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Accessibility-Aware Parent Controls and Wellbeing: An AI-Driven Personalized Screen Time Management Framework for Children with Disabilities

Anand Sarangam

Group Technical Manager, USA

Abstract-- As the use of smartphones and tablets grows, screen time is becoming a critical part of children's digital wellbeing. There are already some mechanisms for parents to keep tabs on how these devices are being used and set limits on screen time, but most are designed as a one-size-fits-all solution and don't take into account the wide range of accessibility needs that children with disabilities may have. Consequently, critical assistive technologies, such as screen reading software, augmentative and alternative communication (AAC) applications, text-to-speech software, educational platforms and telehealth services are unnecessarily limited, impacting education, communication, therapy and independent living. This study presents an artificial intelligence (AI) based framework to provide individualized screen time recommendations considering disability characteristics, educational needs, therapeutic schedules and individual wellbeing requirements based on accessibility considerations. It includes user profiling, disability classification, generation of recommendations based on AI, adaptive enforcement, protection of accessibility, and the management of caregivers, all in one system. A representative disability scenario is used to conceptually test the proposed framework, with an experimental research methodology employed for development. The proposed system allows for the differentiation of AT use from screen time for recreational use and introduces gradual interventions (reminders, countdowns, personalized recommendations) rather than abrupt intervention (device restrictions). It is hoped the framework will have the following impact to improve digital wellbeing, accessibility, inclusive education and caregiver decision-making. In conclusion, this study provides a new model of parental control in digital technologies, using AI to ensure that children, regardless of their disability and accessibility requirements, have access to such technologies in a balanced way, while enabling them to manage their screen time in a more personalized manner.

Keywords-- Accessibility, Parent Controls, Digital Wellbeing, Artificial Intelligence, Disability, Personalized Recommendations, Assistive Technology

I. INTRODUCTION

1.1 Background

As the number of mobile smart devices has ballooned, children have come to rely on mobile devices to facilitate learning, communication, entertainment, and interaction.

Children's screen time has gone up significantly due to increased Internet access and mobile applications. Digital technologies help in learning and development, but overuse of screen time has been associated with sleep issues, decreased physical activity, attention issues and poor mental wellbeing [1]. This has led to digital wellbeing as an important research, education, health and technology agenda. Parental control tools are tools that are already in place to help parents monitor their child's use, limit screen time, and block inappropriate content; however, they do not take into account the accessibility needs of children with disabilities.

1.2 Problem Statement

Existing parental control mechanisms use the same limits on screen time across all users and do not differentiate between necessary accessibility features and other uses of the screen. As a result, assistive technologies like screen readers, AAC applications, text-to-speech software, educational platforms and telehealth services can be unnecessarily limited. This can hurt children with disabilities relying on these technologies for communication, education, therapy and independent living [2]. Thus, there is a need for more intelligent and individualized parental control mechanisms.

1.3 Research Aim

This aims to create an AI framework that is accessible and creates personalized recommendations for screen time based on disability, educational requirements, therapy plans and wellbeing needs.

1.4 Research Objectives

- To discuss how current parental control systems can be extended.
- To discuss disability-specific digital wellbeing needs.
- To create an AI-powered personalization recommendation system.
- To create a flexible enforcement system.
- To make it more accessible and promote digital well-being.

1.5 Research Contributions

This research introduces an AI-based accessibility-aware, layered parental control model incorporating disability-specific recommendations, adaptive enforcement, accessibility protection and ethical design, that supports digital wellbeing and maintains access to vital assistive technology for children with disabilities.

II. LITERATURE REVIEW

2.1 Digital Wellbeing and Screen Time

Digital wellbeing is about the appropriate use of digital technologies that enables individuals to be physically, psychologically and socially well. Smartphones and tablets have made children even more accessible to education, communication and entertainment but have also raised awareness regarding the use of excessive recreational screens in children. Excessive screen time is associated with sleep issues, lack of physical activity, difficulty with concentration, and anxiety. Others say that it isn't about the amount of time spent on a screen, but rather why and how screen time is used and the quality of the content [3]. However, several studies have argued that there are more important considerations than total screen time, including that spending time on educational or creative activities has more benefits than sitting in front of a screen passively consuming entertainment or social media.

