TESTING SYSTEM FOR THE BLINDS IN THE E-LEARNING ENVIRONMENTS

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ABSTRACT

In under-development countries, technology helps people with special needs to succeed and continue their educational achievement and overcome life difficulties. Distance education is one of the most important products of modern technology, which provides home-education for those who have difficulty attending traditional schools for financial, security, or health causes. Electronic tests still considered an essential obstacle to some health conditions such as the blind. In an e-learning environment, where the blinds need someone to read and answer questions. This last is difficult and embarrassing and negatively affects the result especially with female students. This research provides a developed system for electronic testing that enable blinds to work easily and flexibly without the need for assistance. The use of an automatic reading service provides control and exploring mechanisms. These mechanisms help to jump from a question to another by some special buttons on the keyboard. Our contribution focus on improving the educational attainment opportunities for blinds as well as normal people.

Keywords: Education, Smart School, Blind Student, E-Test, IoT

INTRODUCTION

Disability means people who have mental or physical disorders. Some disabilities prevent people to integrate smoothly into normal life with other people. For example, children who have disabilities, such as deafness or blindness, cannot join regular children in the same school because they need special kind of education. Meanwhile, people are living in the technological era, and new technologies make our lives easier. Therefore, many of the

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works have been presented to help disabled people or children to learn and stay at the same educational level as others (Underwood, 2019) (Wang et al., 2019).

In the past, books for blind people had to be available in bold or written letters in what is known as the Braille language. There were special printers that were expensive for such books (Senjam et al., 2019) (Datta et al., 2019). Now, the great advances in information technology, the Internet of things, cloud computing, and others have provided many possibilities, ideas, and facilities that contribute greatly to make these people's lives normal without any obstacle like place and time (Sen et al., 2018) (Basahel et al., 2019) (Yamin et al., 2019) (Fouz & Sen, 2016).

Most smartphones at present provide many applications that read what is displayed and then the user responds by touch or via voice recordings. Therefore, many search engines have given priority in their results to websites that have been developed based on a standard that takes into account people with special needs. Where these criteria focus primarily on the presence of a textual description of each item or image within the page so that the browser can read the page content for the blind person automatically by converting the text into voice (North, Norris & Chu, 2017) (Yuan et al., 2018).

Thus, such applications enabled the blind to participate in the digital revolution, social media and the digital world, as read book applications and audible news became abundant and available on most phones. Also, smart cities began to provide services and applications that enable the blind person to rely on himself to roam within the city, shopping and other daily activities without the need for an accompanying person, by relying on wireless network sensors and radio identifiers (Sen, Eassa & Jambi, 2017) (Sen et al., 2018) (Ellis & Kent, 2016).

The great development in the field of protecting the security and privacy of users and identity verification operations paved the way for applications that need electronic payment currencies. This enabled the blind person to exercise them alone and without fear of fraud or theft (Yamin & Sen, 2018) (Basahel et al., 2019) (Alrahhal et al., 2017) (Al-Rahal, Sen & Basuhil, 2016).

Evolution does not depend on software applications alone, many tools (Assistive Technology) are now available. These tools represent any device that helps solve or exceed an individual's deficit in the way of practicing an activity. Whether small devices such as road barriers, a smart bracelet for alerts, scanners for books and finally driverless cars (Yamin, Basahel & Abi Sen, 2018) (Carver et al., 2016).

Despite all of the above, education remains the most important field of all and the greatest obstacle to the blind. This obstacle needs more attention in providing special facilities and flexibility for these people in order to raise the level of educational attainment and make it similar to ordinary students. This is confirmed by an opinion poll that included 11 blind students and 30 deaf students, as the study showed that the students' grades and levels have changed with special facilities and flexibility in education (Waller, 2019) (Bahbouh, 2019).

Smart schools and e-education systems have provided solutions to many problems and difficulties for special need students to complete their academic achievement, but the final test for the blind student still requires the presence of an assistant or companion and sometimes the teacher stands next to the student during the test, which is embarrassing and affects the student's final result (Butler et al., 2018) (Sampebua & Mangiwa, 2017).

