

Development of educational games for XO laptop.

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ABSTRACT:

The purpose of this report is to define the objective of the project, which is to develop an educative game for XO laptop which deployed in Schools in India.

Relevant research into current practice will include configuration of laptop, graphics supported, game engine, programming language, evidence to prove educative game is better than text and example of already existing educative game.

Categories and Subject Descriptors

K3.0 (General) and K3.1 (Computer Uses in Education), Educative Learning,

General Term: XO laptop, SDLC (System Development Life Cycle), OLPC (One Laptop per Child), Quest Atlantis (QA).

Keywords: Educational Game, XO laptop, Indian education syllabus, Learning /Teaching.

1. INTRODUCTION



The XO laptop is not an ordinary laptop because it is exclusively develop for kids of the developing nation. It is equipped with exceptional features such as high density plastic, dual mode display i.e. suitable for room as well as in sunlight, sealed keyboard and no internal moving component [11].

XO laptop is equipped with user interface called Sugar and designed, keeping all the parameters of learning, to target audiences i.e. school kids. XO laptop does not have standard software which is used in daily life, rather, it has software aimed at kid's activities such as reading, playing, learning calculation etc. [4]

The XO laptop is provided by the organisation known as One Laptop per Child (OLPC). This organisation was founded by **Nicholas Negroponte** with a core of Media Lab veterans. The mission of this organization is to give power to kids of developing nations to learn by providing connected laptops to every school-age kids [8].

These laptops were deployed in various developing countries. The most important factor of this laptop is that its tools and software configuration depend upon the country where it is being used. Because it is developed for educational purposes and every country has its own pattern and syllabus to teach, XO is not an ordinary laptop.

Like in every human, limbs can be compared to the hardware and the mind considered as the software, such is the case in every laptop. However, this laptop has got very nominal configuration i.e. very low level of hardware as follows:

- Approximate weight: 1.45KG with LiFeP battery; 1.58KG with NiMH battery.
- CPU: x86-compatible processor with 64KB each L1 I and D cache; at least 128KB L2 cache; AMD Geode LX-700@0.8W (datasheet).
- Graphics controller: Integrated with Geode CPU; unified memory architecture.
- DRAM memory: 256 MB dynamic RAM.
- Mass storage: 1024 MB SLC NAND flash, high-speed flash controller.

As mentioned earlier, this laptop is deployed in various developing countries and it is very tough to develop an educative game which will be helpful for every type of education patterns and syllabus. Hence, to make precise my dissertation I choose to develop the educative game for Indian School. India was selected due to the following reasons:-

- Due to logistical reasons and familiarity with the country research will be facilitated.
- Aware of the education system and pattern.
- As OLPC is developing in India and still lots of things have to come, it has lots of future scope.

An educative game will be developed for XO laptop, which will be exclusively manufactured for India. The factors which motivated this project are as:

- It is very challenging to develop a mixture of a 2D and 3D graphic game for such low and restricted configuration.
- It has got broad future scope.
- No picture games are available.

2. Aims and Objective of the project:

2.1 Aims:

To develop an educative game suitable for Indian School kids. It will not be simply any random educative game; it will be completely based on the syllabus of the school. In this way it will not be necessary to read books.

The game will be precise according to the demand of the syllabus. So, it will be easy for kids to understand and it will be comfortable for the teacher to teach them.

The game should be attractive which means proper levels of graphics because proper graphics attract people to get involved. More over the game should be user friendly, allowing very simple game play, which is suitable to the age of the children using it.

2.2 Objective: -

To achieve set aims System Development Life Cycle (SDLC) method has been used. This method consists of seven steps which include from initial research until implementation and maintenance of the system.

3. Methodology :

In order to achieve set target in a given time span, it is always important how we approach towards it. Keeping above statement in mind System Development Life Cycle has been used [22].

3.1 System Development Life Cycle (SDLC)

It is a method used for developing any system and it involves seven steps [22]:

3.1.1 Requirement Analysis:

In this step data has to be collected, so, that on the bases of the data requirement can be identified. Data collection method includes two types of data [1]:

- **Primary Data:** - In primary data collection, data is collected by the researcher using methods such as interviews and questionnaires. The key point is that the data collected is unique because nobody can have access to it until it is published. There are many methods of collecting primary data for example: - Questionnaires,

Interviews, Focus group interviews, Observation, Case-studies etc [1].

To the collect the primary data for this project Interviews method is going to be used.

