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BRIDGING THE GAP BETWEEN THE REAL WORLD AND VIDEO GAMES USING IOT

A Project Report of Capstone Project - 2

Submitted by

SHREYANSH KUMAR
(1613106013)

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MR. TARUN KUMAR

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SCHOOL OF COMPUTING AND SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

Certified that this project report **"BRIDGING THE GAP BETWEEN THE REAL WORLD AND VIDEO GAMES USING IOT"** is the Bonafede work of **"SHREYANSH KUMAR (1613106013)"** who carried out the project work under my supervision.

SIGNATURE OF HEAD
Dr. MUNISH SHABARWAL,
PhD (Management), PhD (CS)
Professor & Dean,
School of Computing Science & Engineering

SIGNATURE OF SUPERVISOR
MR. TARUN KUMAR,
Assistant Professor,
School of Computing Science & Engineering

Abstract

Video games have come a long way in terms of their scope and fidelity. Modern video games tend to deal with a plethora of life changing issues such as mental health, social and political causes, etc. With video games becoming the most flexible medium of expression, thanks to its interactive nature, we decided to go one step further and implement its usefulness in the real world as well. The Internet of Things (IOT) has gained a significant amount of popularity in the last decade as well, making it equally, if not more important, than video games.

Our goal here is to synchronize the capabilities and scope of both these growing fields of technologies and utilize it for more meaningful purposes such as education among youths, teach life changing morale concepts and even the importance of social unification.
We aim to create a medium where the decisions taken in real life impacts the one in the games, making them even important in the process. All of this will be undertaken with the help of the ever growing arsenal of IOT attributes.

Introduction

Games are modernizing the way people learn and. It’s doing so stimulating various new kinds of ways which are allowing people to use their mind creatively. Serious gaming has proved to be an essential factor behind this changing user models in the so called real world.

Games are an interactive medium that attracts people’s attention and keeps them focused on the task bestowed upon them while they are playing it.
The player character is the main element in the game that can be used as a process of learning via the different goals they achieve.
In serious games, these goals can generate feedback and can easily be tracked by their teachers for better understanding and growth.
Of course, not any game is an academic game, whether or not it possesses educational content. The secret is game design. it's necessary to style a game in such how which will drive the players to immerse themselves and test their knowledge to their fullest capabilities

A plethora of research indicates that games provide a medium that is more interactive and engaging since it enables people of all ages to better understand almost anything-from a
history lesson to learning the teachings of a selected, untamed religious community. they're increasingly used whether in formal education or reception, and also for vocational education.

One can use a “virtual world” as a secure environment to do certain behaviour and train repeatedly that behaviour until the simplest approach to succeed in a specific objective has been learned.
Simulation serious games are widely employed in many various fields, even in military or order to train the behaviour of learners in specific situations, or to cope up with mental state issues.

The realisation of the potential benefits of serious gaming when used as educational tools in an educational or social inclusion framework has recently began to be appreciated by the standard computer gaming industry, now desperate to vary into new market segments.
Certainly, there has been a big increase in activity within the research community but also within the enterprise sectors, with a good number of companies beginning to emerge within the serious game market.
Indicatively, the serious gaming industry was valued at slightly over $2.5 billion in 2015, and is anticipated to double, reaching almost $5.5 billion by 2020. However, any company targeting the event of non-leisure games faces significant practical and pedagogical challenges.

The most critical issue is that the modular tools currently available to the gaming industry are almost exclusively based around leisure-based gaming and don't support, or can not be easily integrated, into educational contexts. Simultaneously, shaping serious games to specific learning objectives poses a challenge for educators as serious games generally don't allow easy adaptation of the content to the educators’ own purposes.

The aim is to facilitate the combination of real-world information into the game world and validate how this approach helps towards creating immersive, persuasive serious games that may have a big impact in their growth and development.

