

ToI Stereopticon for Rural E-Learning Education System

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Abstract: Learning is a very integral part of smart education system even called to be as a smart-work method of educating. The contemporary challenge is to easily integrate the e-learning education system into a smart educational environment, considered that to be in rural areas with one of the most emerging technology called Internet of things (IoT). The e-learning services rely on a software system that allows access to all the materials that are related to the education and makes them electronically available to all students/teachers on the internet using whenever they need and at wherever they are being stated. The whole system of e-learning system is a critical part of the educational process as it reflects on the usage of the complex system too. In this paper, the design and implementation of e-learning systems through ToI (Things on Internet) stereopticon is described. The proposed ToI Stereopticon for Rural E-Learning Education System is designed using off-the-shelf and open-source software engineering model, programming tools, raspberry pi circuit as hardware and database models. The system is tested to prove the new design concepts and features. The method used in the back-end and front-end design and implementation allows flexible usage and integration of the whole system by the educational institutions in rural areas.

Index Terms—Android Studio, Database, E-Learning, Education, Educator, Firebase, Internet of things (IoT), Institution, LED-Projector, Raspberry-Pi, Raspicast, System of System (SoS).

INTRODUCTION

The *ToI Stereopticon for Rural E-Learning education system* has been developed to override the problems prevailing in the practicing/traditional manual system of teaching in rural areas. This paper is supported to eliminate such kind of existing problems. Moreover, ToI refers to *Things on Internet* whereas, Stereopticon is a kind of projector that is particularly used to project/view/display a particularly described source or any consisted data provided to it. This device is designed to access and visualize the topics in the form of videos or any other data that are stored in the firebase database platform using IoT and manage the same using the passkey given to the authority or operator of the stereopticon which can also be controlled by using their smart phone. This helps in explaining the topics in the form of video and making the students understand the academics smooth, effective and in efficient way.

ToI Stereopticon for Rural E-Learning education System as described above, can lead to error free, make an enthusiasm and excitement in students to learn the topics, secure, reliable and fast teaching system. It can assist the user/teacher to concentrate on their teaching academics rather than to concentrate on the record keeping. Thus, it will help the institute in better utilization of resources.

This is designed to assist the organization/Institute to

develop the mode of teaching and turn that to a smart class, keep records of syllabus covered, status of the video/syllabus, maintain the teaching parallel to the scheme and syllabus that are mentioned from the Universities.

Procedure for Paper Submission

Review Stage

Submit your manuscript electronically for review.

Final Stage

When you submit your final version, after your paper has been accepted, prepare it in two-column format, including figures and tables.

Figures

As said, to insert images in *Word*, position the cursor at the insertion point and either use Insert | Picture | From File or copy the image to the Windows clipboard and then Edit | Paste Special | Picture (with "Float over text" unchecked).

The authors of the accepted manuscripts will be given a copyright form and the form should accompany your final submission.

1. PROBLEM STATEMENT

The main problem India now faces is that all the pedagogical innovations are fit to improve the quality of urban education while the rural learners and their education remain largely neglected. With 65 per cent of the population residing in rural India, education there truly deserves much more attention, especially when it is

plagued with so many problems - dearth of teachers, teacher absenteeism and poor quality of teachers too.

Non-permanence of teachers is demotivating:

Most of the schools in rural areas are run by the government. They appoint ad hoc teachers, instead of permanent ones, who are poorly paid as compared to the huge remuneration of a full-time Trained Graduate Teacher (TGT). Moreover, promising career prospects, which is quite a motivation booster, is almost nil for the non-permanent teachers. This leads to dissatisfaction, eventually resulting in a dearth of teachers because they move away to more permanent jobs.

Late or blatantly absent:

Lack of accountability of teachers and school authorities has raised the rate of absenteeism. School Development and Management Committees (SDMCs), comprising parents and members of the local community, have been entrusted with the responsibility of overseeing teachers and their duties. However, research suggests that the committee has hardly seen success.

Non-teaching duties:

Moreover, non-teaching duties like election invigilation often keep teachers away from schools. Furthermore, teachers often have to report for duty far away from their home. With an inadequate transport system in rural India, the distance only adds to their woes and often results in absenteeism.

