

Child Alert System

Syed Shahzaib Sohail¹, Muhammad Khurram Junaid², Junaid Altaf³, Kashif Altaf⁴, Muhammad Atif Noor⁵

¹Department of Computer Science, Bahria university Lahore, Pakistan

²Department of Computer Science, Bahria university Lahore, Pakistan

³Department of Information Technology, Gulab Devi Educational Complex, Lahore, Pakistan

⁴Department of Information Technology Murdoch University Perth, Australia

⁵Department of Computer Science & IT Cholistan University of Veterinary and Animal Sciences Bahawalpur, Pakistan

ARTICLE INFO

Article History:

Received:	July	31, 2024
Revised:	August	22, 2024
Accepted:	August	22, 2024
Available Online:	August	25, 2024

Keywords:

Child
Alert
System
Child Safety
Gadgets
Sensors
Child Protection
Child Vehicle Alert

ABSTRACT

In the early times questions come out on how to protect the child or make them safe as many children were facing death, being lost or come across some serious accidents. Later many researches come out and many systems were developed for different child safety purposes like health safety, danger from surroundings etc. As technology advanced many systems were developed including tracking, wrist bands and alarm system. In this paper we will describe some of the child alert systems that can prove handy and functional for the safety point of view to decrease the death rate.

Classification Codes:

Funding:

This research received no specific grant from any funding agency in the public or not-for-profit sector.



© 2024 The authors published by JCIS. This is an Open Access Article under the Creative Common Attribution Non-Commercial 4.0

Corresponding Author's Email:

Citation:

1. Introduction

In the early times questions come out on how to provide the protection or safety to the child as many cases come out regarding child abuse, child health issue etc. After that many researches were conducted and an idea was devised and many systems were developed for different child safety purposes like health safety, danger from surroundings and vehicle safety etc.

With the advancement of technology and algorithms many new ideas were devised and systems have been developed that include sensor to sense any unsafe event that may happen or just happened. An example is a wrist band that the driver (parents/others) must wear. This wrist band alerts if any child is locked inside the car alone so to make the child safe. Furthermore, there are more gadgets that prove to be handy and functional.

Child protection and safety can be provided in many domains that include health issue, child abuse, inside locked vehicle, unsafe surroundings and missing children cases. There are various alert systems that can be used for safety of children and many systems are under review and research. We're going to review some of them here.

2. Child Abuse Alert System

In early times many children were abused (i.e. mentally/physically) which were unknown to the childcare authority because of no proper system introduced. Later many systems were introduced for child protection but some need further work for improvement. Corporal maltreatment is a chief basis of pediatric injury and impermanence. Medical doctors do not steadily conceal for maltreating, even in high-peril conditions. Alerts [1] in the electronic health record may aid advance shielding rates, ensuing in premature spotting and enhanced conclusions. [2] [3]

A blend of a child maltreat protection, [2]natural language processing, doctor briefings, and dismissal analyses were used to recognize children <2 years of age with grievances distrustful for corporal maltreatment. Benefactors acknowledged an alert and were denoted to a corporal maltreatment order set whenever a child prompted the system. Doctor amenability with medical procedures was related earlier and throughout the intercession. Prompts [1] were rooted into the electronic medical record system, and the blend of all these prompts will henceforth be stated to as the child exploitation alert system. Distinct [1] [2] prompts were nominated after evaluation of child exploitation fiction and electronic data entry fields presented in the CHP electronic medical record system.

The child guard alert system [3] [4] [5] was premeditated by a collaborative cluster of medics, information technology (IT) superintendents and programmers, and associates of our homegrown medical incorporation team. The preprogrammed list of child exploitation-related analyses was carefully chosen by the consent of three child exploitation surgeons, one medic-researcher, one student research subordinate, and one proficient on coding. The child guard alert system was shaped to be prompted by the incidence of any analysis representing child exploitation that was counted in the preprogrammed list of child exploitation-related analyses.

The collaborative [5] child fortification teams were asked to contemplate a set of homogeneous child fortification cases subsequent their common practice and also requested to partake in an online survey [4] to check whether the anticipated system actually aided the children to be kept harmless. After scrutinizing the quantifiable data and qualitative findings, health professionals observed the child guard alert system positively but in order to advance it further, some more research is to be done [4] [5].