With increasing awareness of screen addiction, governments and health institutions have begun to push for healthier digital habits. The World Health Organization (WHO) suggests less time spent recreationally watching screens and increased physical activity, good sleep and a balanced approach to technology use. Parental control features available in the current apps enable parents to track how their kids are using the apps, set caps on the amount of screen time, and block inappropriate content. While such systems can curb overuse of the recreational applications, they are usually used in the same way for every use and do not differentiate between educational, communication and access uses [4]. This means that they offer minimal assistance to the users who use their gadgets for other purposes other than entertainment.



Fig. 1: Digital Wellbeing and Screen Time

2.2 Accessibility and Assistive Technologies

Assistive technology helps people with disabilities communicate, learn and engage in daily living activities without assistance. Unlike recreational applications, these technologies are used for vital tasks and must be accessible on an ongoing basis. Therefore, screen time for accessibility should not be equated with entertainment time. Screen reader software helps a visually impaired or visually challenged user access digital content through speech output, and text-to-speech helps people with dyslexia by providing speech output from digital content. Captioning is useful for those who are Deaf and hard of hearing, while magnification and high-contrast display options are for those with low vision.

Users with speech impairments and those who have Autism require the use of Augmentative and Alternative Communication (AAC) applications to communicate through symbols, text or synthesized speech. The use of educational accessibility technologies also contributes to inclusive education, such as using audiobooks, adaptive learning platforms, speech recognition technologies, and digital textbooks [5]. While there is a need for parental control, existing control mechanisms do not distinguish assistive technologies from entertainment technologies, and this could lead to the unnecessary limitation of assistive technologies. Thus, digital wellbeing should take into account the intent of using the device, not just screen time.

2.3 Disability-Specific Digital Needs

There are significant differences in digital wellbeing needs between disability groups, and making universal screen-time recommendations is inappropriate. Sometimes it is best to increase the number of movement breaks in a day for children with ADHD and reduce the length of the learning time. Likewise, children with autism may behave better by following routine, visual countdowns to times and/or slow changes of devices rather than quick ones. People with dyslexia often need longer to read a text and should have access to speech software, audiobooks and learning reading software. Research suggests that for those who feel anxious or depressed, reducing social media use and having free access to mental health services, meditation apps, and telehealth is the best approach. People with OCD can do better by decreasing repetitive checking of their devices rather than minimising the overall amount of device usage.

Users with intellectual disabilities and cognitive limitations need simpler interfaces, visual cues, and help from a caregiver [6]. Deaf users rely on captioning services and video communication, vision impairment users rely on screen readers, video communication, etc., and OCR applications. Similarly, people with speech impairment need to have constant access to AAC applications to communicate effectively. Recommendations made to date have placed value on accessibility technologies but are not so concerned with distinguishing educational, therapeutic, communication, and recreational activities, resulting in unequal outcomes in traditional parental control processes.

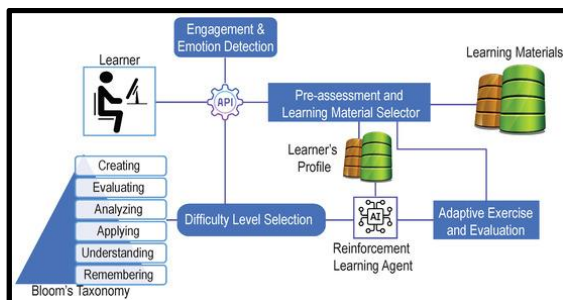


Fig. 2: Disability-Specific Digital Needs

2.4 AI for Personalized Wellbeing

The adoption of AI or Artificial Intelligence has gained huge significance in Personalized Digital Wellbeing, involving machine learning, user modelling, and intelligent recommendation systems. The role of AI or Artificial Intelligence has been growing significantly in relation to Personalized Digital Wellbeing using machine learning, user modelling, and intelligent recommender systems [7].