This research proposes an electronic system of tests for blinds. The blind students can achieve any test without needing help. In the following sections, we review some of the support methods and solutions in the field of education for people with special needs in general, then we will review the details of proposed system, and present some interfaces of the applied system in the results section. Finally, summary and future proposals will be presented.

PREVIOUS WORKS

With the development and over time, people are beginning to realize more and more that people with special needs can integrate into their societies through learning and work. Initially, private schools for deaf and blind students appeared (Bartlett, Weisenstein & Etscheidt, 2002). In 1986, some agencies adopted laws to protect the rights of people with special needs in education and the use of technology. In 1998, computers and the Internet began to be used on a public scale. Finally, hence, the role of assistive technology in supporting people with special needs (Jette & Field, 2007).

However, who can benefit from Assistive Technology? In general, any student can benefit from this technology. However, students who suffer from learning disability are most likely to benefit more from Assistive Technology. The disabled students have difficulty in reading, describing, answering, following directions, and managing time. They also seem inactive. In reality, they have normal or above intelligence, and they do their best to learn. In other words, Stanberry & Raskind (2009) summarize their problems as "The student's brain just processes information differently." They struggle in listening, thinking, organizing, memorizing, reading, and writing (Fong, 2014).

In the digital world, new ideas, research, and systems have emerged to provide greater support for such cases. For instance:

Fong, (2014) proposed a development for the Moodle educational system to adapt its digital content to people with special needs. The main obstacles facing blind and deaf people in accessing digital content have been identified and then providing content in more than one format (audio or visual).

Batanero et al. (2019) suggested to use an automatic reader device that helps students read papers, scientific content or test papers. Therefore, the blind students can access the information that ordinary students have.

Lazar (2019) presented an idea of a system that enables the blind to move freely by relying on the Internet of Things tools for daily activities without the need for assistance. Consequently, the blind student can reach his school alone and continue his educational attainment.

D'Atri et al. (2007) and Nahar, Jaafar & Sulaiman (2017) confirmed that in the poor countries, the blind in some special subjects such as mathematics or some higher education subjects in which the traditional Braille method does not work, research must be sought on new ways to solve this problem.

Actually, American law (ADA) states that "acceptable places" must be equipped for students with disabilities to ensure equal educational opportunities (Bualar, 2018).

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Voice-based systems allow users to access information on the Internet via an audio interface, but electronic voice-based testing systems in the answer may not constitute an adequate or accurate form of evaluation (Holt et al., 2019) (Donovan, 2017).

Also, the development in the field of research and applications that worked in the field of OCR (Optical Character Recognition) to transform the image into writing, has contributed in many useful applications such as converting the discovered writing to voice, Braille, or sign language. Special tools or screens have also emerged that can display Braille by controlling a range of Pins. In addition, smart phones and the various facilities, services and applications remove any sense of difference with those suffering from a problem (Islam, Islam & Noor, 2017) (Tang et al., 2018).

This research will use technology to solve the problem of the education sector due to its great interest, especially tests. Most schools and universities still use special assistants for people with special needs during tests or rely on oral tests, especially for the blinds, which is no longer acceptable.

THE PROPOSED SYSTEM

According to importance of the Education which is everyone's right, so the idea of this research was contributes to support one of the most important aspects of educational which is the exams and tests.

The main goal is to help people who have been deprived of the blessing of sight to make their exams without the need for any help from any person. Where, existing like this person will cause embarrassment for blind user, in addition to commotion in the place of exam.

The proposed system will enable the blind students to make their automated exams by themselves as any other student. The system has auto reader for the questions and answers, and the student can control and move between these questions by pressing the pointer of the keyboard to the right or left (Next and Previous), and same issue with answers by using Up and Down Keys.

So, student will feel free to navigate through the exam's questions as he wants without any difficulties. At the end of the exam, the student has to press on the Space Key to get the result immediately.

