Online Parent Monitoring Tool

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There are many dangers for children, aged between 6 and 13, who are using the Internet. They can be exposed to age-inappropriate or hateful content. They can have their privacy violated by websites that track them or collect their data. Excessive use may lead to negative physical changes, sleep troubles and the development of addiction. To prevent this effect, parents may choose to use parental monitoring applications, monitoring their children's activities and protecting them from such dangers. However, there are many features (filtering websites, monitoring calls, messages and social media), that are desired by parents but not implemented in free popular applications (Google Family link, Kids Place Parental Controls and Parental Control - Screen Time Location Tracker). This project aims to analyze these free applications and other paid applications (Norton Family Parental Control, MMGuardian, Qustodio, FamiSafe), gather the requirements of parents by conducting quantitative research and develop an Android application for the mobile phone of the child and a web interface for the parent to use.

Additional Key Words and Phrases: Parental monitoring applications, Child online protection

1 Introduction

Modern children and teenagers spend quite a large portion of their time studying and relaxing online. Children can play games, watch funny videos and chat with their friends[1]. For parents who have children that spend so much time online, it is essential to have a safe environment, in which privacy is respected, age-appropriate content is shown and safety from people with malicious intent is provided[2]. Children can be harmed by having their personal data and pictures shared on the Internet[3]. Children can be victims of cyberbullying, an experience in which the involvement of the parent is crucial in order to prevent other negative effects[4]. Their privacy can be violated by data collection, bullying may occur, misuse of information and even worse actions to be taken against them[3]. While laws such as Children's Online Privacy Protection Act (COPPA)[5] and General Data Protection Regulation (GDPR)[6] protect the privacy of children, websites rarely comply to the fullest extent[7].

When it comes to monitoring the behaviour of the child, many parents adopt a restrictive approach[1], prohibiting websites that may cause harm to the child and limiting screen time to avoid developing sleeping[1] and physical[8] problems, being exposed to violence[8], addiction and antisocial behaviour[8][9]. Parents take many factors into account when choosing which applications their children can use. Privacy is the most important factor along with parental permissions being required for tasks such as shopping and age-appropriate content is shown[1]. Many parents have also shared that they want to be able to view their children's chat history and would want to know how their children's data is being used [3]. Many of them, however, do not know how to modify their child's devices, in order to have explicit content hidden and even experience peer pressure to create social media accounts for their children, possibly putting the children at risk[3]. Parents also tend to judge the safety of an application based on its popularity rather than user reviews, putting them in even more danger[3].

There are many applications that try to address these problems. The most downloaded and reviewed applications in the Google Play Store, when it comes to parental control, are Google Family Link [10], Kids Place Parental Controls [11], Norton Family Parental Control [12], Qustodio [13], Parental Control - Screen Time & Location Tracker [14] and FamiSafe[15]. All of these applications can view and control application activity, allowing the parents to see how long have their children used different applications. These parental control applications also grant the ability to limit and even block screen time spent on a specific application [10–15]. Google Family Link and Kids Place Parental Controls also require permission from the parent for an application to be installed [10, 11]. FamiSafe[15] is considered to be the best application for parental monitoring[16] with all the features a parent might need: viewing and managing application activity, limiting screen time, very strong and customizable web filtering, social media and messaging monitoring, detecting if suspicious pictures have been taken and if inappropriate texts have been received or sent.

2 Problem Statement

Despite many applications existing to aid parents with looking after their children, there exist many limitations in the applications mentioned above. To start with, almost all applications that were given as an example cost money. Google Family Link is a free application but has limited features - no control over which websites are used, no way to monitor what messages are being sent and received [10](See Fig. 1). Age-inappropriate content is not hidden [17]. The application is only enforced if the child is under 13 [17]. After they become 13, they have the option to manage their account by themselves. While this is unsatisfactory for parents who want to protect their teenage children, Google Play Store reviews show that there are many parents experiencing bugs and are overall dissatisfied with the lack of functionality [10]. Kids Place Parental Controls has similar limitations that are addressed in the premium version of the application [18] (See Fig. 1). Norton Family Parental Control and MMGuardian Parental Control[19] are paid applications (See Fig. 1) and have poor user interface design and performance issues [12, 19]. These applications also have limited message monitoring. Calls and SMS can be viewed but there is no way to see what is being sent on messaging applications such as WhatsApp[20]. However, FamiSafe [15] does address all these problems and provides even more useful

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features. The downside of this application is that it costs 60 Euros yearly[21] (See Fig. 1).