This will be examined on the basis of the implementation of a gamification platform and therefore the accompanied development of great games, within which users can progress by completing specific tasks in reality, like switching off a light when leaving an area or cooperate with other persons in simple actions, granted monitoring infrastructure by sensory devices implementing the Internet-of-Things (IoT) paradigm.

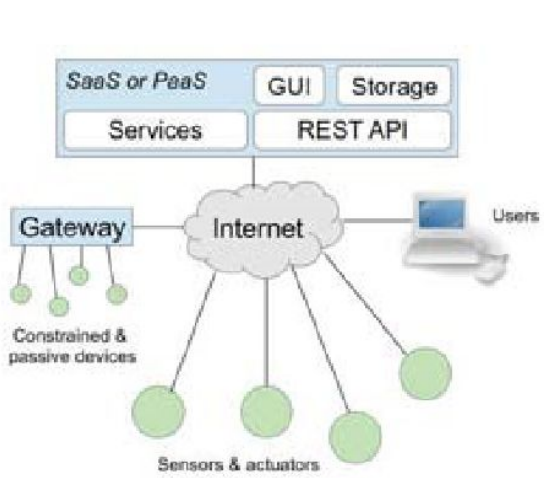
Methodology adopted

1.IOT
2.Gamification

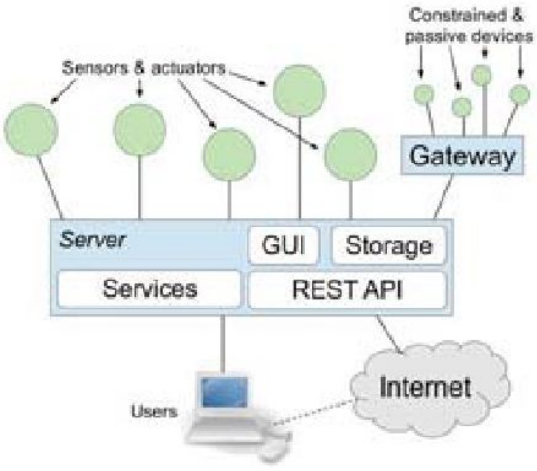
IOT

Two different IOT Platform architecture could also be used for this.
They are:-

a.Cloud based platform.
b.Local platform.



(a) Cloud-based platform



(b) Local platform

Wireless sensors servers are used because it is the root of this IOT layer. By implementing these wireless sensors in an environment, we are able to use real world consequences to impact the game's world.
Two of the foremost commonly used wireless protocols are Zigbee and Bluetooth Low Energy.

These sensors will be used so that the appropriate input will be able to detect events or confirm events registered into the system manually by users, so the users are fair and also for the integration of the game world and also the real world remains consistent and proper.

This concept suggests a good integration of user sourced information and sensor-based data.
A simple example for this may be a kindergarten class where the teacher asks the kids not to make plenty of noise.
Wireless sensors placed within the facility could monitor noise levels created by the kids and objectively give feedback to them and also the teacher during a game like manner. This approach to enforcing the required behaviour would be not only effective, but also entertaining for kids, which might act collectively so as to realize a particular group goal.

Gamification

Gamification is the process where we use the game elements and attributes in an exceedingly non-gaming context or environment. Usually gamification has played a large role in online marketing where it's been noticed for garnishing better user engagement, organizational productivity, flow, learning, crowdsourcing,etc.Here we use gamification to integrate with the ever going social media technology

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Social media are employed in (serious or not) gaming platforms, mainly as a method to report gameplay progress so as to extend motivation and competition among players. This enhances the playing experience of users and contributes to the success of a game.

An example of using social media in an incredibly serious game involves taking under consideration the amount of participation of the player in a vast social network (such as counting shares, likes,
friends, commits, etc.) and thereby ,allow progress given that a checkpoint has been reached.
In an academic serious game for example, it might be asked that the player completes a task and then uploads a corresponding video on YouTube, where it
gathers views by other players. The game rendering engine could make sure the user has indeed uploaded a video on their account and it's enough views to think about the task as fulfilled, providing the relevant reward.