Sure, this system can be used by normal students in the same time, so all students will be in the same conditions without any difference. Moreover, the electronic exams are used in the most of recent universities because it provides many advantages comparing to paper exam like saving cost, time, and effort, and avoiding human error or bias, in addition to preserving the justice. Nevertheless, it still needing more focusing in the educational level.
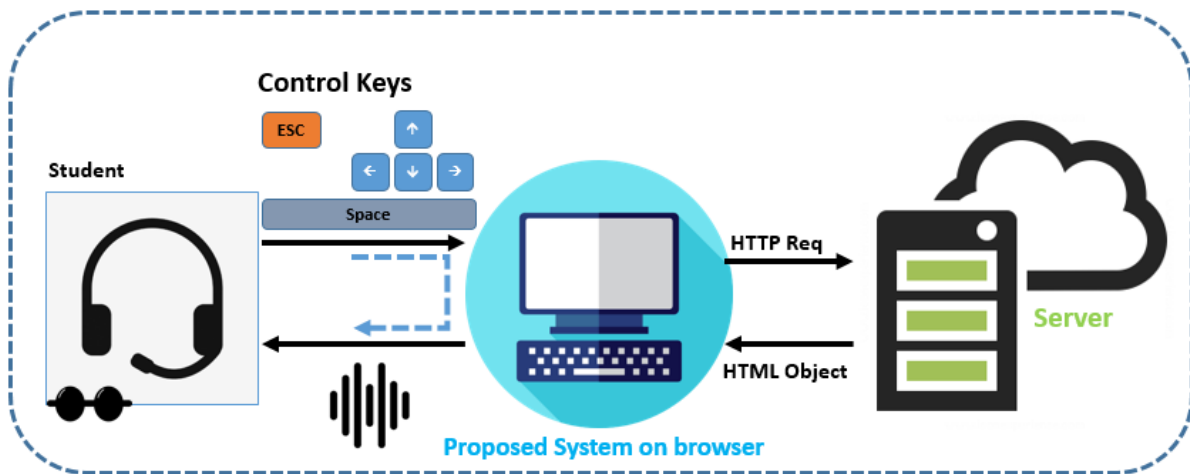
Figure 1:
Architecture of the proposed system

Figure 1 illustrates the scenario of using the proposed system, while Figure 2 shows the main keys that the blind user has to click to move and manage his exam. Where after each click or action student will hear guide message (current question, current answer, and confirm message for save or exit action).
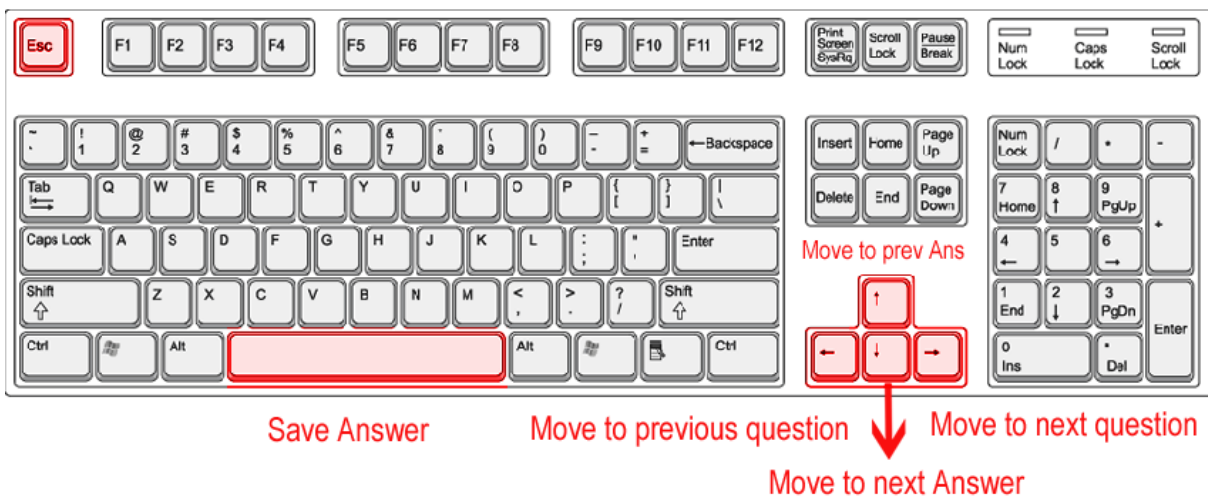