According to [22], it is important to have discussions between the parent and the child regarding what should be monitored and restricted. It is crucial for children to be taught to cope with risky situations and have possible solutions proposed to them such as blocking contacts or taking a break. While risk coping is a very discussed feature, most applications are focused on alerting the parents instead of first showing the child how to approach the given problem and possibly avoid it [22].

The aim of this research project is to analyze the above-mentioned parent monitoring applications, identify key features and discover what features are missing. Using these findings, a free application was developed with the needed features with a user-friendly interface. To ensure that the application satisfies the requirements, reviews from parents were gathered. These tasks can be split into the following research questions:

RQ1. What features do parents see as required from a parental monitoring application, such as blocking age-inappropriate content , limiting screen time and approval of application installation?

RQ2. What features do parents think are missing or need to be improved upon in the application they use to monitor their children, such as controlling the browser access or the ability to view text messages?

RQ3. How can an application be developed that addresses the previous research questions and allow for parents to monitor and protect their children?

3 Related Work

When analyzing feedback of certain parental monitor applications, [23] found out that the majority of parents have issues regarding the cost, performance and ease of use. Meanwhile, teenagers have issues with how their autonomy was harmed by the limitations imposed by their parents, echoing the same concerns also mentioned in [22]. This research, however, does not identify the key features present in the existing applications and does not list any features that need to be added.

Research has been done on how some parental control applications approach safety and privacy[24]. This very exhaustive research analyzes the features of parental control applications and the privacy risks they pose. Two of the applications mentioned above, MMGuardian and Norton Family, are present in this research. The paper[24] shows that Norton Family does not encrypt the information upon website visit, which poses a great privacy threat. MMGuardian also does not encrypt some information which is sent, posing a great privacy threat as well. This research shows some features that are required for having a safe application such as encrypting all data, informing the user of their privacy policy, not causing information leakage and not sending sensitive information to a third-party server.

Regarding the development of the application, [25] proposes steps and proposed features for developing an Android monitoring application. Useful technical details are shown which were taken into account when implementing features such as monitoring calls and browser history.

One of the previously mentioned features, that is not present in the existing applications, is protecting children from websites that may not be adhering to the COPPA requirements. POCKET (Parental Online Consent for Kid's Electronic Transactions)[26], is a tool developed to protect children's online privacy. The tool has many important features: automating parents' consent and setting preferences for collected data, the possibility to review what data has been sent to the website and providing the option to verify a website's privacy practice. When developing the application, the information about how POCKET was developed may be useful.

Another one of the previously discussed features is monitoring the child's messaging application in order to prevent cyberbullying. SafeChat[27] takes a more preventative approach, censoring harmful words while also being secure. The paper[27], provides a detailed methodology of how the achieve censoring and security, which was taken into account when working on the project.

4 Methodology

RQ1, RQ2 The initial approach to solving the first two research questions involved contacting schools in Enschede and sending surveys to the parents. The surveys would gather data about their opinion on the dangers of the Internet and important and missing features among the most used parental monitoring applications in the Google Play Store. Unfortunately, an underwhelming amount of people responded, meaning that the data needed to be gathered from other sources. These two research questions are answered by analyzing the Google Play Store reviews for each application. The newest 100 reviews were picked for each application in order to get an understanding of the opinions of the newest version.

RQ3 Using that data, an application was developed with the aim of addressing the missing features parents have identified, directly addressing Research Question 3. Due to time constraints and knowledge gaps in mobile development, the boundaries of the project were quite limiting. These limitations also restricted the number of features that could have been implemented.

4.1 Analysis of Existing Solutions

The top five applications with the highest amount of downloads and comments were selected for analysis of their features (See Table 1) and reviews, as seen in Table 3 and Table 4.