3. CHILD VEHICLE ALERT SYSTEM

Every year during summer due to heatstroke and hyperthermia [6] [7] an unknown number of children die for being enclosed in parked vehicles. According to report of National Safety Council, United States the children that have died from vehicular heatstroke in the United States (1998 – 2020) have ranged in age from 5 days to 14 years and total deaths are 873.

Age	Number of children	Percentage
< 1	272	31.16%
1	198	22.68%
2	168	19.24%
3	125	14.32%
4	52	5.96%
5	28	3.21%
6	8	0.92%
7	3	0.34%
8	3	0.34%

9	2	0.23%
10	3	0.34%
11	3	0.34%
12	1	0.11%
13	2	0.23%
14	2	0.23%

Table 1 Total recorded deaths and percentage of children of different ages (Source: <https://www.noheatstroke.org>)

To overcome such dreadful accidents and stop children from dying many researches have been done and many inventions have been proposed and developed that has decreased the children death rate. First of them is a seat sensor [8] which is installed in the child seat to detect a child and an alarm fob. When the sensor detects a child in the child seat it interrogates the GPS for the GPS coordinates of the sensor. The GPS directions of the area of the seat sensor are remotely communicated to the alarm fob. The alarm fob gets the GPS directions of the area of the seat sensor and looks at the GPS directions of the area of the seat sensor to the GPS directions of the location of the alarm fob. On the off chance that the distance between the GPS directions of the area of the seat sensor and the GPS directions of the area of the alert dandy is more prominent than a most extreme permissible distance the alarm fob produces an alert.

Second is a wireless sensor [9] that is installed in the seat of the child and is connected via app. If the driver is walking away from the car the sensor in child's seat is triggered by the child's weight and the transmitter sends the signal to the driver's device on which the app is installed. If the receiving device is not in the transmission region an alarm in the receiving device will be triggered.

Third is wristband a childcare alert device [10] that includes a visual display tag that includes a slot for hanging the tag from the handle of a rearview mirror used to prevent a driver from leaving the child in a vehicle unattended. The tag body incorporates indicia that can be strong dark letters on a profoundly brilliant beautiful label surface that reminds the driver to eliminate an infant from the vehicle while leaving the vehicle. The gadget additionally incorporates a driver's wristband, that likewise has printed text helping the wearer to remember a baby to be removed from the vehicle.

Many child safety systems are currently being used in the market but they are mostly erratic and defective. Automatic vehicular heatstroke detection system [7] is more effective alert system that consists of various sensors like thermal human presence sensor, carbon dioxide sensor, motion sensor, ultrasonic sensor and pressure sensor.

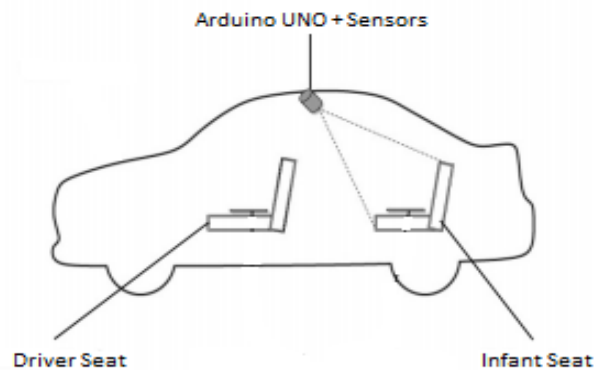


Figure 1: Installed Arduino UNO with 433 MHz RF Modules and Sensors

3.1 Working of AVH Detection System:

Figure 2 gives an overview of the automatic vehicular heatstroke detection system [7]. When the driver leaves the vehicle, detection system gets power from the battery and activates sensors. Firstly, the sensors detect if any child is being left unattended in enclosed vehicle. If the child is detected sensors monitor the temperature and carbon-dioxide level inside the vehicle. If temperature exceeds 85° or carbon-dioxide level inside vehicle is 60% of total air the system will generate an alert and triggers alarm in the receiving device (car key or smartphone).