Figure 2:
Selected keys for control in the proposed system

The problems of current system;

The main issue is the needing blind person to somebody help him during the exams, which constitute many restrictions negatively impact on his education, in addition to

- **The need to repeat the question to hear more than once, causing him embarrassment with Assistant person**
- **The big hype that can occur during reading questions within the examination halls**
- **Big slowness in getting exam results in most often**
- **Bias by some supervisors during correcting the exams**
- **Human errors that may occur during the process of correction or sorting**
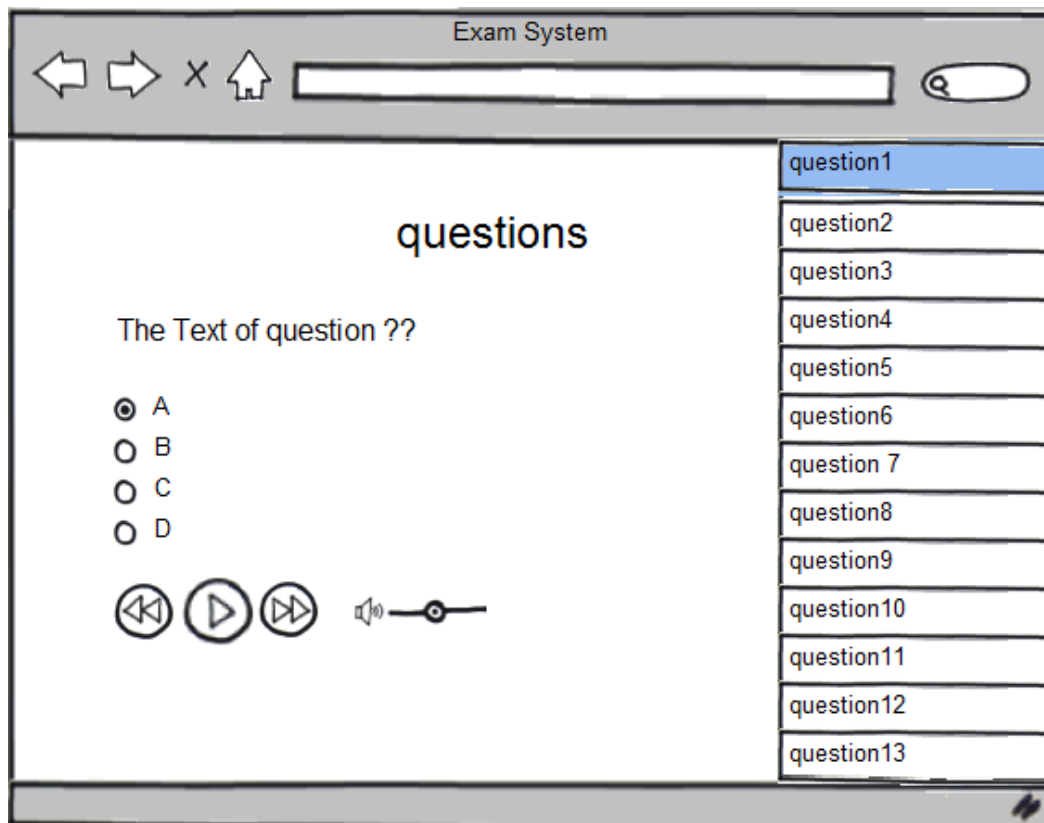
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- **Big time required managing the operations of the exams as well as the considerable effort.**

The advantages of proposed system;

Find a tool that helps the blind human to make his exams quietly and without the need for any help from anyone, and better and more efficient than traditional methods

- **Facilitate the process of repeating hear any question without the need for any help**
- **Noise Cancellation in exam halls**
- **Speed up the progress of the examinations processes in general and get results and increase effectiveness**
- **Cancel the human discrimination in the correction process**
- **Cancel human errors in the correction and sorting**
- **Saving time and effort needed to manage the examination process and use it to upgrade the education process.**

Building this system have passed through several stages starting from the collection of requirements for automated examinations system in general by reviewing few previous researches and meeting with some employees and teachers in the schools level. Then the analyzing phase for these requirements and identifying the main functions of the proposed system (Figure 3 & 4). In the design phase, virtual interfaces are proposed, and then we used ASP.NET language in Microsoft framework to investigate the whole system (Figure 5). At the end, we tested this system by real cases and students to proof the effectiveness and flexibility of it.