Lack of quality teacher training:

There are many private teacher-training institutes in India, but the quality of the training they provide is unsatisfactory. Continuous professional development is a motivator for teachers, and enough attention is needed in this regard.

Devolution of powers is extremely important to make education accessible to children. Administration at the grass roots should be encouraged. Panchayats should have the power to decide whether a piece of land should be allocated to a power plant, hospital or elementary school.

2.1 CASE STUDY-1

Problems in the Indian education system

The Indian Education system is considered to be one of the best education systems in the world. I still agree that and there are many problems in the Indian Education systems that are not known to the public in a magnifying glass. I do not want to refer something and the things

come out of my heart as I have crossed years in my academics.

We the Indians are forced to move with the current education system and there is no one to question the drawbacks. This article is mainly focused to improvise the education standards and the education system and not to blame the current system.

The first and foremost thing I submit here is the Exams. Nearly 70% of the students study only to score marks in the Exams and not to learn the new concepts. It is merely a waste and this will go vanished after the exams are over. It will affect his career when he/she wants to rewind the things later when it is needed. This may be a short collection of words but if you think of it deeply it means a lot and lot to you in the education system.

Govt schools vs Private schools:

This is going to be one of the major factors that create a complex between a Govt schools and the private school students. Even though you could add up with the reasons, there is a small heart in your corner saying Yes. The syllabus and the curriculum are same in both and the clash lies in the infrastructure and the miscellaneous facilities. I could ask a direct question.

There is a basic fact that people do not get in to Govt schools, hospitals etc. and this is not a case when they go for Govt jobs. I could say one more fact that getting a seat in the highly reputed schools or colleges by giving a lumpsum amount also affects the education of others who could not get that due to their low economy. It directly or indirectly affects the education of other students.

There are more to summarize on this and once these facts are nullified with a proper system everything will be good and we could get a better, standard and a beautiful education system in India. This may be a short collection of words but if you think of it deeply it means a lot and lot to you in the education system.

2.2 CASE STUDY-2

Need and Significance of Education

Education is a movement that is considered crucial for the development of human resources. The various kinds of developments, such as, cognitive, intellectual, social, personal are enhanced through education. In the system of education, higher education incorporates management, engineering, medicine, technology, science etc. these fields contribute a major role in the impartment of knowledge, information, values and skills amongst the individuals (Chakrabarty, 2011). It also plays a vital role

in increasing the growth and productivity of the nation. The development of the society, community and the nation is an imperative concern; human resources can work towards the development of the community and nation, when they possess the knowledge, awareness and the skills, hence, the generation of knowledge, awareness and the development of skills will be applicable only through education.

Besides, management, engineering, medicine, technology, science, there are number of other fields in education such as, mathematics, English, Hindi, arts, education, political science, history, geography, hotel management, business administration and so forth that contributes in enriching the aptitude, capabilities and proficiency amongst the individuals, so that they are able to accomplish their desired goals and objectives. In educational institutions, the subject that people select are usually on the basis of their interest, hence, in order to understand the subject in an efficient manner and to make use of it in employment opportunities, a person should be diligent, resourceful, creative and ingenious. It entirely depends upon the individual how he understands his field and works towards it. Teachers and instructors can guide the learners towards the right direction, but the learners themselves have to follow the right path through dedication and hard work.

In leading to growth and productivity of the nation, the government is committed to making provision of primary education and certain facilities and subsidies are also required for higher education. The cost involved is high in the management of the higher educational institutions and private sector in the present existence is contributing towards the operation of educational institutions (Chakrabarty, 2011). The main objectives of education are, the individual should be educated regarding all areas that are necessary to enhance ones living, such as, norms, values, ethics, social skills, academic knowledge, cultures, and they should learn to use the critical thinking skills. When an individual acquires higher education and becomes a doctor, engineer, lawyer, teacher, manager, administrator etc. then this is apparent that he works to sustain his living conditions as well as the conditions of his family, but it is vital that he should contribute towards the welfare of the community. Education and learning should be implemented throughout the lives of the individuals, they are regarded as lifelong processes and a person should always focus upon learning new things in

his day-to-day life.