Interview: It is a technique that is used to get an understanding of the primary reasons and motivations for people's attitudes, preferences or behaviour. Interviews can be conducted on a personal i.e. one-to-one basis or in a group.

- **Secondary Data:** - It is data that has already been collected by someone else for a different purpose than its being aimed by the study. For example:

- Data collected by a hotel on its customers through its guest history system.
- Data supplied by a marketing organisation.
- Annual company reports.
- Government statistics[1].

3.1.2 Analysis:

In this step all the information and data collected from data collection methods is analysed i.e. how existing systems work, what are the requirements and how the system can be changed according to the requirements.

3.1.3 Designing or Developing Prototype:

In this step a system is initially developed from the preliminary requirements gathered from the above two steps. After developing the prototype it is shown to the consumer to get feedback.

3.1.4 Designing/ coding:

In this step the actual system is developed according to the set requirements and the feedback obtained by the consumer after reviewing the prototype.

3.1.5 Testing:

In this step the developed system is tested thoroughly, keeping all the requirements of the consumer so that there should be no loopholes.

3.1.6 Implementation:

In this step system/product is deployed after testing and debugging thoroughly so that it can be used by target audiences or consumers.

3.1.7 Maintenance and up gradation:

In this step the system is checked at certain intervals of time to check that it is running properly, or to see if any up gradation is required [23].

4. Research Area

4.1 Hardware:

It was designed with the real world in mind, considering everything from extreme environmental conditions such

as high heat and humidity, to technological issues such as local language support. As a result, the XO laptop is extremely durable, brilliantly functional, energy-efficient, responsive, and fun [3].

4.1.1 General Specifications

Processor & core system:

AMD LX700 CPU (433 MHz) with integrated Graphics Processing Unit.

AMD CS5536 Companion chip for peripheral I/O.

256 MByte DDR SDRAM system memory chip, running at 333MHz.

Embedded controller for system monitoring

ISA Compatibility: Support for both the MMX and 3DNow! X86 instruction-set extensions

Storage:

1 GiB of NAND Flash memory on motherboard.

1 MiB of serial Flash memory provided separately for firmware.

Expandable through a single SD/MMC memory module socket.

Audio:

AC'97 audio subsystem

Internal stereo speakers and amplifier

Internal mono. microphone

Jack for external stereo headphone

Jack for external mono. microphone, sensor, or switch.

Display:

7.5in (19 cm) color/monochrome dual mode TFT LCD, 1200x900 (200dpi)

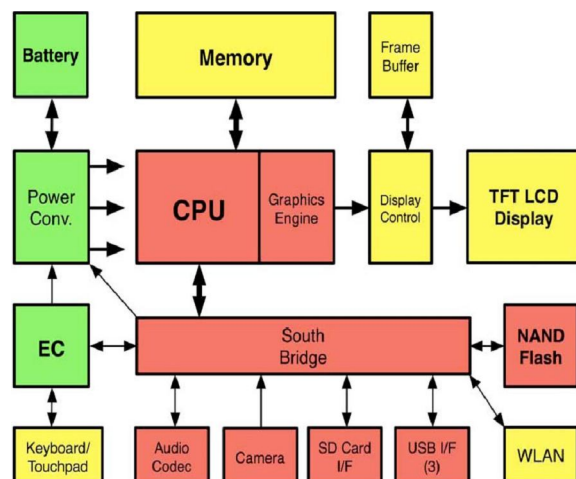
Viewing area 152.4 mm x 114.3 mm; 6 x 4.5 in

Sunlight readable

Dedicated display controller (with separate 2MB SGRAM frame buffer) supports use of display when CPU is powered down Solid state (LED) backlight [9].

4.1.2 System Block Diagram:

All components except the keyboard and touchpad are located behind the LCD panel. This is called the **Core Module**.



Hardware System Diagram [20].

4.1.3 CPU & Companion Chip:

Among all the hardware component mention above, the major concern for this dissertation is Central Processing Unit (CPU) and its chips. Because due to CPU and its chips components present in the XO laptop this dissertation has been selected. It will be very challenging to develop an interactive game for such basic specification[10].

CPU: - The core processing system used an embedded x86 processor (CPU), integrating a memory management unit, x87 compatible floating point unit, a graphics processing unit. An integrated memory controller provides a unified memory model to the processor, the graphics processor, and an integrated display controller.

Companion chip:

• Interrupts

Dedicated system interrupts are provided for system timer, keyboard, AC'97, SD Card, Camera, RTC, system control, USB (also used for networking), display control, touchpad, math co-processor, and DMA.