Through machine-learning algorithms, application usage, session length, and patterns in app usage are analysed to determine whether they are healthy or unhealthy. The user modelling techniques involve building user models based on a set of information: age, disability characteristics, education activity, daily activity, and preferences.

With the help of behaviour prediction models, AI systems can detect excessive entertainment consumption, sleep disturbances, or diminished educational achievement and then provide the right steps that can be taken. In addition to offering general guidelines on how long to spend on screen, how often to move, when to go to bed and what to do, application-specific recommendations might also be sent based on user-specific behaviour, rather than rules or blacklists. Reinforcement learning additionally enhances personalization by improving the recommendations continually as users interact with them, and adaptive interfaces adjust the notifications and modes of interaction based on accessibility needs [8]. Despite AI showing great promise for understanding and promoting digital wellbeing and healthcare, there is much fragmentation concerning research. However, for the most part, there is a focus on decreasing screen time or creating assistive tech for accessibility. There have been few studies that combine the use of AI tools, disability-specific access needs, and parental control systems in the same smart system.

2.5 Literature Review Gap

The literature surveyed shows considerable advances in digital wellbeing and accessibility technologies, together with personalization using AI tools. The body of existing research has identified the value of healthy screen use and assistive technologies to people with disabilities. Current parent controls do not frequently account for a child's need for access, and there are few systems regarding accessibility-aware recommendation engines for screen-enabled parental controls and little research into accessibility-aware personalization for parent controls. The identified research gaps are instrumental in the development of the proposed accessibility-aware Artificial Intelligence framework, focusing on inclusive and accessible technology use while also attempting to safeguard digital wellbeing through personalized recommendations and adaptive enforcement.

III. METHODOLOGY

The study has used an experimental research style to create an accessibility-aware artificial intelligence (AI) framework for personalized controls and digital wellbeing for parents. The proposed system would allow for individual recommendations for each user, using disability characteristics, education needs, therapy plans and

accessibility as data inputs for the recommendation process compared to the previously proposed systems for parental control, which applied the same screen-time limits for everyone. These are the elements that are included in the methodology: requirement analysis, framework design, generation of AI recommendations, adaptive enforcement, accessibility protection and ethical considerations.

3.1 Research Design

The development and evaluation of a conceptual framework of parental control within the framework of artificial intelligence are realized by employing an experimental research design [9]. The prototype combines a user database, disability consideration, adaptive solutions and protection of access into a single system. An example of disability scenario is represented for illustration and to show that necessary services for disabled people are still able to be accessed whilst play is managed.

3.2 Requirement Analysis

Available parenting control systems and disability support literature, and information generated from accessibility guidelines and the World Health Organization (WHO) recommendations are used to identify the system requirements. Accessibility standards define assistive technologies as tools like screen readers, AAC applications, text-to-speech software, captioning and magnification tools. Current screen-time control mechanisms include guidance from WHO on healthy screen-time use, which includes guidelines, and parental control mechanisms that include monitoring and reporting. Literature sources provide information about the needs of users of each disability type, such as disability in the area of attention deficits (attention-deficit/hyperactivity disorder, Autism, dyslexia, visual disabilities, hearing disabilities, speech disabilities, anxiety and depression, OCD, intellectual disabilities, and cognitive disabilities.

3.3 System Architecture

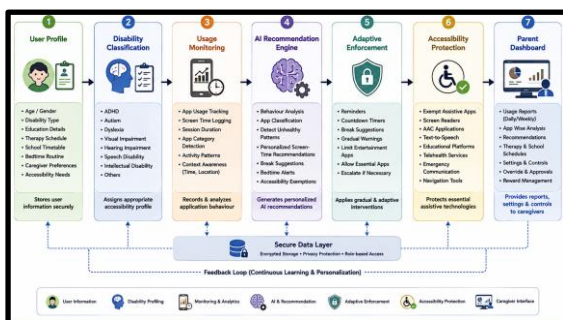


Fig. 3: System Architecture of the Proposed Accessibility-Aware AI-Based Parental Control Framework

User information is kept in the User Profile and Disability Classification to allocate suitable profiles of accessibility. The AI Recommendation Engine provides personalized recommendations, while Usage Monitoring tracks application usage [10]. The combinations of steps are implemented through Adaptive Enforcement; the availability of Assistive Technology is maintained through Accessibility Protection, and the Parent Dashboard has been given reports, settings and caregiver controls.