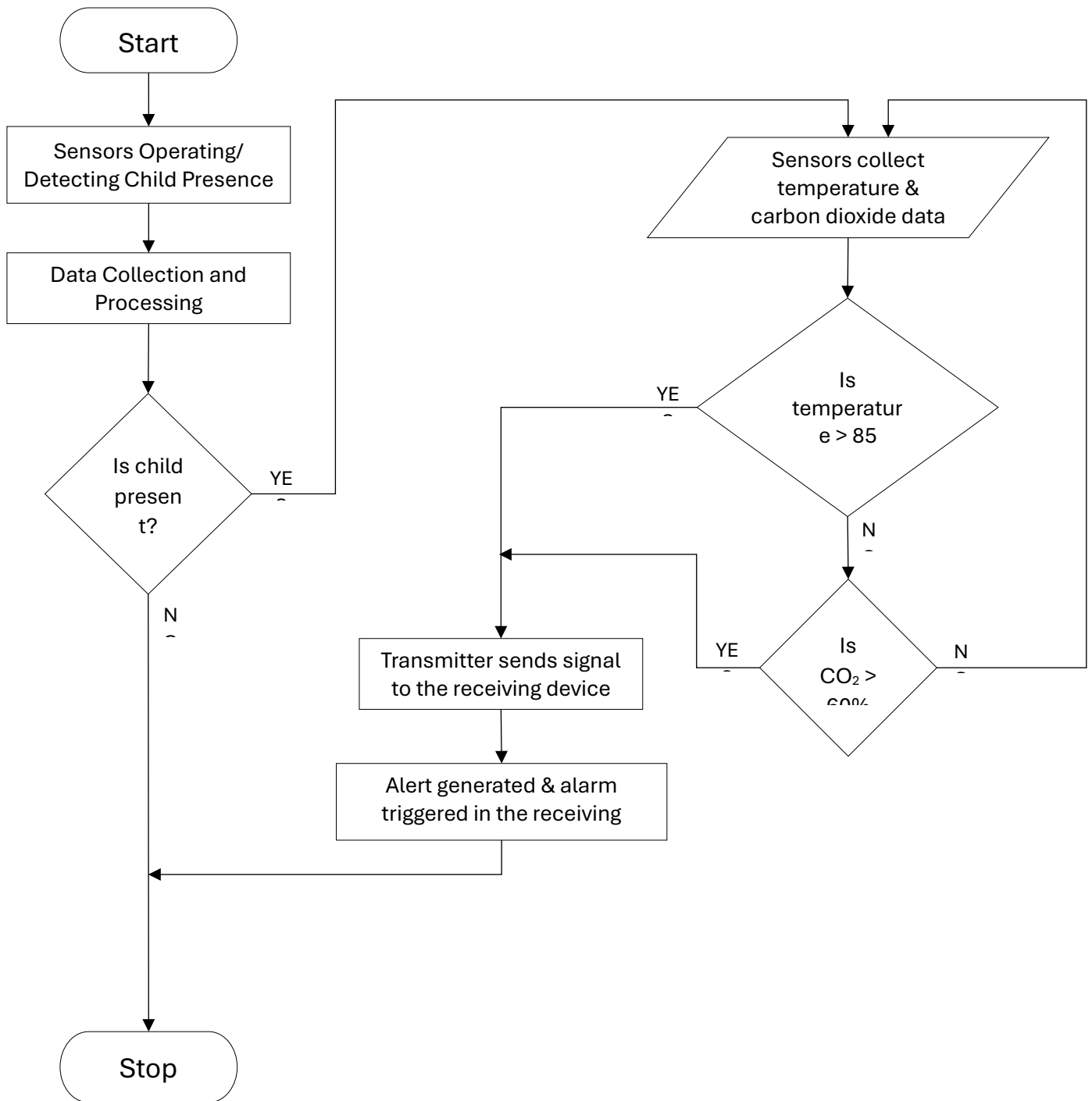


Figure 2: Working of Automatic Vehicular Heatstroke Detection System

4. MISSING CHILD ALERT SYSTEM

The general idea of the AMBER/Child Alert System [11] [12] [13] is that by spreading and dispensing info about a lost child to the public, the public's contribution can cause serious response that would have otherwise been unnoticed. This response, in numerous cases, can be proved significant in finding the lost child. Regardless of the exertions at country and European level to effectually address the matter of lost children, a number of crucial encounters remain

open, including deficiency of site-intensive distribution of alerts, inadequate detention and dispersion of info, and deficiency of a mechanism that uses and fuses all available sources of info.

The aim of this paper is to present a novel approach for handling such challenges through a data analytics platform and a mobile application available to all citizens. Using the active research fields of human mobility pattern analysis and machine learning, we show that missing children investigations, as well as search and rescue operations, can be actively supported and enhanced when multiple data sources are combined and analyzed.