Requested features from popular applications:

- 4 requested from Qustodio a better grouping of texts and messages
- 1 requested from Qustodio that sent pictures inside chats should also be shown
- 1 requested from Google Family Link to add monitoring calls

Table 1. Present, Paid and Missing Features in Parental Monitoring Applications

Name	Price	Monitor Screen Time	Control Screen Time	View Browser History	Web Filters	Monitor and Control Calls and SMS	View Messages and Social Media
Google Family Link [10]	Free [10]	Free	Free	Missing	Free	Missing	Missing
Kids Place Parental Controls [11]	$4.99/month [18]	Free	Free	Paid	Paid	Missing	Missing
Norton Family Parental Control [12]	€39,99/year [28]	Paid	Paid	Paid	Paid	Missing	Missing
Qustodio [13]	€42.95/month [29]	Paid	Paid	Paid	Paid	Paid	Paid
Parental Control - Screen Time & Location Tracker [14]	$6.99/month [30]	Free	Paid	Free	Paid	Missing	Missing
FamiSafe [15]	$10.99/month [21]	Paid	Paid	Paid	Paid	Missing	Missing
MMGuardian [19]	$7.99/month [31]	Paid	Paid	Missing	Paid	Paid	Paid

Table 2. Color coding for the Pie Charts of Table 3 and 4

Green ● - Positive Review	**Red** ● - Negative Review	**Blue** ● - Feature Request

Table 3. Analysis of Existing Applications

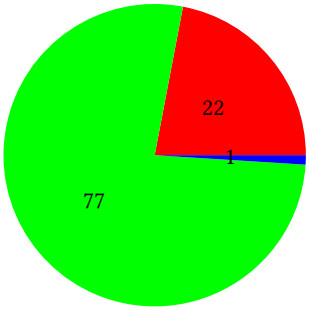
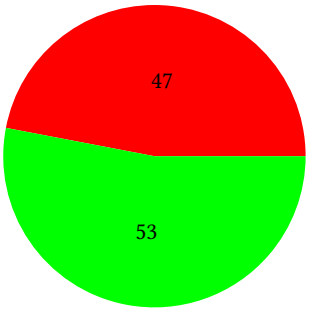
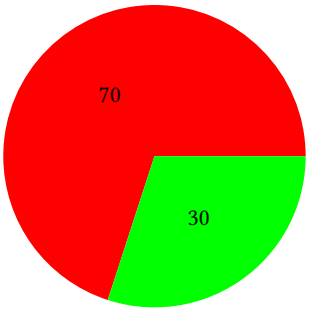
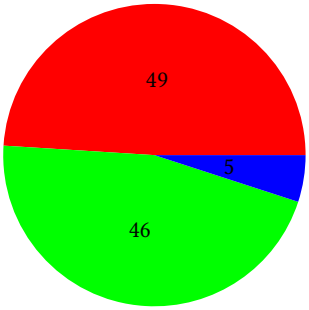
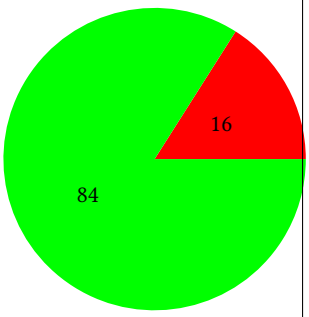
Features	Reviews Graph	Positive Reviews	Negative Reviews
Google Family Link [10] • Completely free • Great Design • Location tracking • Control and Monitor Screen Time per Application • Setting schedules for when the mobile phone can be used • Web Filters (no categories)		**Amount: 77** • 47 were generally positive • 14 liked the restrictive features • 9 liked the monitoring feature • 3 liked the design • 2 liked the web filters • 2 liked the location feature	**Amount: 22** • 11 experienced a lot of malfunctions • 6 were generally negative • 2 experienced a lot of malfunctions while using the location feature • 2 did not like the design • 1 complained about the lack of features
Kids Place Parental Controls [11] • YouTube Safe Search (free) • Monitor Screen Time per Application (free) • Child Lock (free) • Control Application usage ($2.99/month) • Web Filtering ($4.99/month) • Location tracking ($4.99/month) • Web Site Access Reports ($4.99/month)		**Amount: 53** • 33 were generally positive • 15 liked the restrictive features • 3 liked the design • 2 liked the web filters	**Amount: 47** • 16 experienced a lot of malfunctions • 9 complained about the design • 6 were generally negative • 6 experienced a lot of malfunctions while using the restrictive features • 5 complained about the price • 5 complained how easy it is to bypass