Issues in the Indian Education System

The emerging issues in the Indian education system have been stated as follows:

Teaching Attribute is in a Low State – In most of the educational institutions and training centers within the country, the quality of teaching is not in a very developed state. The main factors that lead to the deprived teaching methods are, shortage of teachers, the curriculum and the instructional methods are not well developed, the teaching-learning methods are not well organized, lack of appropriate communication between the teachers and the students, lack of modern and innovative techniques and financial problems. Due to these problems, the teaching that takes place in educational institutions is not of improved quality and measures need to get implemented to make it useful (Chahal, 2015).

Financial Constraints – There are many students who belong to minority groups, marginalized and socio-economically backward sections of the society. They show interest in their education, are diligent and aspire to become professionals such as, doctors, lawyers, engineers, business administrators, teachers and so forth. But low income of their families and financial constraints serves to be impediments within the course of the acquisition of education. Students usually migrate to urban areas to get enrolled in higher educational institutions and besides, tuition, they have to pay for their living, food, books, e-resources, and other expenses (Challenges in Indian Higher Education, n.d.).

Traditional Teaching Methods – In educational institutions, traditional methods of teaching are adopted, and teachers do not make use of technology or audio-visual aids in teaching, particularly in nursery schools. There is requirement for technology and internet within the education system, particularly in rural areas. The investment made in the technological infrastructure will contribute in facilitating learning amongst the rural masses. The testing and the evaluation systems need to be made more creative by recognizing the significance of technology, adopting innovative teaching-learning methods, and ways to solve the problems in an efficient manner (Thanky, 2013).

Privatization - Privatization of higher education is actually a new but a wanted trend and is indispensable to sustain resourcefulness, adaptableness and superiority.

The economic track of liberalization and globalization demands for it. In India, both the public and the private institutions function simultaneously. Almost 50 percent of the higher education in India is imparted through private institutions, primarily unassisted comprising of high cost. However, the condition is not considered to be very unassuming. Private providers, in the interest of maximizing profit, have every motivation to minimize the costs by negotiating on the quality of education available in their institutions (Chahal, 2015).

Inadequate Facilities and Infrastructure – Educational institutions and training centers in India in some cases, do not have adequate facilities and infrastructure. In the provision of education, it is vital that there should be availability of proper furniture, technology, machines, cooling and heating equipment in accordance to the weather conditions, clean restrooms and so forth. These are regarded to be important in the provision of education, as the physical environmental conditions of the educational institutions should be comfortable. The facilities and the infrastructure are mainly found to be in an underdeveloped state in schools in rural areas. Due to these, there would be a decline in the enrolment of students, hence, measures are required to be implemented to make provision of facilities and development of infrastructure (Chahal, 2015).

Reward Creativity, Original Thinking, Research and Innovation – At all the levels of education, it is vital that creativity, logical and rational thinking, research and utilization of innovative techniques and methods should be encouraged. These will contribute in making learning pleasurable. There are students, who do not take interest in learning or attending classes, this results in an increase in the rate of absenteeism. Therefore, in the teaching-learning methods, the teachers and the instructors are required to be imaginative, so that they can make the lesson plans interesting for the students. It is vital for the students to learn the research techniques, as these are imperative in higher education.

2.3 CASE STUDY-3

In poorly performing educational systems as in the country, online learning may not usher in a revolution.

Equality of opportunity to all is one of the basic principles of our Constitution. From an educational point of view, John Dewey, American philosopher, psychologist, and educational reformer, strongly argued that “[A]n environment in which some are limited will

always in reaction create conditions that prevent the full development even of those who fancy they enjoy complete freedom for unhindered growth.” Another point he makes equally strongly is that for good education, one must lead the child’s current interests and abilities organically to logically organized human knowledge. This second point is an indicator of the quality of education.