In the framework that we'll be creating, social media will have a prominent role. It'll allow a tighter integration of social media into the gameplay elements, which can in result, not only be a platform to showcase the results of the game but will also influence the progress of the game.

Serious games started off as an idea focused on education through experimenting and investigation, keeping entertainment and pleasure a secondary purpose.
Board and card games are two samples of serious games which are around long before the introduction of electronic games.

One of the best challenges within the creation of significant, serious games is to seek out the correct proportions between efficacy and pleasure. A game of this sort should be effective in building skills, knowledge and competences for its players, while at the same time providing a subtle but not excessive reward level.

The effectiveness of such games has been proven within the domain of commercial and military role-playing training games, and that they have recently made their way into the serious games. The success of serious games in education relies on some fundamental and inherent characteristics they possess; they're well-structured,highly motivational, they need a well-defined set of rules that are accepted by all
participants etc.

Of course, one of the most important aspects of any game is the gameplay, which is what keeps the players curious about it. A serious game should therefore be able to adapt to every participant’s interest and time they spent playing the game, providing the required rewards, even as a conventional game would do.

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Proposed System

We have embarked on to style and develop a tool that will help convert learning into an impactful and fulfilling experience. This goal is achieved in a very variety of serious games based on academics to support IoT technologies. The game tests the knowledge of a topic and just like the teaching process is split into lectures, the task is also classified into smaller parts. To properly measure the students' knowledge over the topic in the curriculum, the game is split into so-called tasks. Each task or objective represents a lesson of the course and tests the knowledge of the concerned lesson implemented in the task. During the game, students receive tasks one by one, in random order, and might only proceed to the subsequent task after entering the answer to the prior problem.

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The serious game we are trying to implement here takes over various floors of a school building, subsequently labelled as different levels. Every level has a checkpoint where the IOT applications have been installed to save and record progress, which is directed to the cloud storage of the game's interface.
The task in every level (floor) is different and gets more complex as players progress further and further, just like in a normal game.
We have discussed this more elaborately in the implementation section.

Existing System

The ICEBERG serious game which was implemented as a primary use case scenario in InLife. ICEBERG is a role playing, methodical game (RPG) which evolves on earth, but within the lost world of ice. The creatures that live there are the Yetis, but other animals exist similarly, like penguins, polar bears, albatrosses, whales. Each player incorporates a Yeti to interact within the ice world and an "ICEBERG", which is the place where the Yeti lives. There are various forms of resources in ICEBERG. The most important of them all are the ice blocks, which are produced by penguins. The speed of this production per penguin is going to be configurable. it'll even be possible to induce access to varied technologies and materials so as to erect buildings on the available space of the "ICEBERG". The screenshot below presents a more elaborative view of the ICEBERG graphical computer program.

ICEBERG game interface.