Table 4. Analysis of Existing Applications

Features	Reviews Graph	Positive Reviews	Negative Reviews
Norton Family [12] • Location and Geo-fencing (setting perimeters for the child and alert the parent when they go outside of them) • Monitor and Control Screen Time per Application • School Mode (allow only a set of applications and websites to be used for during a specified time) • Varying Web Filters • Location tracking • Monitor Web History and Searches		**Amount: 30** • 21 were generally positive • 3 liked the restrictive features • 2 liked the monitoring features • 2 liked the web filters • 1 liked the location feature • 1 liked the design	**Amount: 70** • 22 experienced a lot of malfunctions • 20 were generally negative • 9 experienced a lot of malfunctions while using the restrictive features • 8 complained about the design • 4 complained about how hard it is to configure • 4 complained how easy it is to bypass • 3 experienced a lot of malfunctions while using the location features
Qustodio [13] • Filtering Content and Apps • Monitor Activity • Setting Time Limits • Track Calls and SMS • Location tracking • Alerts for dangerous activities • Monitor Messages (WhatsApp, Messenger)		**Amount: 46** • 32 were generally positive • 8 liked the restrictive features • 3 liked the design • 2 liked the monitoring features • 1 liked the location feature	**Amount: 49** • 11 experienced a lot of malfunctions while using the restrictive features • 11 complained about the price • 8 were generally negative • 7 complained how easy it is to bypass • 4 experienced a lot of malfunctions • 4 complained about how hard it is to configure • 4 experienced a lot of malfunctions while using the monitoring features
FamiSafe [15] • Real Time Location, Location History and Geo-Fencing • Monitor Activity • Screen Time Control and App Blocker • Varying Web Filters • Monitor Browser History • Monitor YouTube • Block YouTube channels • Monitor Social Media for Suspicious Texts • Monitor the Gallery on the Child's phone for nude images		**Amount: 84** • 24 liked the monitoring features • 22 liked the location feature • 15 were generally positive • 14 liked the restrictive features • 5 liked the design • 2 liked the restrictive YouTube features • 2 liked the web filters	**Amount: 16** • 7 complained about the price • 4 were generally negative • 2 experienced a lot of malfunctions • 3 complained about how hard it is to configure

Applications that were not included on the analysis were Parental Control - Screen Time & Location Tracker [14] and MMGuardian [19]. Parental Control - Screen Time & Location Tracker [14] does not have any useful feedback. The majority of the reviews complain about how the application does not work well on iOS or about the price. The application does not have features that were not discussed before and are mentioned for the sake of analyzing as many as possible parental monitoring applications. MMGuardian [19] could not be found on the Google Play Store, making it impossible to know the parents' perspective. The reason it is included is that it has features that many other applications do not have such as message reporting, inappropriate image alerts and safety warnings for sexting, cyberbullying or suicide online activities.

5 Results

5.1 Research Question 1

Considering the analysis of the 500 reviews in Table 3 and Table 4, a feature can be seen as more valuable by parents if the feature is discussed more regularly. If the features are compared in that manner, it can be concluded the parents want the following features:

1. Restrictive features - control the usage of an application by blocking, assigning a schedule or block a category such as games or social media (80 total - 54 positive, 26 negative).
2. Monitoring behaviour - monitor screen time per application (41 total - 37 positive, 4 negative).
3. Location features - locating, Geo-Fencing and location history (34 total - 26 positive, 5 negative).
4. Web Filters with varying categories such as gambling, pornography, social media, etc. (8 total - 8 positive, 0 negative).
5. Messages Monitoring such as WhatsApp, Messenger, etc (5 total - 5 feature requests)
6. Blocking YouTube channels (total 2 - 2 positive, 0 negative).
7. Monitoring calls and SMS (total 1- 1 feature request).

5.2 Research Question 2

Taking into account the answer of Research Question 1 and the analysis in Table 3 and Table 4, it can be concluded that the following features need improvements or need to be included (based on the amount of negative reviews for a given feature divided by the total amount of times the features is mentioned. Some of the features in the list are present because they were requested by other parents. In that case, they will be compared by the number of times they were mentioned.