The key issues:

Our education system was never very efficient even in the best of times. The COVID-19 pandemic has rendered it extremely biased and faulty. The main thrust of providing learning opportunities while schools are shut is online teaching. There are several sets of guidelines and plans issued by the government, the National Council of Educational Research and Training (NCERT) and the Central Board of Secondary Education (CBSE) for this purpose. The Internet space is teeming with learning schemes, teaching videos, sites and portals for learning opportunities. The content of all government sites and scheme is primarily the NCERT-issued alternate academic calendar, videos of teaching, digital editions of textbooks, and links to other such material.

There are three pertinent issues in this whole effort of online education and schemes that need serious consideration. One, and exacerbation of inequality; two, the pedagogical issues leading to bad quality education; and three, an unwarranted thrust on online education, post-COVID-19:

Exacerbation of inequality:

It is worth repeating a truism that calamities, be they natural or man-made, affect the underprivileged the hardest; COVID-19 is no exception. The plight of millions of migrant labourers, many of who walked thousands of kilometres right in the beginning of the lockdown, proved the point adequately. A similar but less noticed deprivation is being visited to children of the same people, which may push the next generation in a direction of even greater comparative disadvantage.

In our society there is no large movement that may generate any hope of an improved situation in terms of equality and social justice. Therefore, any positive change that might come about will be a cumulative result of the development of capabilities and grit in individuals. The COVID-19 shutdown has affected this opportunity for the poor even harder than their counterparts from well-to-do sections of society. The government began plans for students with no online access only by the end of August.

The plans themselves were the usual glib talk always served to the poor. These plans assume semi-literate or illiterate parents teaching children, community involvement, mobile pools, and so on. Anyone with an understanding of rural India will immediately note these to be imaginary. As a result, whatever online or digital education is available is for students with only online access. Thus, digital India may become even more unequal and divided than it already is. Even if one takes it as an emergency measure (that 'something is better than nothing') and also accept 'for some is better than no one' despite it being against the principle of equal opportunity, the quality of online teaching-learning leaves much to be desired. The NCERT declares in its Learning Enhancement Guidelines, or LEG that 60-70% students, teachers and parents consider learning satisfactory. However, its survey asks a single question on the feeling of students using the criteria of 'joyful to burdensome'. The happiness or otherwise of the student while learning is, of course, important, but it says nothing about the quantum and depth of learning.

Listening to lectures on the mobile phone, copying from the board where the teacher is writing, frequent disconnections and/or having blurred video/audio can hardly and organically connect the child's present understanding with the logically organised bodies of human knowledge.

The pedagogical issues leading to bad quality education:

If one sees videos of teaching mathematics, science, history, and the English language, one can hardly avoid noticing problems with them. In the science and mathematics videos, in particular, there are many misconceptions and ambiguities. The emphasis is more on 'tricks' to remember for success in an examination than laying the stress on conceptual understanding.

The government of Delhi also uses videos by the Khan Academy ("a non-profit with a mission to provide a free, world-class education to anyone, anywhere"). Many American educators have questioned the quality of teaching and have pointed out inadequate or plainly wrong concepts, particularly in mathematics. To quote an article in *The Washington Post*, Khan Academy: The revolution that isn't: "teachers... are concerned that... the guy who's delivered over 170 million lessons to students around the world... considers the precise explanation of mathematical concepts to be mere 'nit-picking'.

The secondary students are in a better position still because of their relative independence in learning and possible self-discipline. The beginners in the lower primary can get nothing at all from this mode of teaching. An example of assumptions in the NCERT's planning in LEG can be instructive; it is glibly pronounced that "for a child in grade I, the learning outcome — associates words with pictures — can be easily taught with the use of resources available from or at home such as newspapers, food packets, things at home, TV programmes, nature, etc. All that will be needed is guidance to the parents." Well, if it were all that simple, then why are our children not learning to read and write? Education does not happen in chance encounters with print. As Michael Joseph Oakeshott who also wrote on education would say, it requires well-connected, regular efforts that are incrementally building to help the child focus his attention and to provoke him to distinguish and to discriminate, and develop a habit of staying on task. And this requires help from someone who knows the child as well as understands the objective of education. Food packets and newspapers in the hands of even 'guided' semi-literate parents will be good enough to present a plan on paper, but will be completely useless for the child's learning.

