Guardian Teen

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ABSTRACT

We demonstrate GuardianTeen, a context-aware Android app for teenage safety from a parental viewpoint. It provides an innovative blend of physical and health safety features like speed monitoring, geofencing, fall detection, health vitals monitoring, SOS emergency button, and live location sharing. The application leverages the GPS and gyroscope of the child's device to notify parents if their child is over-speeding, exits a safe zone, has fallen, has abnormal heart and respiratory rates, or presses the SOS button. GuardianTeen has separate interfaces for a child and a parent. A parent can add any number of children, set geofences, and request their child's vitals. While a child can view their own vitals and have access to an SOS feature.

1. INTRODUCTION

Teenage safety has been a great concern for parents for decades. Seeing the growing independence among teens and rapid technological advances, especially the introduction of smartphones, it is necessary to have a 'Guardian Angel' monitor and protect our kids from everyday dangers. GuardianTeen fills this gap with a suite of features designed to look after the driving habits, physical well-being, and health issues of the children without violating their privacy. This paper demonstrates all the core functionalities of GuardianTeen, along with its user-friendly and minimalist user interface. Speed monitoring is done by utilizing the phone's GPS to alert parents if their child is over-speeding. This can promote responsible behavior associated with driving. The next is geofencing, where the parent can define certain areas as safe-zones for their children and receive instant notifications if their child leaves these areas, offering parents with peace of mind. Fall detection is particularly crucial in emergency situations and provides parents some extra time to respond quickly. It uses the phone's gyroscope and accelerometer to detect falls. We extended the application's scope to include real-time monitoring of heart and respiratory rates of the kids. As an additional under-rated feature, we added an SOS button to the child's interface for urgent communication. By pressing the button, the child's live location is shared with the parents and concerned authorities. The integration of context-aware technology and real-time data makes GuardianTeen an effective and reliable solution for the concern regarding teen safety in this complicated world. Our app can prove to be a step forward in the mobile computing domain.

2. ARCHITECTURE

The architecture of Guardian Teen revolves around providing a secure and comprehensive platform for monitoring teenage safety. It consists of various modular context-aware features compiled into one application. These specialized features leverage external APIs, Location, Camera, Accelerometer etc. for the functioning. These include, Speed Monitoring, Geofencing, Fall Detection, and Health Vitals Monitoring which are incorporated in a multifaceted approach for optimal user safety. GPS is necessary for the working of Speed Monitoring, Location Sharing and Geofencing, which allows for precise location tracking on smartphones. The mobile gyroscope and accelerometer are integral to the innovative Fall Detection feature, providing critical alerts in emergent situations. Health Vitals Monitoring extends the app's reach into well-being, utilizing advanced sensor data to track and report on heart rate and respiratory rate, encapsulating a holistic view of safety that addresses both immediate dangers and ongoing health. The user interface of Guardian Teen has been designed with a focus on simplicity and intuitiveness, making it easy to navigate and access essential functionality. This design concept, which prioritizes the needs of the user, is critical since it makes important features and information easily accessible to parents and teenagers alike, as well as allowing for quick access. The emergency response functions of Guardian Teen are an essential component of its design structure. For emergency communication, an SOS button and live location sharing features are integrated, guaranteeing prompt assistance and response in times of need. This supports the core goal of the application, which is to protect teenagers in a range of situations. The architecture of the application has been planned with future-proofing in mind, guaranteeing scalability and seamless integration.

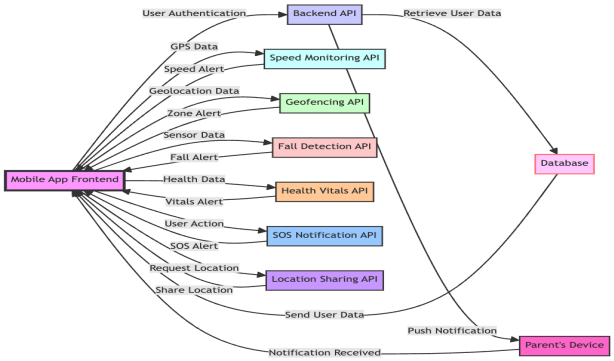

Figure 1: GuardianTeen Application Architecture.