1. Restrictive Features (32.5%, or 26 out of 80)
2. Location (19.2%, or 5 out of 26)
3. Monitoring Messages (5 feature requests)
4. Monitoring Activity (9.8%, or 4 out of 41)
5. Monitoring Calls and SMS (1 feature request)

Besides the improvement of features, negative reviews have also indicated other requirements:

1. Good performance and no malfunctions (55 negative reviews)
2. Affordable Price (23 negative reviews)
3. Good Design (19 negative reviews)
4. Hard to bypass (16 negative reviews)
5. East to configure (11 negative reviews)

6 Developed Solution

After concluding what features need to be improved or implemented from the results of Research Question 2, it can be seen that one of the missing features for free applications is monitoring calls and SMS and possibly blocking contacts. While this feature is discussed the least, it is one of the thee features that does not have a free alternative alongside viewing browser history and viewing chat messages (See Table 1). When developing the web and Android application for Research Question 3, there was an attempt to develop all of these three features but only the monitoring calls, SMS and contacts was implemented. This section discusses how an Android application was developed for the mobile device of the child and how a web application was developed to allow the parent to monitor the calls, contacts and SMS.

6.1 Android Application for the child

The android application for the child collects the calls and SMS and sends them to a Firebase Realtime database. The application was developed using Android Studio and Java. The application has no user interface since its primary idea of it is to collect data and upload it. In order to use the application, it needs the following permissions: Calls Logs, Contacts, SMS and Phone. Blocking phone numbers could not be done since many of the solutions were deprecated or required the application to become the default phone application. When using the application for the first time, the parent needs to authenticate themselves with their Google account, and use the same account to log in to the Web Application that they are using.

6.2 Web Application for the Parent

A web application was developed to allow the parent to monitor and restrict the child with the JavaScript framework Svelte and the CSS library Tailwind. When first visiting the website, the parent needs to authenticate themselves with their Google account in order to gain access to collected data. The Firebase Realtime Database rules only allow for the same account to read and write data, preventing outside accounts from accessing or modifying any data that does not belong to them. Because of the lack of time to develop the application, the data could not be encrypted on Firebase. Using Firebase is also compliant with GDPR [32].

The web application has two tabs - one for calls and one for contacts/SMS. The Call tab (See Fig. 1) has statistics for the calls of the month and the list of all the calls. Each call shows the name of the contact, the number of the caller, and the duration and data of the call. It also has the type of calls: REJECTED, INCOMING, OUTGOING, MISSED.