3.4 AI Recommendation Engine

The AI recommendation system is based on factors such as disability type, age, screen usage, therapy schedules, educational application usage, bedtime routines, and caregivers' preferences. There are several kinds of applications: education, accessibility, communication, healthcare and entertainment; these applications are categorized behaviourally before applying the personalization. These encompass a screen time cap, alerts, screen breaks, bedtime reminders and “exemptions” where they are appropriate depending on the individual user's needs – not daily limits.

3.5 Adaptive Enforcement

The framework contains progressive interventions, rather than making a snap decision to lock applications. The AI have been reminded, warned, and provided with visual countdowns before suggesting breaks. If excessive use is still being conducted, only entertainment applications are temporarily restricted, but accessibility applications are always possible [11]. This strategy can be used to develop healthier digital routines without interfering with instruction and/or therapy.

3.6 Accessibility Protection Module

The framework is an exception to screen-time restrictions for assistive technologies that are essential to a school's operations. They include screen-reading software, navigation solutions, telehealth, educational programs, emergency communications, and AAC software. The system differentiates tools that are used for accessibility from recreational applications which support those who require communication, education, health and independent living.

3.7 Ethical Framework

The framework has elements of privacy, informed consent, information protection, fairness, transparency, and control. Information about users is protected and recommendations are not based on disability labels, but on the behaviour of users. Also, caregivers have control over recommendations via configurable settings and override permissions [12].

These principles contribute to the responsible use of AI, maintain accessibility, autonomy and trust of both users and the system.

IV. SYSTEM DESIGN

AI can be part of the accessibility-aware parental control regime by users generating their profiles, recommended suggestions for people with disabilities are possible, adaptive interventions, and protecting accessibility. The framework includes children's access to education and assistive technology and is intentionally designed to ensure these services continue to be accessible for children while supporting a healthy approach to screen time, unlike traditional parental control systems.

4.1 Overall Framework Diagram

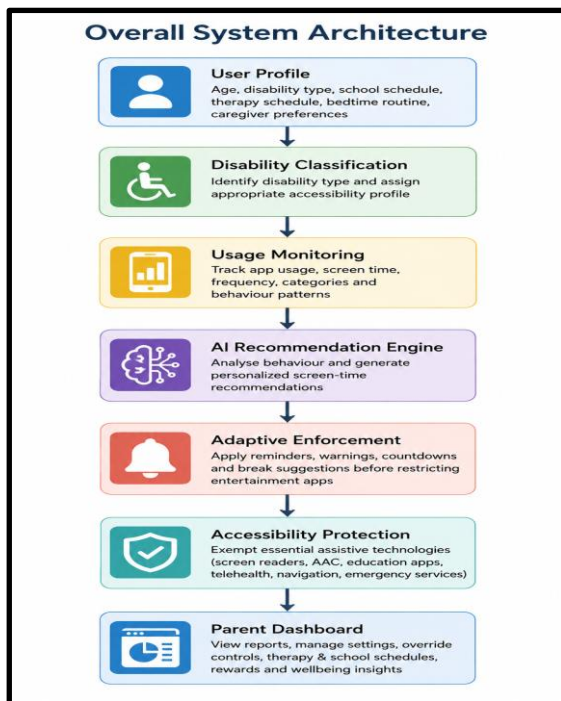


Fig. 4: Overall Framework Diagram

Age, type of disability, therapy schedule, school timetable, bedtime schedule and preferences of caregivers are saved in the User Profile. The suitable accessibility profile for an application is set in Disability Classification, and application use and behaviour are tracked in Usage Monitoring [13].