3. THE APPLICATION SUITE

The GuardianTeen application suite is a comprehensive amalgamation of advanced features, each designed to enhance the safety and well-being of teenagers. This suite, through its integration of various functionalities, provides a robust tool for parents to monitor and ensure the safety of their children, while respecting the teenagers' growing need for independence. The suite comprises several key features.

3.1 Parent and Child Dashboards

3.1.1 Parent Dashboard

GuardianTeen's Parent Dashboard is a centralized interface that helps parents effectively control and keep an eye on their teen's safety features. The dashboard offers a complete overview of multiple functionalities, such as monitoring speed alerts, viewing health vitals, and setting and modifying geofencing limits. With live location monitoring, parents can easily find their child and get rapid alerts for things like speeding or leaving designated safe zones. The dashboard presents important information in an easy-to-use manner and is intuitively built to make it simple to utilize. It gives parents the power to monitor their adolescent's safety and wellbeing and gives them the adaptability to change settings in response to evolving situations.

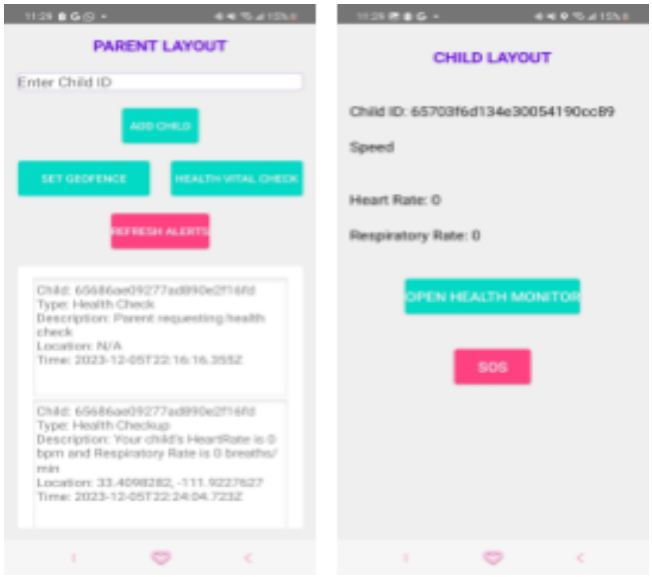

Figure 2: Parent and Child View for GuardianTeen

3.1.2 Child Dashboard

With an emphasis on giving teenagers the things they need without compromising their sense of liberty, Guardian Teen is designed with their preferences and needs in mind, which also focus on providing them needful and essential features while simultaneously maintaining a sense of autonomy. In case of emergency, teenagers may notify their parents by using the SOS feature on the dashboard which enables teenagers to alert their parents while there is any fall detection.. Transparency in the monitoring process is recommended since it enables teenagers to view and comprehend the geofencing boundaries that their parents have established. Teens are to meet the preferences and requirements of teenagers, focusing on providing them with essential features while maintaining a sense of autonomy. This dashboard includes access to the SOS feature, enabling teenagers to alert their parents in case of emergencies. It also allows teenagers to view and understand the geofencing boundaries set by their parents, promoting transparency in the monitoring process.The interface is designed to be attractive and non-intrusive, encouraging young adults to take into account their protection without feeling overly monitored. The dashboard moves a balance among supplying important safety functions and respecting the teenager's independence, aligning with the utility's purpose of fostering accountable behavior and mutual acceptance as true between dad and mom and young adults.

3.2 Speed Monitoring

This feature utilizes GPS technology to constantly monitor the speed of teenagers. It is in particular designed to encourage secure driving behavior and alert parents in real-time of any times of overspeeding. This proactive approach serves as a preventive measure against potential road accidents, fostering accountability using conduct among teens.

3.3 SOS Button and Live Location Sharing

Teens can immediately notify their parents in an emergency and share their area location in actual time by using the emergency SOS button, which is a vital feature. This feature gives parents and teenagers peace of mind by guaranteeing that when assistance is needed, it can be obtained right away. Furthermore, parents can maintain continuous situational consciousness by tracking their child's whereabouts with the assist of the stay region sharing feature.

Figure 3: SOS working logic

3.4 Geofencing

Geofencing allows parents to outline virtual boundaries or secure zones, which include home and schools, and different regularly visited locations. Notifications are sent to parents while their child enters or exits those zones. This feature strikes a sensitive balance between ensuring protection and granting independence, preserving parents' knowledge without being overly intrusive.