5. IN-VEHICLE SAFETY AND SECURITY MONITORING

Another improved version of child safety and security system in vehicle is an intelligent system with face recognition [14] [15]. The system uses HOG-based face detector from Dlib library to obtain face counting function. Face recognition is achieved through two steps, facial feature extraction and face identification. The ResNet is used in facial feature extraction. It transforms an aligned face into a 256-dimensional vector, a Euclidean facial embedding. In face identification, labeled faces will be transformed to facial embeddings first. Then k-nearest neighbor classifier (kNN) is adopted to identify people using such facial embeddings. The simulation on ChokePoint dataset is tested and the average accuracy is 93 percent.

6. DATA SOURCES

Downloaded research articles, journals and conference proceedings from IEEE, Google Scholars. Studied them and analyzed the system thoroughly.

Type	Count
Journal Articles	7
Conference Proceedings	4
US Patents	2
US Patent Application Publication	2

Table 2 Sources of Data

7. CONCLUSION

The researches made proved to be helpful in improving alert system for child safety and protection. Most critical cases were death of child in an enclosed vehicle due to heatstroke which has been controlled a lot and also other detection systems like detecting missing child or child abuse are being applied and proving beneficial in controlling such critical cases.

8. References

- [1] R. P. Berger, R. A. Saladino, J. Fromkin, E. Heineman, S. Suresh and T. McGinn, "Development of an electronic medical record-based child," *Journal of the American Medical Informatics Association*, p. 8, 2017.
- [2] B. Rosenthal, J. Skrbin, J. Fromkin, E. Heineman and T. McGinn, "Integration of physical abuse clinical decision support at 2," *Journal of the American Medical Informatics Association*, p. 10, 2019.
- [3] C. Krawiec, S. Gerard, S. Iriana, R. Berger and B. Levi, "What We Can Learn From Failure: An," p. 9, 2019.

- [4] P. Kelly, C. Basu, V. T. Graham, C. Chan, M. Ritchie, D. Wilson and F. Seymour, "Health professionals' perception of the New Zealand National Child Protection Alert System: An online survey," *Journal of Paediatrics and Child Health*, 2020.
- [5] P. Kelly, C. Chana, P. Reedc and M. Ritchied, "The national child protection alert system in New Zealand: A prospective multi-centre study of inter-rater agreement," 2020.
- [6] M. M. H. Rosli, N. I. Afandi, L. P. J. Yuen, N. S. Joli, K. A. A. Kassim and M. R. A. Mansor, "Study of unattended child presence detection system for ASEAN NCAP safety rating," 2019.
- [7] S. N. D. Chua, W. J. Goh, S. F. Lim, A. Joseph, O. Y. B and C. V. Sia, "Development of an Automatic Vehicular Heatstroke Detection System," in *International Conference on Advanced Manufacturing and Industry Applications*, Sarawak, Malaysia, 2018.
- [8] H. F. (. Carlos Espinoza and H. F. (. Ana Lila Espinoza, "Vehicle Child Safety Alert System". United States Patent US 9,805,574 B1, 31 October 2017.
- [9] C. D. A. I. (. Paula Labelle, "Car Seat Child Safety Alert Device". United States Patent US 2018/0361887 A1, 20 December 2018.
- [10] L. W. F. (. Avalon Biederman, "Vehicle Child Onboard Visual Alert Device". United States Patent US 10,183,619 B1, 22 January 2019.
- [11] M. K. Miller, M. J. Alvarez and J. Weaver, "Empirical evidence for AMBER alert as crime control theater: a comparison of student and community samples," 2017.
- [12] A. Michalitsi-Psarrou, M. Pertselakis, I. Brantl, C. Ntanos, D. Varoutas and J. Psarras, "Complementing Amber Alert: Increasing the social sensors' effectiveness through focused communication channels," in *2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, 2019.
- [13] C. M. McDermott, M. K. Miller and A. DeVault, "They should have known: Hindsight and outcome biases in child abduction cases," *Journal of Applied Social Psychology*, 2020.
- [14] X. Fu, J. Lu, X. Zhang, X. Yang and I. Unwala, "Intelligent In-vehicle Safety and Security Monitoring System with Face Recognition," Houston, TX, 2019.
- [15] S. C. (. Shengdong ZHU, S. C. (. Lei ZHONG, S. C. (. Kaisheng SONG and S. C. (. Jia GUO, "Children Face Distance Alert System". United States Patent US 2020/0151432 A1, 14 May 2020.