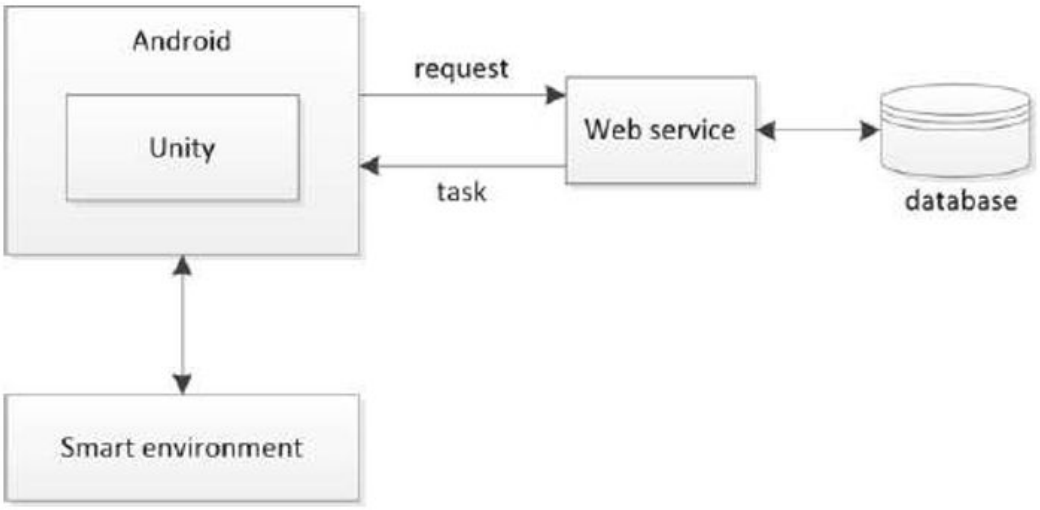
When your behaviour is environmentally friendly and you're trying to be energy-efficient as suggested by the ICEBERG 374 game, then the realm of your ICEBERG increases within the virtual world while at the same time you get more friends, namely penguins, polar bears, albatrosses, whales, that are coming to your ICEBERG and are willing to assist you. For instance, penguins are able to produce ice blocks, polar bears are able to create bridges and buildings, etc. A bear might become your friend after you complete a particular mission or achieve a target within the desired period of your time. Similar settings will exist for the opposite animal friends similarly. On the other hand, if the behaviour of the user is opposite of what's expected, this may be depicted within the virtual world similarly, e.g. the ICEBERG might start to melt, some penguins might get disappointed and leave, etc.

Implementation and Architecture

During the course of this research, we've taken a style to develop a tool that might help turn learning into a noteworthy and motivational experience. This goal is achieved after successful implementation of a serious, academic game supporting IoT technologies. This game tests the knowledge of the subject matter and just like a regular teaching is split into lectures, the tasks are also split into smaller parts. To properly measure the students' grasp over the topic curriculum, the game is split into so-called tasks. The tasks each represent a lesson of the course and test the knowledge of the student regarding the same lesson. During the game, students receive tasks one by one, in random order, and might only proceed to the subsequent task after entering the answer to the present problem.

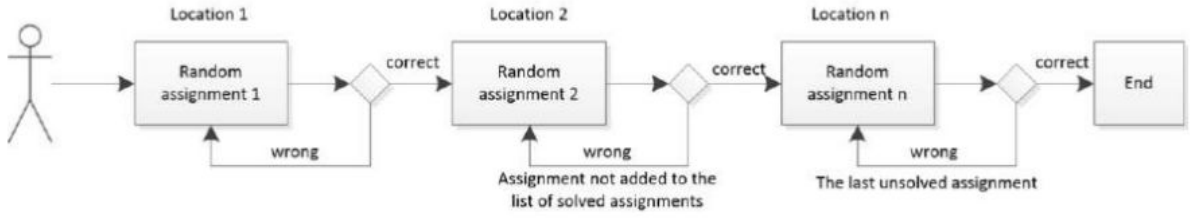
The system consists of a mobile application that is a controller just like a normal video game controller. An administrative tool within any internet application is utilized by the teachers, as well as a database and a set of web services to transmit data through a sensible environment that has on-site equipment (hardware and software) for every task. Communication between components is realized through the employment of web services, RFID tags, and QR codes.

The mobile application is the player's gateway into the complex, diverse system of the game. Its sole purpose is to update the information that the IOT tools capture when the user interacts with the physical objects necessary to unravel tasks. So as to accommodate a large range of tasks, it uses task metadata to adapt to the present type and generate only the capabilities necessary at the instant. It does this by being split into modules that are used as building blocks to make full during the loading of a brand new task.The appliances are often divided into two parts, the Vuforia part, that permits the employment of augmented reality, and also the Android part that facilitates everything else.



The administrative tool is employed by teachers to prepare tests (playing of the game), to make new tasks or modify existing ones, review achieved results for a given student and grade them.