3.5 Fall Detection

Utilizing the phone's integrated sensors just like the gyroscope and accelerometer, the Fall Detection characteristic is designed to come across sudden falls. In such a situation, the application automatically indicates parents, probably signaling emergencies or health-related issues. This instant notification system is vital for providing rapid assistance in critical conditions.

3.6 Health Vitals Monitoring

Extending past safety, this feature gives real-time monitoring of key health metrics, together with heart-rate and respiration-rate. It gives parents insights into their teenger's physical health, which may be important for early detection of health issues. This monitoring component adds a layer of health supervision, improving the general scope of the software application.

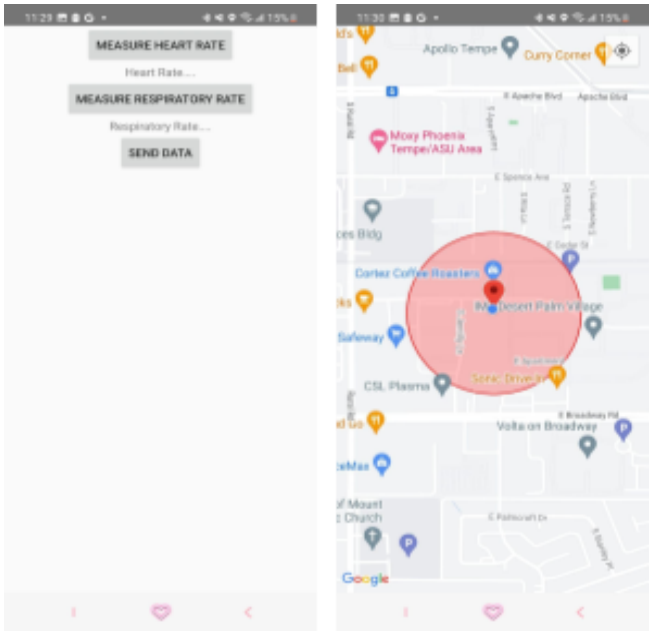

Figure 4: a) Health vital monitoring screen; b) Geo-fencing set-up screen

In summary, the GuardianTeen mobile application isn't just a set of isolated remote features however it is an application designed for the multifaceted desires of safety and parental peace of mind. By combining modern technology with considerate design, the suite effectively addresses the complexities of tracking and safeguarding teens within the advanced world. This comprehensive method makes GuardianTeen a pivotal tool in the domain of protection applications, catering to the nuanced demands of teenager's life and parental responsibilities.

4. IMPLEMENTATION

Every function within the GuardianTeen app was developed in a highly systematic manner allowing for independent operation while maintaining successful incorporation with the overall system. During the implementation of, we focused on reliability, usability as well as technological advancements.

To begin with, we concentrated on establishing a framework through which it was possible to leverage upon Node.js. The backend of this application acts as a central hub for storing user data, relationship data for mapping parent with child, location data and all the alerts specific to a user. To verify the reliability of the restful APIs routes that deal with functional processes such as geofencing alerts and sending notification we did testing using postman software.

At the same time, we did frontend development by working with Kotlin and/or Java in a way of building an interactive user interface. We used various web API's for location tracking, finding the nearest hospital and police station to the child's location and for speed testing. Providing intuitive navigation and an appealing interface for both teens and their parents, we created XML layout files for delivering engagement and information.

Incorporation of such functions as location tracking and fall-detection alert ensured that the system had real time abilities. Adjustments were made to its optimization to enhance its performance when reviewing the applications responsiveness and processing of real time data inputs. The implementation process included utilizing smartphone sensors for some features such as Fall Detection and Speed Monitoring. Calibration and test procedures were designed to enable timely fall detection and also to monitor speeds based on built-in devices that include gyroscope, accelerometer and GPS.

We also went a step ahead by not just implementing the features that we planned upon but also by minimizing the false fall alert by giving the user an option to select don't send alert if the phone falls down, providing child with the option to record video when SOS button is pressed, also providing the parent with nearest hospitals and police station from the child's location from where the alert is sent.

Finally, deployment of GuardianTeen consisted of backend programming, user interface engineering, system configuration, sensor integration, and cyber-security. Every stage involved building a trustworthy yet easy-to-use and highly sophisticated application that handles various teenage safety as well as parent worries issues.