Fig. 1. Web Application Calls Page

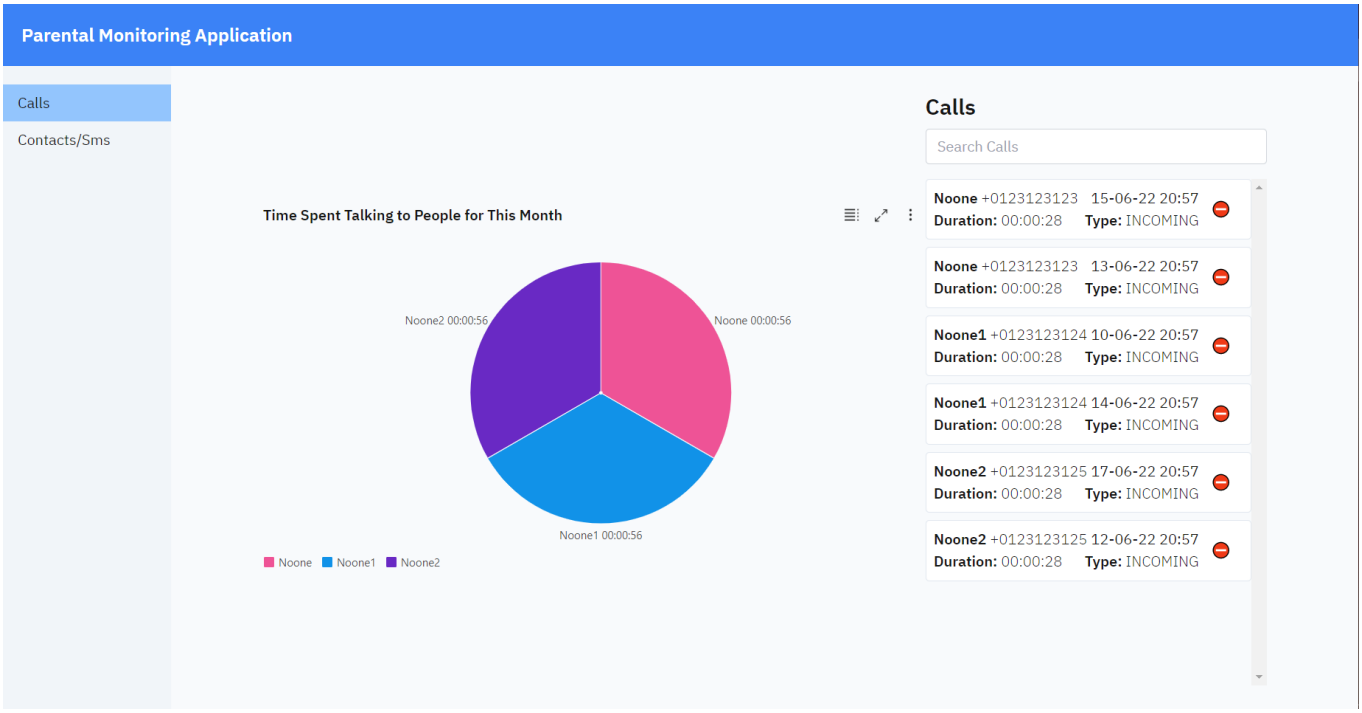
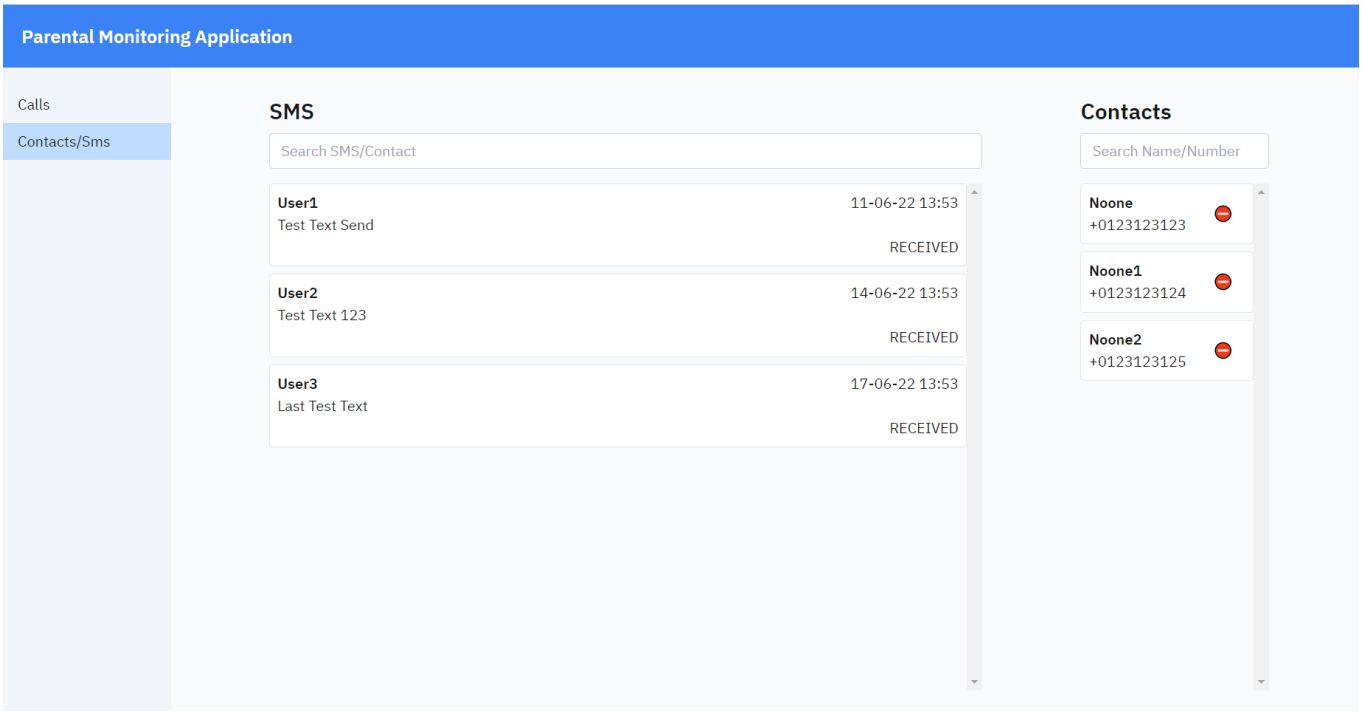