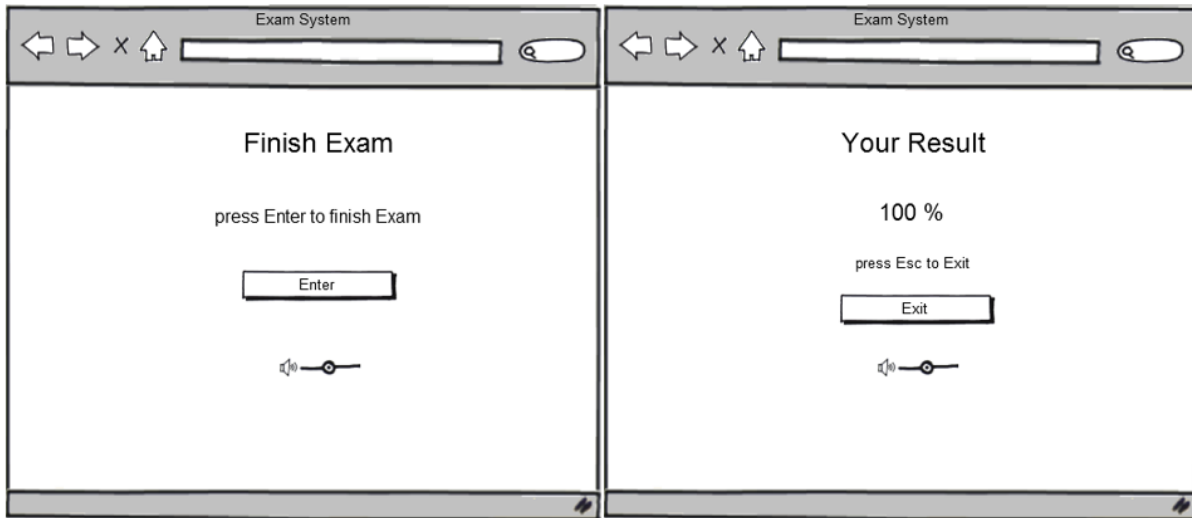
Figure 3:
Proposed exam interface

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Figure 4:
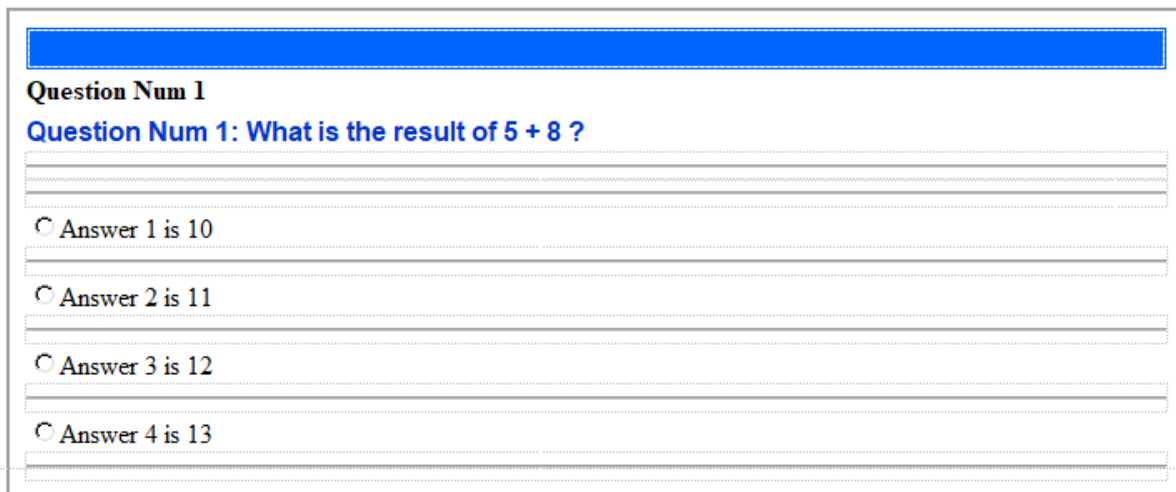**Proposed interface of finishing the exam**

Figure 5:
Real interface of the exam sheet

This system was tried out within a school for the blind, in a class of 20 students and the system was explained to them and the satisfaction rate was very high as the students were able to take the tests on their own without any assistance.