The user table, relationship table, location table and alert table are used as the database in the proposed design. Our users may be either kids or parents. Such information involves for example, their device tokens which we need for sending alerts and childId, parentId, name, email password. This allows the Relationship

Figure 5: Overview architecture of GuardianTeen

Table to link to a child user through their ChildID, and connects it to its matching parent user using the ParentID. The Location Table plays an important role in both safety issues and in monitoring functions since it contains the geofence limits that parents have set and it also keeps track of where their kids' are at the moment. Finally, the Alert Table records all child-related alerts such as crossing geofences. The tables are linked in order to enable seamless communication, maintain data security, and uphold user confidentiality. The structure is the backbone of our system through which the users' data and actions are traced.

5. DEMONSTRATION

Demonstration of the GuardianTeen application was presented as an evident way of depiction of its characteristics and utility. Indeed, this was a critical showcase of the reality of the application and how it could be used to enhance teens' safety and parent supervision. We started the demonstration with a brief description of the problem addressed, the challenges faced, and how our team managed to overcome such obstacles before delving into the features of our product – the Parent Dashboard which had a user-friendly interface and was able to perform multimodal monitoring. There were live demos like establishing geofencing zones, capturing over/under speed alerts, and access to vital health data in real time. Finally, this highlighted dashboard's ability to allow the parent to easily adjust the settings as well as receiving a notification immediately made it easy to use the device and its functions were responsive. Moving forward, focus was on the Child Dashboard. The demonstration illustrated how the panel had an informative layout and provided useful information about the positioning of the SOS button and the geofencing boundary lines. This part of the demonstration was also crucial as it helped in showing how the application strikes a good balance between safety features and protecting the teenager's privacy. One essential part of the demonstration was highlighting the app's live functions in front of everyone. It involved tracking the speed of the child's vehicle to showcase the Speed Monitoring functionality of the application, which identified and notified about over-speeding instances. A similar mock scenario was used to portray the Geofencing feature, setting off alerts every time the teenager's mobile device left or entered the safe zones. A staged setting was used where a falling motion initiated an instantaneous notification on the Parent Dashboard of the Fall Detection module. This was a critical showcase of how quick the application can prove as efficient in case of unexpected situations. For Health Vitals Monitoring, live data showcasing the heart rate and respiratory rate monitoring was presented. This feature's demonstration underscored GuardianTeen's extended functionality beyond

safety, venturing into health monitoring aspects. In conclusion, the demonstration of GuardianTeen effectively highlighted the application's comprehensive suite of features, its ease of use, and its practicality in real-life scenarios. By showcasing the application in action, the demonstration reinforced GuardianTeen's role as a reliable and innovative solution in the realm of teenage safety and parental monitoring applications.

6. CONCLUSION

Guardian Teen development and implementation play an important role in safeguarding teens and making sure that parents monitor their children well and keep track of their well-being. This project introduces cutting-edge technology to help resolve many challenges that come with modern parenting. The application suite has a variety of features like Speed Monitoring, Geofencing, Fall Detection, Health Vitals Monitoring, and an SOS button, which combines safety, health monitoring, and real-time responsiveness in a single, user-friendly platform. Throughout the project the focus was placed more on creating an application that is not only technologically advanced but also intuitive and respectful of the teenager’s need for independence. The dual dashboard system for parents and teenagers reflect this commitment by balancing oversight with autonomy. The application's ability to update the information and send notifications to parents in real time and provide responses that are context-aware further improves its effectiveness, making it a versatile tool in a variety of scenarios. The successful integration of frontend and backend systems along with the effective use of smartphone sensors like accelerometer, GPS, Gyroscope, Camera demonstrates the project's technical proficiency. Moreover, the strict attention to security and privacy measures tells about a deep understanding of the sensitivity of the data involved and the importance of user trust. In conclusion, GuardianTeen is more than just an application, it is a comprehensive solution that addresses a crucial need. It stands as an embodiment of how technology can be harnessed to improve safety and peace of mind in the digital age. From a long-term point of view, the scope for upgrades and adapting the latest technologies creates room for further development of the application for international use by families at large. Hence, they were able to achieve more than just an important milestone in safety monitoring applications. Rather they were able to advance toward an harmonious marriage of technology, safety, and family wellbeing.

7. REFERENCES

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