment. It can be used by the students to gather data from real physical laboratory setup, including real equipment, from remote locations. http://www.go-lab-project.eu/online-labs.

***iLabs Project*** is dedicated to the proposition that online laboratories can be accessed through the Internet. It can enrich science and engineering education by greatly expanding the range of experiments that students are exposed to in the course of their education. Moreover, iLabs can be shared across a university or across the world by sharing expensive equipment and educational materials. http://icampus.mit.edu/projects/ilabs/

## APPENDIX (II)

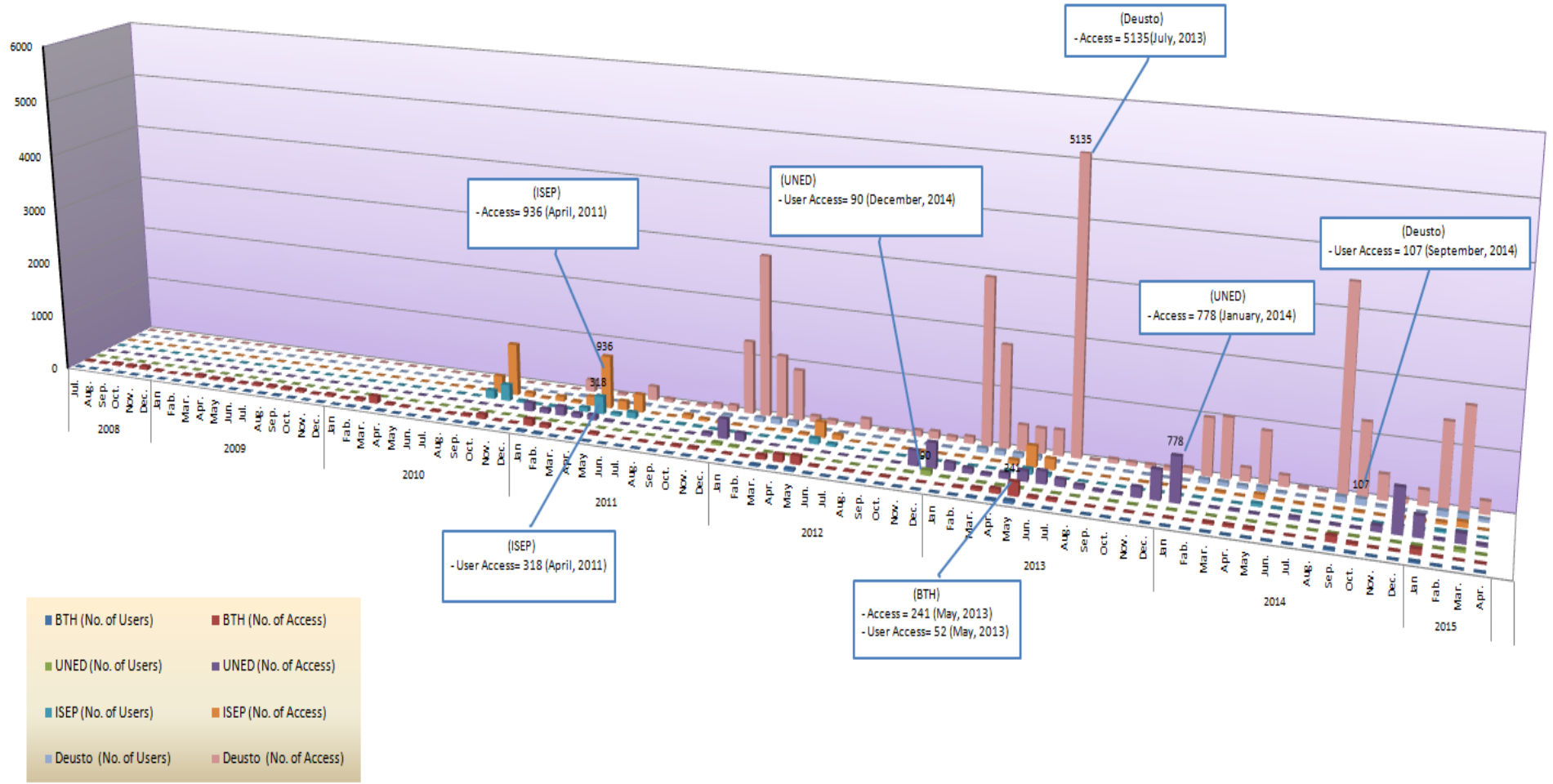


Fig.2 NUMBER OF ACCESS AND USER ACCESS (UNIQUE USER) OF VISIR SYSTEM AT BTH, DEUSTO, ISEP, AND UNED INSTITUTES FROM THE FIRST YEAR OF INSTALL UNTILL THE END OF APRIL, 2015. ONLY THE HIGHEST NUMBER OF ACCESS AND USERS ACCESS ARE ZOOMED FROM EACH VISIR NODE.