CONCLUSIONS AND FUTURE WORKS

This research proposed a new system for electronic exam which enables blind students to do their testing without need to help or assistant. The system depends on API convert text to voice in addition to the special bottom for controlling and moving between questions and choices of answers. In this stage, the proposed system supports the multi-choices exams only, however future work will enable the writing questions by depending on library for converting speech to text. Moreover, we will provide statistical metrics to evaluate each question and its multi-choices, which will level of exams and in the same time the level of

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education. It is also suggested that the future system contain a part to describe the images, and that there is also another development of the system that helps people who have problems with the upper limbs. Here we can use sound or eye gestures to control and perform the test.

REFERENCES

Al-Rahal, M. S., Sen, A. A., & Basuhil, A. A. (2016). High-level security based steganography in image and audio files. Journal of theoretical and applied information technology, 87(1), 29.

Alrahhal, M. S., Ashraf, M. U., Abesen, A., & Arif, S. (2017). AES-route server model for location based services in road networks. Int. J. Adv. Comput. Sci. Appl, 8(8), 361-368.

Bahbouh, M. N. (2019). Smart School Model for Syrian Education to Overcome Female Educational Issues. International Women Online Journal of Distance Education April 8(1), 01.

Bartlett, L. D., Weisenstein, G. R., & Etscheidt, S. L. (2002). Successful inclusion for educational leaders. Prentice Hall.

Basahel, A. M., Bahbouh, N. M., Sen, A. A. A., & Yamin, M. (2019). A Framework for Integration between E-Health Systems and New Technologies. International Journal of Human Potentials Management, 1(2), 44-55.

Basahel, A. M., Sen, A. A. A., Yamin, M., & Alqahtani, S. (2019). Bartering Method for Improving Privacy of LBS. IJCSNS, 19(2), 207.

Batanero, C., de-Marcos, L., Holvikivi, J., Hilera, J. R., & Otón, S. (2019). Effects of New Supportive Technologies for Blind and Deaf Engineering Students in Online Learning. IEEE Transactions on Education, 62(4), 270-277.

Bualar, T. (2018). Barriers to inclusive higher education in Thailand: voices of blind students. Asia Pacific Education Review, 19(4), 469-477.

Butler, M. A., Katayama, A. D., Schindling, C., & Dials, K. (2018). Assessing resilience in students who are deaf or blind: Supplementing standardized achievement testing. The Journal of Educational Research, 111(3), 352-362.

Carver, J., Ganus, A., Ivey, J. M., Plummer, T., & Eubank, A. (2016). The impact of mobility assistive technology devices on participation for individuals with disabilities. Disability and Rehabilitation: Assistive Technology, 11(6), 468-477.

D'Atri, E., Medaglia, C. M., Serbanati, A., Ceipidor, U. B., Panizzi, E., & D'Atri, A. (2007, April). A system to aid blind people in the mobility: A usability test and its results. In Second International Conference on Systems (ICONS'07) (pp. 35-35). IEEE.

Datta, P., Halder, S., Talukdar, J., & Aspland, T. (2019). Barriers and Enablers to Inclusion of University Students with Disabilities in India and Australia. In Inclusion, Equity and Access for Individuals with Disabilities (pp. 525-553). Palgrave Macmillan, Singapore.

Donovan, J. (2017). The Experiences of Autistic Women during Childbirth in the Acute Care Setting. Widener University.

Ellis, K., & Kent, M. (Eds.). (2016). Disability and social media: Global perspectives. Taylor & Francis.

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Fong, A. (2014). Becoming an efficient student using mainstream technology: resource guides for students with learning disabilities.

Fouz, F., & Sen, A. A. (2016). PERFORMANCE AND SCHEDULING OF HPC APPLICATIONS IN CLOUD. Journal of Theoretical & Applied Information Technology, 85(3).