The AIR provides customized suggestions, the Adaptive Enforcement program gradually implements interventions, the Accessibility Protection maintains important assistive tech, and the Parent Dashboard offers reports and caregiver controls.

4.2 Disability-Aware Profiles

The Focus Mode in ADHD seems to be more about shorter study times with frequent movement breaks that can occur no less than every twenty minutes. Autism Routine Mode gives visual countdowns and predictable transitions prior to the end of sessions. In Dyslexia Learning Mode, the reading applications, audiobooks, and text-to-speech software can be used completely free of restrictions. Low Vision Mode is a mode that removes restrictions on screen readers, magnification tools, OCR applications and navigation software [14]. The Anxiety Balance Mode restricts access to social media sites in the evening and increases access to mental health and telehealth applications. Profiles can be derived for impairment in hearing function, speech function, intellectual function, cognition, depression and OCD.

4.3 Recommendation Workflow

The first step in the workflow is to collect user data such as types of disabilities, age, screen time, educational activities, time for therapy, and sleep habits. AI evaluates behaviour to classify application types, recognise unhealthy usage patterns and make tailored recommendations before starting on adaptive interventions.

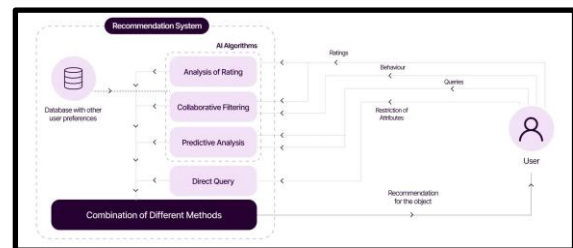


Fig. 5: AI-Based Personalized Recommendation Workflow

4.4 Adaptive Intervention Strategy

The framework is a step-by-step approach to locking applications. Firstly, a user is given reminders and countdown timers and then break suggestions are provided [15]. Where excessive use of the item has occurred, it has only been temporarily reduced so that it can only be used for entertainment, but not for the purposes of access.

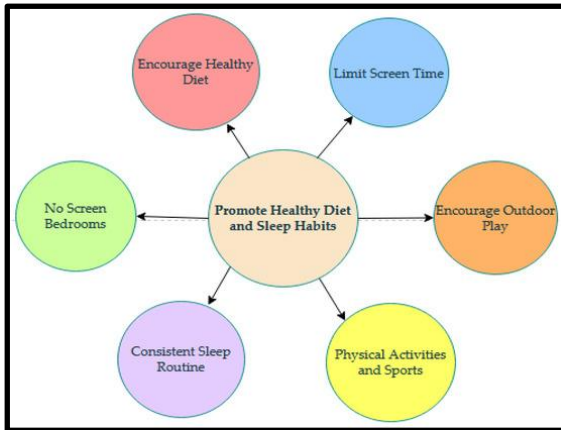


Fig. 6: Adaptive Enforcement Process for Screen-Time Management

4.5 Parent Dashboard

With the Parent Dashboard, parents can check children's digital wellbeing and set accessibility settings for them. It offers reports for the day and the week to be broken down into reports by education, entertainment, communication, healthcare and accessibility usage. With override controls as needed, parents can view therapy schedules, school times, bedtimes and AI suggestions [16]. The dashboard has a healthy digital habits framework which aims to encourage healthy digital habits by making it fun, such as more playtime or the presentation of achievement badges for meeting suggested screen-time guidelines.

V. RESULTS AND DISCUSSION

The proposed framework is not an actual application but a concept-oriented, AI-based framework, and its effectiveness is illustrated using exemplary disability scenarios. These examples show that personalized recommendations offer improved accessibility and digital wellbeing support over traditional parental control systems.

5.1 ADHD Example

The default parental control that generally includes devices with a fixed screen time limit does not take into account the context of a child's usage. Applications have been "locked" once the limit is reached, even if the child is doing some studying or communication. The suggested version of ADHD Focus Mode, on the other hand, suggests a 25-minute instructional period followed by a 5-minute moving period [17]. The game mode is available for educational use and has been limited with custom controls in gaming and social media. It can develop healthier habits of study and better concentration through gradual reminders.