• Firmware

The Low Pin Count (LPC) interface, provided by the Southbridge and used to communicate with the Embedded System Controller (EC), is also used by the main processor to load the laptop's firmware. The EC's LPC interface in turn reads the firmware from a serial interface Flash memory.

• Graphics Processing Unit

A 2D graphics processing unit (GPU) is provided in to accelerate common graphics and video operations. This GPU shares the main memory with the main processor, using a unified memory architecture. It provides separate processing pipelines for video and graphics, with a hardware blend before display. Separate color-space converters and rescaling is provided for each pipeline.

• Memory

The processor supports an integral 64 bit wide DDR1 SDRAM interface. No external buffering is used. Four 16-bit wide DDR SDRAM ICs are directly mounted on the motherboard, supporting 256 MBytes of main memory using 32M x 16 (512 Mbit) components. The speed of this memory bus is selected at boot time by firmware, and using current chips may be either DDR-266 or DDR-333. As the memory is mounted on the motherboard, and not expandable, there is no SPD interface supported for detecting the speed or size of memory [20].

4.2 Graphic and Resolution:

The XO laptop's unique 7-1/2 inch dual-mode LCD supports a resolution of 1200x900 in monochrome mode and 800x600 in colour mode [2].

4.2.1 Theory:-

The display, offers higher resolution luminance information than chrominance. A key thing to understand is that the blend of information, and thus the perceived resolution of the display, varies as the ambient light level of the room changes. Each pixel has both a reflective part that is B&W, and a transmissive part that is one colour: red or green or blue. If one red, one green and one blue pixel merely combined to make a single full-colour pixel, then the resolution would be $1200/\sqrt{3} \times 900/\sqrt{3}$ or 400×300 [12] [16].

4.3 Game Engine: -

A series of modules and interfaces that allows a development team to focus on product game-play content rather than technical content is known as Game Engine [7].

XO Laptop supports game engine called PYGAME. It is the most commonly used library for creating Python games. In design it is a wrapper around the Simple Direct Media Library (SDL), which provides a low-level interface suitable for doing reasonably efficient 2D games. **Pygame** is highly portable and runs on nearly every platform and operating system [5] [15].

Pygame game engine is selected for the development of the game because of the following:

It is supported by XO Laptop.

It's an open source and will be appropriate for the set aim.

It's very easy and user friendly [19].

4.4 Programming Language:-

Python is a dynamic, object-oriented programming language that can be used for many kinds of software development. It offers strong support for integration with other languages and tools, comes with extensive standard libraries and used for XO laptop programming [13] [17].

4.4.1 Python is powerful... and fast:

It describes the standard library, which covers everything from asynchronous processing to zip files. The language itself is a flexible powerhouse that can handle practically

4.5.1 A Few Important Research Findings

"A Google search conducted 6/6/06 on games OR gaming AND research AND education, produced about 167 million hits. Obviously, this search needs to be substantially narrowed! However, it suggests that many people are involved in conducting or writing about Games-in- Education." [28]

It is assumed that the teacher, parent, or other person making use of these suggestions will adjust the activities to fit the needs of the students. What are some games that are fun to play? Engage an individual student or a group of students in a brainstorming activity designed to make a long list of games that they have played and

any problem domain. Build your own web server in three lines of code. Build flexible data-driven code using Python's powerful and dynamic introspection capabilities and advanced language features such as meta-classes, duck typing and decorators [24].

4.4.2 Python runs everywhere:

Python is available for all major operating systems: Windows, Linux/Unix, OS/2, Mac, Amiga, among others. There are even versions that run on .NET, the Java virtual machine, and Nokia Series 60 cell phones.

4.4.3 Python is Open:

The Python implementation is under an open source license that makes it freely usable and distributable, even for commercial use. The Python license is administered by the Python Software Foundation [24].

4.4.4 Key features :

It has got some very distinguish feature which make this programming language very popular among various industries like: Game Industries and Software etc. Some of the key features are as follows:

- intuitive object orientation
- natural expression of procedural code.
- full modularity, supporting hierarchical packages
- exception-based error handling
- very high level dynamic data types extensive standard libraries and third party modules for virtually every task [24].