Holt, M., Gillen, D., Nandlall, S. D., Setter, K., Thorman, P., Kane, S. A., ... & Supalo, C. (2019). Making physics courses accessible for blind students: Strategies for course administration, class meetings, and course materials. The Physics Teacher, 57(2), 94-98.

Islam, N., Islam, Z., & Noor, N. (2017). A survey on optical character recognition system. arXiv preprint arXiv:1710.05703.

Jette, A. M., & Field, M. J. (Eds.). (2007). The future of disability in America. National Academies Press.

Lazar, J. (2019). The Use of Screen Reader Accommodations by Blind Students in Standardized Testing: A Legal and Socio-Technical Framework. JL & Educ., 48, 185.

Nahar, L., Jaafar, A., & Sulaiman, R. (2017, November). Mathematics education and accessible technologies for visually impaired students in bangladesh. In International Visual Informatics Conference (pp. 592-600). Springer, Cham.

North, R., Norris, J., & Chu, F. (2017). U.S. Patent No. 9,639,682. Washington, DC: U.S. Patent and Trademark Office.

Sampebua, M., & Mangiwa, S. (2017). THE DESIGN SMART SCHOOL APPLICATION TO INCREASE EDUCATION IN JUNIOR HIGH SCHOOL. International Journal of Computer Science and Information Security (IJCSIS), 15(10).

Sen, A. A. A., Eassa, F. A., & Jambi, K. (2017, November). Preserving privacy of smart cities based on the fog computing. In International Conference on Smart Cities, Infrastructure, Technologies and Applications (pp. 185-191). Springer, Cham.

Sen, A. A. A., Eassa, F. A., Jambi, K., & Yamin, M. (2018). Preserving privacy in internet of things: a survey. International Journal of Information Technology, 10(2), 189-200.

Sen, A. A. A., Eassa, F. B., Yamin, M., & Jambi, K. (2018). Double Cache Approach with Wireless Technology for Preserving User Privacy. Wireless Communications and Mobile Computing, 2018.

Senjam, S. S., Foster, A., Bascaran, C., Vashist, P., & Gupta, V. (2019). Assistive technology for students with visual disability in schools for the blind in Delhi. Disability and Rehabilitation: Assistive Technology, 1-7.

Stanberry, K., & Raskind, M. H. (2009). Assistive technology for kids with learning disabilities: An overview. LD Online.

Tang, J., Xu, P., Nie, W., Zhang, Y., & Liu, R. (2018, October). A Review of Recent Advances in Identity Identification Technology Based on Biological Features. In CCF Conference on Big Data (pp. 178-195). Springer, Singapore.

Underwood, K. (2019). The construction of disability in our schools: Teacher and parent perspectives on the experience of labelled students. Brill Sense.

Waller, A. (2019, August). Digital Assistive Technology Education and Training. In AAATE 2019 Conference: Global Challenges in Assistive Technology: Research, Policy & Practice (p. 158). IOS Press.

Wang, K., Walker, K., Pietri, E., & Ashburn-Nardo, L. (2019). Consequences of confronting patronizing help for people with disabilities: Do target gender and disability type matter?. Journal of Social Issues, 75(3), 904-923.

Yamin, M., & Sen, A. A. A. (2018). Improving privacy and security of user data in location based services. International Journal of Ambient Computing and Intelligence (IJACI), 9(1), 19-42.

Yamin, M., Alsaawy, Y., B Alkhodre, A., Sen, A., & Ahmed, A. (2019). An Innovative Method for Preserving Privacy in Internet of Things. Sensors, 19(15), 3355.

Yamin, M., Basahel, A. M., & Abi Sen, A. A. (2018). Managing crowds with wireless and mobile technologies. Wireless Communications and Mobile Computing, 2018.

Yuan, X., Chen, Y., Zhao, Y., Long, Y., Liu, X., Chen, K., ... & Gunter, C. A. (2018). Commandersong: A systematic approach for practical adversarial voice recognition. In 27th {USENIX} Security Symposium ({USENIX} Security 18) (pp. 49-64).

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