An unwarranted thrust on online education, post-COVID-19:

IT has been presented as a harbinger of a revolution in education for more than three decades now. However, all reliable studies seem to indicate that Information and Communication Technology (ICT) in the classroom helps in already well functioning systems, and either has no benefits or negative impact in poorly performing systems. That does not indicate much hope from IT in our education system. The NCERT's LEG states that "COVID-19 has created a situation which demands transformation in school education... the transaction mechanisms in school education may go through a drastic change. Therefore, even if the pandemic will get over, its traces will be there and school education needs to remodel itself..." It recommends that "alternative modes of education for the whole academic session include Internet-based, radio, IVRS, TV DTH Channels, etc." should be developed. The transformation of schools in the current understanding of pedagogy, suitability of learning material and quality of learning provided through IT will further devastate the already inadequate system of school education in the country. Of course, IT can be used in a

balanced manner where it can help; but it should not be seen as a silver bullet to remedy all ills in the education system

Institutional environment

The importance of an institutional environment cannot be overemphasised when one thinks of online teaching. Even when the institutions function sub-optimally, students themselves create an environment that supports their growth morally, socially and intellectually in conversations and interactions with each other. The online mode of teaching completely forecloses this opportunity.

In conclusion, our democracy and public education system have, as usual, left the neediest in the lurch and are providing bad education to those who matter.

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2. OBJECTIVE

The project mainly consists of the following objectives:

1. To make a stereopticon(projector) based on Internet of Things and that works/project's the videos and data that are stored in the firebase cloud storage. And the data can only be accessed by the application(app) that is developed by Android Studio.

2. Interfacing the built app to the stereopticon circuitry and accessing the both using the authentication key.

3. METHODOLOGY

The above-mentioned problem statements accomplished by our literature survey can be overcome by implementing the following methodologies: 1. Establishing the new mode of teaching i.e., teaching the topics according to the scheme set by the board in the form of videos. 2. Having a hands-on set of syllabi that need to be covered and in assigned set of time in digital form. 3. Implementing the stereopticon(projector) interfaced with the IoT and Learning Management system makes the teacher to concentrate on the topics that to be taught rather than making records of the daily schedule. 4. Making students enthusiastic, excited and interested in studying using this project will help in developing the literacy rate. 5. Making students of rural areas to learn with new technics makes them to know more about the new trending technologies in the developed areas or the technologies that are being used in this contemporary world.

4.1 SYSTEM ARCHITECTURE

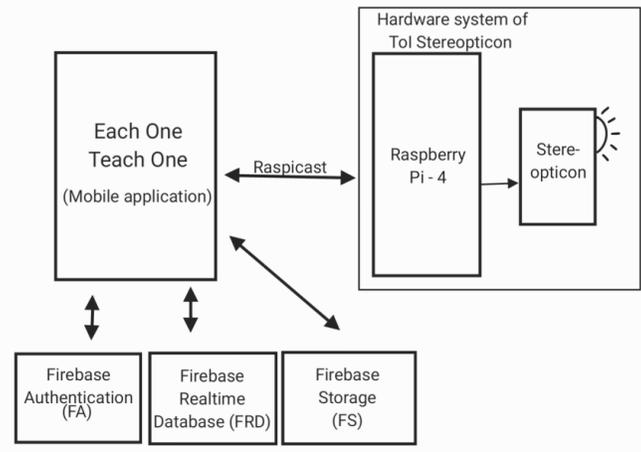


Fig-1: Block diagram of System architecture

4.1.1 HARDWARE DESCRIPTION

A. Raspberry pi 4 Model B:

Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior-generation Raspberry Pi 3 Model B+, while retaining backwards compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems. This product's key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 8GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on). The dual-band wireless LAN and Bluetooth have modular compliance certification, allowing the board to be designed into end products with significantly reduced compliance testing, improving both cost and time to market.

Specifications of Raspberry pi-4 Model B

Processor: Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz Memory: 2GB, 4GB or 8GB LPDDR4 (depending on model).

Connectivity: 2.4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac wireless LAN, Bluetooth 5.0, BLE Gigabit

Ethernet 2 × USB 3.0 ports 2 × USB 2.0 ports.