5.2 Autism Example

Predictable and structured routines and transitions can help children with autism. Traditional parental controls can give instant access denial of app usage, which can be frustrating. The new Autism Routine Mode features visual countdown timers, transitions are reminded up to seven steps in advance, and there are options to extend sessions as preferred. Features that help ease anxieties and promote transitions between activities.

5.3 Dyslexia Example

Children with dyslexia typically need more reading time than other children. The proposed Dyslexia Learning Mode would give users of reading-related apps, text-to-speech, audiobooks and educational providers unfettered access to reading software and would leave recreational entertainment programs alone [18]. This way, the students can learn without becoming too exposed to TV time.

5.4 Vision Impairment User Example

Children with dyslexia typically need more reading time than other children. The proposed Dyslexia Learning Mode would give users of reading-related apps, text-to-speech, audiobooks and educational providers unfettered access to reading software and would leave recreational entertainment programs alone. This way, the students can learn without becoming too exposed to TV time.

5.5 AI Recommendation Examples

It has an AI tool that constantly studies user behaviour and creates customized prompts. Example recommendations include:

- Could be a problem with sleep (late-night gaming – consider stopping 30 minutes before bed).
- Using it for education got more this week; continue the well-rounded study practices.
- A goal is scored for activities outside; 20 minutes of fun is gained.
- Communication applications are not to be restricted since they facilitate accessibility.
- The regular screen breaks and movement have helped with a better day-to-day balance of screen time.

These recommendations have provided positive learning behaviours and support adjustment to individual access needs [19].

5.6 Comparative Discussion

The proposed framework is more personalized and easier to access than the traditional parental control systems.

Rather than suggesting the same amount of screen time, it takes into account disability characteristics, educational requirements, therapy timings, and behavioural patterns when providing recommendations of screen time. Management of education, healthcare, communication, accessibility and entertainment purposes and effects goes on separately to ensure that essential assistive technologies continue to be available [20]. Offering a supportive and inclusive approach, AI-powered recommendations, adaptive interventions, caregiver controls, and accessibility exemptions help to balance responsible digital wellbeing with delivering a great user experience.

VI. CONCLUSION

This study aims to develop an AI-based machine learning (ML) mechanism for designing tailored and individualized parental controls and digital wellbeing while being more accessible. The proposed framework takes some responsibility for both parent and child to raise account holders to do so, while offering an option where screen-time recommendations take disability characteristics, educational needs, therapy schedules and accessibility needs into consideration and develop recommendations that take these factors into account. This framework combines disability profiles, AI-driven generation of recommendations, adaptive enforcement, accessibility protection, and caregiver management in one comprehensive solution to encourage healthy and inclusive online experiences. A new framework for parental control of assistive technology designed to differentiate between “required” use of assistive technology and “freeware” use of screens as a form of recreation is the most significant finding of this work. The proposed system would allow using the accessibility services to communicate, to study, to receive educational information, information necessary for healthcare, to live without restrictions and still would not strive to make the use of digital tools passive, but would promote balanced digital habits. The intervention strategy adapts further to enhance user experience by avoiding sudden application locking with reminders, countdowns, break cues and a progressive restriction of entertainment.

However, there are some limitations of the study. This proposed framework has not yet been worked out in all aspects, and has not yet been applied or tested in the field. The actual behavioural data sets have not been used in the design of the AI recommendation engine, and user acceptance has not been confirmed with children, carers and health professionals. Moreover, disability needs vary from person to person and need to be customized and continually improved.

The dietary guidelines should be extended to create a complete mobile app and tested in real-world settings with varied groups of users. Further improvements may include adding cross-platform capability for different operating systems, clinical testing with health care practitioners, cross-platform deployment, continuous monitoring for real-time behaviour prediction, or the integration of large language models (LLMs) for intelligent caregiver support. These advancements could enhance the functionality, reliability and usability of these accessibility-aware digital wellbeing systems.

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