Fig. 2. Web Application Contacts/SMS Page



Calls can also be searched by the name and number of the caller. There is a button on the right side of each call, allowing the parent to block the number of a given caller. Unfortunately, the blocking feature could not be developed on the Android application. The tab also has a pie chart with the duration of the calls of the month. This is be useful for parents who want to know how much their child talks on the phone per person.

The Contacts/SMS (See Fig. 2) shows a list of SMS and Contacts of the possibility to search them. The block button also appears for the contacts list. The SMS list contains the sender, date, body and type of SMS (RECEIVED and SENT).

6.3 Discussion

While the developed feature lacks many of the functionalities of premium applications, it compensates by being completely free. The simple configurations allow for the parents to quickly set up the application, something many struggles with, and the intuitive design helps them to monitor their children and protect them. For people who want to install the applications, the apk for the child's device is available online as well as the online web application for the parents. After installing the mobile application, the application needs to be provided the necessary permissions either when it launches or through the settings. In case something did not go as planned, people can download the code and test it using the following links for the Android application and the Svelte web application.

7 Conclusion and Future Work

After investigating what features are missing in popular parental monitoring applications (Google Family Link, Kids Place Parental Controls, Norton Family Parental Control, Qustodio, Parental Control - Screen Time & Location Tracker, FamiSafe, MMGuardian) using Google Play Store, a list of missing features was gathered. Such features include monitoring calls, SMS, messages, social media monitoring, alerting the parent when their child gets exposed to inappropriate content, restricting what web pages the child visits based on categories of web filters and blocking content with different applications such as YouTube channels. Using these requirements, a web application was developed that can monitor calls, SMS and contacts on an Android phone. While the developed tool lacks the polished design and variety of features, it still manages to contribute to and aid parents to monitor and protect their children.

For future work, the first suggestion would be implementing the Android functionality for blocking phone numbers. After that, receiving alerts for dangerous searches, images or texts, similar to Qustodio can be implemented. Another nice feature can be monitoring the child's YouTube watch-list since many younger children use that application.

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References

[1] R. Brito and P. Dias, ""which apps are good for my children?": How the parents of young children select apps," *International Journal of Child-Computer Interaction*, vol. 26, p. 100188, 2020. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2212868920300180

[2] P. Dias and R. Brito, "Criteria for selecting apps: Debating the perceptions of young children, parents and industry stakeholders," *Computers amp; Education*, vol. 165, p. 104134, 2021. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0360131521000117

[3] P. Manotipya and K. Ghazinour, "Children's online privacy from parents' perspective," *Procedia Computer Science*, vol. 177, pp. 178–185, 2020, the 11th International Conference on Emerging Ubiquitous Systems and Pervasive Networks (EUSPN 2020) / The 10th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (ICTH 2020) / Affiliated Workshops. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1877050920322924

[4] F. J. Elgar, A. Napoletano, G. Saul, M. A. Dirks, W. Craig, V. P. Poteat, M. Holt, and B. W. Koenig, "Cyberbullying victimization and mental health in adolescents and the moderating role of family dinners," *JAMA pediatrics*, vol. 168, no. 11, pp. 1015–1022, 2014.