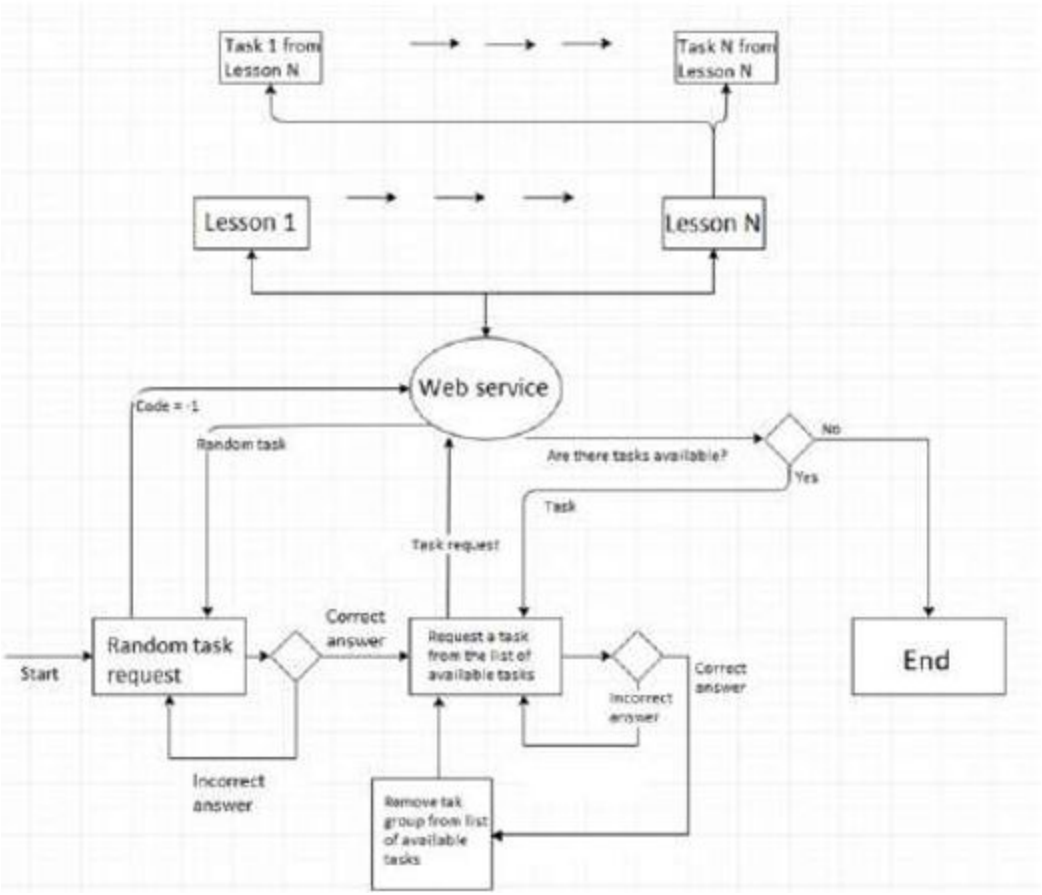
Workstations are equipment present on site for every task. Since the task is envisioned in a way that can only be solved with the help of external factors and devices, all the mandatory hardware and software must be properly set. The game requires the user to travel different locations scattered throughout the building. An example of a workstation schema is displayed in the figure below. Locations of every task are often anywhere, within the classroom, within the faculty building, or outside. In this case, it's just a school building with various floors as discussed before. As an example, a task is often associated with measuring the temperature, and therefore the equipment is often placed somewhere in a classroom. Or, a task is often associated with watering the plants, hence the workstation is placed within the garden.



The administrative application is implemented through the employment of PHP artificial language and Laravel 5.3 framework. It also contains all the online services that are available to clients via the mobile app. All the info is stored in a MySQL database. Both

the database and software are stored inside a virtual machine hosted in a cloud centric environment. The VM could be a basic server installation of Centos 7 OS with Apache and other necessary services installed. By having the server on the Cloud, it's possible to reinforce it by adding more bandwidth, processing power and memory, so as to unravel any bottlenecks that may occur.