GPIO: Standard 40-pin GPIO header (fully backwards-compatible with previous boards).

Video & sound: 2 × micro-HDMI ports (up to 4Kp60 supported) 2-lane MIPI DSI display port 2-lane MIPI CSI camera port 4-pole stereo audio and composite video port. Multimedia: H.265 (4Kp60 decode); H.264 (1080p60 decode, 1080p30 encode); OpenGL ES, 3.0 graphics.

SD card support: Micro SD card slot for loading operating system and data storage.

Input power: 5V DC via USB-C connector (minimum 3A1) 5V DC via GPIO header (minimum 3A1) Power over Ethernet (PoE)–enabled (requires separate PoE HAT). Environment: Operating temperature 0–50°C.



Fig-2: Circuit of Raspberry Pi-4 Model B

B. Stereopticon (Mini-Projector):

An **LCD projector** is a type of video projector for displaying video, images or computer data on a screen or other flat surface. It is a modern equivalent of the slide projector or overhead projector. To display images, LCD (liquid-crystal display) projectors typically send light from a metal-halide lamp through a prism or series of dichroic filters that separates light to three polysilicon panels – one each for the red, green and blue components of the video signal. As polarized light passes through the panels (combination of polarizer, LCD panel and analyzer), individual pixels can be opened to allow light to pass or closed to block the light. The combination of open and closed pixels can produce a wide range of colors and shades in the projected image.

Specifications of the stereopticon:

Dimensions: 14.22 x 9.4 x 5.33 cm; 317.51 Grams.

Resolution: Full HD1080p.

Hardware interface: MicroSD, USB, HDMI, 3.5mm Audio, S-Video.

Display technology: LCD.

Image aspect ratio: 16:9

Aspect ratio: 16:9

Screen resolution: 1920 x 1080

Speakers max. output power: 2 Watts.

Voltage: 12 Volts (DC).

Power source: DC 12v/2.5A

Connector type: HDMI; USB.

4.1.2 SOFTWARE DESCRIPTION

A. Android studio:

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development. A specific feature of the Android Studio is an absence of the possibility to switch autosave feature off. The following features are provided in the current stable version:[1]Gradle-based build support. [2] Android-specific refactoring and quick fixes. [3] Pro-Guard integration and app-signing capabilities. [4] Template-based wizards to create common android designs and components. [5] A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations. [6] Support for building android wear apps. [7] Built-in support for Google cloud platform, enabling integration with Firebase Cloud Messaging and Google App Engine. [8] Android Virtual Device to run and debug apps in the Android Studio.

Android Studio supports all the same programming languages of IntelliJ (and CLion) e.g. Java, C++, and more with extensions, such as Go; and Android Studio 3.0 or later supports Kotlin and "all Java 7 language features and a subset of Java 8 language features that vary by platform version. External projects backport some Java 9 features. While IntelliJ states that Android Studio

supports all released Java versions, and Java 12, it's not clear to what level Android Studio supports Java versions up to Java 12 (the documentation mentions partial Java 8 support). At least some new language features up to Java 12 are usable in Android.

Once an app has been compiled with Android Studio, it can be published on the [Google Play Store](#). The application has to be in line with the [Google Play Store developer content policy](#).

B. Firebase database:

Firebase is a platform developed by Google for creating [mobile](#) and [web](#) applications. It was originally an independent company founded in 2011. In 2014, Google acquired the platform and it is now their flagship offering for app development.

The platforms that are being used under the privilege of firebase are:

Firebase Authentication (FA): Firebase authentication keeps a record of registration of the app that is compact and will auto-save their credentials as such like email-id, name, phone number, passwords, etc. The registered user can login directly using their respective mail-id and their own registered passwords.

Firebase Realtime database (FRD): Realtime database that is compact at the back-end of the firebase console, where these carry out the permission tokens that the data stored in the firebase storage. Thus, it provides the token for the user to access the data that are being stored in the firebase cloud storage.