[5] "Children's online privacy protection act, pub. l. no. 105–277, 112 stat. 2681-728," 1998. [Online]. Available: https://www.govinfo.gov/content/pkg/FR-2010-04-05/html/2010-7549.htm

[6] "General data protection regulation (gdpr), article 8 - conditions applicable to child's consent in relation to information society services." [Online]. Available: https://gdpr-info.eu/art-8-gdpr/

[7] X. Cai, W. Gantz, N. Schwartz, and X. Wang, "Children's website adherence to the ftc's online privacy protection rule," *Journal of Applied Communication Research*, vol. 31, no. 4, pp. 346–362, 2003. [Online]. Available: https://doi.org/10.1080/1369681032000132591

[8] S. Çankaya and H. F. Odabaşı, "Parental controls on children's computer and internet use," *Procedia - Social and Behavioral Sciences*, vol. 1, no. 1, pp. 1105–1109, 2009, world Conference on Educational Sciences: New Trends and Issues in Educational Sciences. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S187704280900202X

[9] K.-S. Cho and J.-M. Lee, "Influence of smartphone addiction proneness of young children on problematic behaviors and emotional intelligence: Mediating self-assessment effects of parents using smartphones," *Computers in Human Behavior*, vol. 66, pp. 303–311, 2017. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0747563216306987

[10] Google, "Google family link - apps on google play," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.google.android.apps.kids.familylink&gl=US

[11] kiddoware, "Kids place parental controls - apps on google play," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.kiddoware.kidsplace&gl=US

[12] Norton, "Norton family parental control - apps on google play," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.symantec.familysafety

[13] Qustodio, "Qustodio," 2022. [Online]. Available: https://www.qustodio.com/en/

[14] P. C. A. by Screen Time Labs, "Parental control - screen time location tracker," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.screentime.rc&gl=US

[15] L. WONDERSHARE TECHNOLOGY CO., "Famisafe: Parental control app," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.wondershare.famisafe&gl=US

[16] F. C. Awards, "Family choice awards," 2022. [Online]. Available: https://www.familychoiceawards.com/family-choice-awards-winners/wondershare-famisafe/

[17] Google, "Google family link - faq," 2022. [Online]. Available: https://families.google.com/familylink/faq/

[18] Kiddoware, "Kiddoware pricing plans - parental control apps for android," 2022. [Online]. Available: https://kiddoware.com/pricing-plans-kids-place-safety/

[19] MMGuardian.com, "Mmguardian parental control," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.mmguardian.parentapp

[20] W. LLC, "Whatsapp messenger," 2022. [Online]. Available: https://play.google.com/store/apps/details?id=com.whatsapp

[21] F. WonderShare, "Famisafe: Parental control app pricing," 2022. [Online]. Available: https://famisafe.wondershare.com/store/family.html

[22] B. McNally, P. Kumar, C. Hordatt, M. L. Mauriello, S. Naik, L. Norooz, A. Shorter, E. Golub, and A. Druin, "Co-designing mobile online safety applications with

children," p. 1–9, 2018. [Online]. Available: https://doi.org/10.1145/3173574.3174097
[23] T. Alelyani, A. K. Ghosh, L. Moralez, S. Guha, and P. Wisniewski, "Examining parent versus child reviews of parental control apps on google play," pp. 3–21, 2019.
[24] Á. Feal Fajardo, "Study on privacy of parental control mobile applications," Ph.D. dissertation, ETSI_Informatica, 2017.
[25] T. Warner, C. Meadows, and P. Wahjudi, "Analysis, recognition, monitoring, and reporting tool (armr)," *Journal of Management & Engineering Integration*, p. 20, 2012.
[26] F. Bélanger, R. E. Crossler, J. S. Hiller, J.-M. Park, and M. S. Hsiao, "Pocket: A tool for protecting children's privacy online," *Decision Support Systems*, vol. 54, no. 2, pp. 1161–1173, 2013. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0167923612003429
[27] G. Fahrnberger, D. Nayak, V. S. Martha, and S. Ramaswamy, "Safechat: A tool to shield children's communication from explicit messages," pp. 80–86, 2014.
[28] N. Family, "Norton family pricing," 2022. [Online]. Available: https://nl.norton.com/norton-family?inid=familycom_subscribe_home
[29] Qustodio, "Qustodio price," 2022. [Online]. Available: https://www.qustodio.com/en/premium/
[30] ScreenTime, "Parental control - screen time location tracker price," 2022. [Online]. Available: https://screentimelabs.com/pricing/
[31] MMGuardian, "Mmguardian parental control pricing," 2022. [Online]. Available: https://www.mmguardian.com/pricing
[32] "Privacy and security in firebase." [Online]. Available: https://firebase.google.com/support/privacy