Output


Task 1 from Lesson N
Task N from Lesson N
Lesson 1
Lesson N
Web service
Code = -1
Random task
Are there tasks available?
No
Yes
Task
Task request
Start
Random task request
Correct answer
Request a task from the list of available tasks
Incorrect answer
Correct answer
End
Incorrect answer
Remove tak group from list of available tasks

The student starts the game from the starting line where they are given the first task, The information they get reveals the location of the next task, name, and title of the matter that has got to be completed.. Metadata is used to come up with a user interface that the player sees. It is like inputting answers (keyboard, RFID tag, QR code).After solving the first task, they get a clue for the subsequent task where a workstation with the second task is found. This process is repeated until the last assigned task is solved. There's no direct penalty or issues for solving a task incorrectly because it could be completed or finished later by trying again.However, the extra time taken to retry the level decreases the score or points that the player receives (as the remaining time is an element of the grade). Another potential penalty can occur if the player is not able to correctly finish a task even after multiple attempts. In such a scenario, not only is the utilized time deducted from the score, so are the points that every completed task brings. Since not all tasks are of the similar difficulty level,the scores for the same varies accordingly. The final score is calculated to support the remaining time and therefore the sum difficulty level of every successfully completed task. The detailed game process is displayed in Fig. Throughout the game, the code can review the solved assignments. After completion of all the assignments, or after the time has elapsed, the score that student achieved is calculated, shown to the code, and inserted into the administration application and the game interface.

A schema of the assignment is shown in figure. The displayed assignment is named the watering plant. The code is required to resolve the Python function shown on the screen. The result of the function is the required humidity level of the plant. The screen shows the text of the present problem. The duty of the code is to travel to the placement per the text of the task and follow the provided instructions to search out the answer to the given problem. the answer is then inputted into the console. If the solution is correct, the solved task is registered as completed and therefore the student won't receive it again. within the case that the solution is inaccurate, the task remains within the scope of possible assignments for the subsequent iteration. After the point in time expires or all the tasks are solved, the code has completed the sport. The results are scored to support the amount of solved tasks and therefore the remaining time, if there's any, and therefore the student is graded accordingly. As previously stated, the game is played in iterations..

Based on the task metadata, the mobile application will, alongside all the opposite views, also show the view with the present humidity and a button activate the pump and increase it to some extent. At any moment the code can interact with another part of the

workstation, the RFID tag generator will create and transmit a code to the mobile application. This code represents the answer of the task and if the humidity level is PRN at the instant of the button slick, the generated code is going to be correct. Granted, the validity of the code, the task is marked as completed or left as a possible option for all next iterations during the present game. After typing within the code, the code receives the subsequent task, if there's one still left unsolved.

Conclusion and Future Enhancements

We were successful in implementing the utilization of IOT and programming to bridge the gap between the real world and the gaming world. Our actions taken within the universe were recorded and analyzed by a moodle system which reflected within the game. However this was just a minor utilization of the humongous scope this area of research still holds.

In the coming years, the scope of AR technology will increase impeccably, and so will the liberty and suppleness of implementing gamification. Current AAA or indie games that folks play for pleasure and entertainment may be able to be used for educational and research purposes.

With the assistance of IOT and games within the coming few years, we are going to not just be able to educate kids during a more efficient and fun way, but also help and guide adults within the right direction by smart implementation of psychological state awareness techniques and far more.

The results have indicated that this kind of game includes a potential for application, that it's considered useful and fun by the scholars, which it contributes to their knowledge. additionally, the evaluation has shown the directions for improving the appliance before its wider use within the educational process. Besides improving the technical aspects of the system, future work is going to be directed towards the event of the next number of tasks, further integration with Moodle and complete technical and academic evaluation of the system.

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