Firebase Cloud storage (FS): The firebase cloud storage platform enables the user to make use of the cloud data in consuming their respective data, wherein this makes the URLs and complete data get stored in one respective console.

C. Raspicast:

Raspicast is a piece of mobile application that is used for interfacing the mobile phone to raspberry pi for casting purpose and for wireless connectivity through enabling Secure Shell (SSH) terminal in raspberry pi.

D. Each One Teach One:

A mobile application (app) that is built using Android Studio, that makes the whole collaboration with Raspicast, Firebase Authentication, Firebase Realtime database and Firebase cloud storage at the back-end. Where this app makes the teachers or the educators to monitor the data, get registered (for the first time), login, activate the ToI view (the view that is being directed for

the stereopticon which means that the educator can view the data using stereopticon) to have the stereopticon view. Even the data can also be accessed by the educators for their references purpose too.

4.2 SYSTEM OVERVIEW

As described above, the educator must install the mobile application Each One Teach One and raspicast as a pre-requisite to have a ToI view. On installation of the whole system in a particular classroom, the educator will be all set connected with the raspberry pi with all SSH enabled, while at the time of use, the educator should just turn ON the system hardware and on getting login unto the Each One Teach One mobile application will direct the educator to make use of data that is being prescribed for their class syllabi.

Which would completely visualize the teaching topics in a visualize manner in a large screen with at most having a smart-classroom environment.

4. OUTCOME OF THE SYSTEM

The *ToI Stereopticon* is being constructed with the support of Raspberry Pi-4 and a projector. The app – *Each One Teach One* is coded and complied using Android studio with the interface as Raspicast application bundle, which enables the Built-app to interact wirelessly with the ToI Stereopticon and have a *ToI View* too.

5. CONCLUSION

Due to the development of technology, electronics have become intertwined with our daily lives. The dependence on various types of user-friendly and technologically savvy products for traditional teaching purpose; in regards to which, improving the method of traditional teaching through existing available technologies is very crucial. An instance of such a case for vast areas of improvement is the smart class environment. In many places, stereopticons have become an indispensable instrument for presentations or teaching, we will improve the traditional teaching method by applying the idea of IoT which concentrates on lowering the cost and upgrading the nature of smart class, by connecting IoT based module to it. The proposed system will substitute traditional boards and chalks with Raspberry Pi and stereopticon, which won't just drastically reduce the cost of developing IoT module for the smartclass, but also will accomplish the nature of reliability as the framework. which will

consume a little measure of energy, yet will give the at most efficient outcome and enhanced visualize learning.

6. BENEFITS OF THE SYSTEM

Time saving technology:

In contrast to the traditional learning method, where students had to make long written notes. Smart class technology allows students to make presentations online and get feedback from their teachers in less time. Same for teachers who do not need to tell students to make rough notes, as presentation can be shared directly with everyone. This saves a lot of time of teachers and students that can be used for another interactive activity too.

Increased Productivity:

Data shared with the help of intelligent class technology is presented in a visual format that is more likely to engage the students. Not only students' involvement but, they understand things more easily in minimal time. This motivates students and teachers accomplish pretty good results leading to improved productivity.

Follows Go Green Concept:

Smart classroom technology follows a dynamic information sharing approach and there is no need of paper, pen, pencil & printouts, thus stepping into ' Go Green Concept '. We can say, this is one of the major benefits of smart classroom technology to keep nature clean and green.

Interactive Learning Experience:

According to a Gallup survey, after introducing smart technology in schools & colleges, students' engagement rate has improved by 55%. The presence of smart boards helps teachers to deliver lectures more effectively by using the different projections in their presentation to explain the topic. Teachers can easily explain each and every part of the lesson with some special effects and graphic presentations. It helps to create a quick FAQ session between teachers and students that actually makes a wonderful learning environment in the classroom.

Easy Access to Online Resources:

A smart class has digital display boards and projectors that are synchronized. A teacher can easily show some practical solutions from the web. While students can see various online resources on the internet.

7. CHALLENGES OF THE SYSTEM

- [1] Highly dependent on electricity
- [2] Requires proper network connectivity such as WAN, Internet, etc.
- [3] Necessity of Darkness is must.

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