4.5 Evidence for Educational Games better than books:

There was recognition across the age range that games support the development of a wide range of skills which are essential to the autonomous learner. Some of these related directly to the context of the game which developed skills such as problem solving, sequencing, deductive reasoning and memorisation. Others were a result of the learning context when children work in groups on a task. These included peer tutoring, co-operation and collaboration, and co-learning. [29]

enjoyed. As the list is being created, divide its items into three categories:

- a. Board games, card games, and other types of non-electronic games that are not organized sports.
- b. Electronic games.
- c. Organized sports. [28]

4.5.2 Attribute for the games that would be useful application for learning:

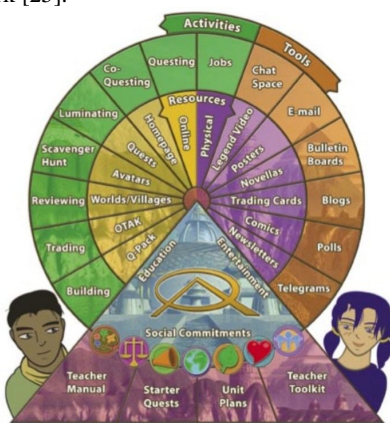
- contextual bridging (i.e., closing the gap between what is learned in theory and its use);
- high time-on-task;
- motivation and goal orientation, even after failure;

- providing learners with cues, hints, and partial solutions to keep them progressing through learning;
- personalization of learning; and
- Infinite patience[6].

4.5.3 Example of games which helps in learning:

4.5.3.1 Quest Atlantis (QA):

Game’s Type: Modification of Never winter Nights Diamond.
Host URL : <http://swi.indiana.edu/arden/index.shtml>.
Learning Objective: Attain an appreciation of Shakespearean authorship and Elizabethan England.
Comment: As part of the Serious Worlds Initiative over at Indiana University, Arden was initially funded by the MacArthur Foundation. Executive producer is Edward Castronova, whose book *Synthetic Worlds* covers many of the economic and social issues in MMOs. Castronova has professed that Arden is not very exciting to typical gamers (no monsters to slay). However, the notion of exploring Shakespeare’s world should prove interesting to English majors and other aficionados of the Bard’s work [25].



Quest Atlantis (QA)[26]

4.5.3.2 River City:

“As visitors to River City, students travel back in time, bringing their 21st century skills and technology to address 19th century problems. Based on authentic historical, sociological, and geographical conditions, River City is a town besieged with health problems. Students work together in small research teams to help the town understand why residents are becoming ill. Students use technology to keep track of clues that hint at causes of illnesses, form and test hypotheses, develop controlled experiments to test their hypotheses, and make recommendations based on the data they collect”

Note: This game is funded from the National Science Foundation.[27]

Type:Multi-user Virtual Environment

HostURL:

<http://muve.gse.harvard.edu/muvees2003/index.html>

Learning Objective: Develop an understanding of the scientific method through inquiry and teamwork, as well as an appreciation for history and environmental issues.

Comment: One of the two big NSF projects for educational gaming on this list, with several years of

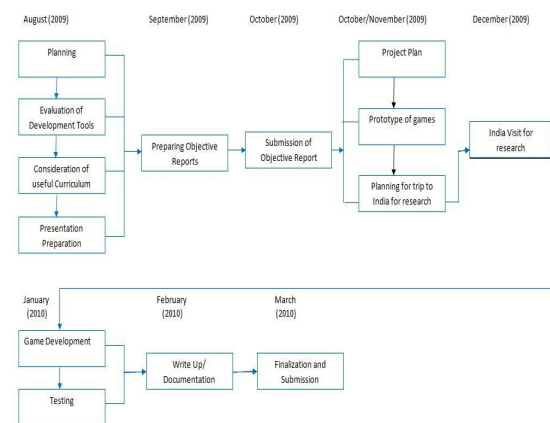
It is an international learning and teaching project that uses a 3D multi-user environment to immerse children, ages 9-16, in educational tasks. In this game it combines strategies used in the commercial gaming environment with lessons from educational research on learning and motivation. It allows users to travel to virtual places to perform educational activities (known as Quests), talk with other users and guides, and build virtual character [26].

research following its progress. This Harvard product is freely available to schools, but only on disc through the mail. The team prefers sending it to teachers wishing to use the program in science classes. Chris Deed spearheaded the project.[25]



River City[27]

5. Project Schedule :



Network diagram indicating planned project schedule to evaluation phase.

6. Acknowledgement:

Thanks you Mr. Darren Wall, Simon Thomson and Hazel Bradshaw without them this proposal wouldn’t have done it.

7. Outcome:

Considering all the aspect mention this objective report . The probable outcome will be an educative game for Indian school children, which can replace their text book and make their class session more lively and interactive.

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